

# CLASSROOMS

*Management, Effectiveness  
and Challenges*

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*Rebecca J. Newley  
Editor*



*Education in a Competitive  
and Globalizing World*

NOVA



**EDUCATION IN A COMPETITIVE AND GLOBALIZING WORLD**

**CLASSROOMS:  
MANAGEMENT, EFFECTIVENESS  
AND CHALLENGES**

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AND CHALLENGES**

**REBECCA J. NEWLEY  
EDITOR**



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## PREFACE

In this book, the authors present topical research in the study of the management, effectiveness and challenges of classroom study. Topics discussed include mathematics and the interactive classroom; the effects of the classroom script and gender composition in the classroom; moral stances and discursive power in classroom discourse; teacher-child interaction training; urban classroom pedagogy; the racist teacher; classroom acoustics and the classroom social climate. (Imprint: Nova)

Chapter 1 - This chapter draws on the findings of a larger study carried out in a Malaysian secondary school that aimed to cultivate an interactive classroom context and to investigate the patterns of discourse that had a positive impact on students' learning over a 10-month period. The Vygotskian school of thought provided the main framework to derive the three constructs of concept formation, student-student interaction and teacher-student interaction. The study was qualitative and the methodology was designed by incorporating the features of naturalistic inquiry, and the interventional nature of action research. The samples were a mathematics teacher and one Form Four class of students aged between 16 and 17 years. We collected qualitative data through audio-visual recordings, observations and interviews. The comparative method suggested by Glaser (1978) was used to analyze the data. Drawing on the analyses of discourse from the data collected, it was possible to change a traditional classroom to an interactive classroom by using a four-phase lesson plan consisting of whole-class discussion, group work, reporting back and summing up. With this lesson plan, the teacher managed to reach the full range of competencies in a multi-racial and large class. Hence, student-student and teacher-student interactions using the Zone of Proximal Development were enacted in the classroom. During group work, the students were faced with the social problems of working together and the problems of solving the mathematical tasks in hand. The teacher used four strategies to initiate and guide the negotiation of his expectations for group work. First, he stopped by the non-collaborative groups to exert his authority on the students involved to act appropriately for group work. Second, he took these cases as opportunities during the reporting-back phase to preach to the class the obligations and expectations for group work. Third, he constantly reminded the students of their obligations and expectations when he moved around the classroom. Last, he approached every solution and explanation in a non-evaluative way. The authors identified relevant, adequate, timely, and understand and use to be the features of student-student interactions that helped students to accomplish the mathematical tasks successfully. Finally, the analyses of data also yielded three types of instructional feedback facilitating the

mathematics growth of students, namely, feedback on the task, feedback on the process and feedback on regulation.

Chapter 2 - The use of collaborative inquiry in classrooms is increasing, despite the fact that the conditions for its effectiveness have not been systematically studied. It has been claimed that inquiry-learning environments with minimal guidance are less effective than those with additional instructional support, especially for learners with little prior knowledge. It has also been argued that collaborative working, working with computers, and learning scientific content may involve gender factors. However, with regard to collaborative web-based inquiry-learning, there has so far been little research on how students' learning and collaboration is supported or hindered by differently structured interaction patterns, and the gender composition of groups. The present chapter deals with technology-enhanced collaborative inquiry-learning. In this context, we examine the influence of the classroom-script structure (high structure vs. low structure) on the help-seeking of single-gender and mixed-gender pairs, and also look at the learning gains achieved. The data are drawn from 54 student pairs in secondary science education. We analyzed screen- and audio-capturing videos according to a model of the help-seeking process. Pre- and post-tests were applied in order to measure the students' learning gains. Overall, the single-gender and mixed-gender pairs under the high-structured classroom-script condition sought less help, but learnt more than those under the low-structured classroom-script condition. The results indicate that in terms of both help-seeking and learning gains, the structure of the classroom script has a greater effect than the gender composition of the classroom. However, mixed-gender pairs seemed obtain particular benefit from the high-structured classroom script in terms of learning gains – a result that would merit further investigation with a larger sample. In addition, a qualitative analysis of successful and unsuccessful pairs was conducted with respect to learning gains, to determine whether there could be differences between gender pairs and their ways of working. In fact, no clear gender differences were found, but students' behavior in successful pairs could be characterized as task-relevant behavior. In conclusion, we discuss the challenges pertaining to the structuredness of the classroom script and the role of the teacher in technology-enhanced inquiry-learning classrooms.

Chapter 3 - Social psychology research provides evidence that people's engagement in groups is related more to their perception of authorities than to economic assurances (De Cremer & Tyler, 2007; Tyler & Degoey, 1995). In educational contexts, Berti, Molinari, and Speltini (2010) have shown that a sense of justice impacts engagement as well as students' identification, motivation, and dialogue in class. Furthermore, survey and laboratory studies show that students who identify more closely with their university report more engagement when university authorities treat them fairly (Berti, Di Battista, & Pivetti, 2010; Smith, Olson, Agronick, & Tyler, 2009; Tyler, Boeckmann, Smith, & Huo, 1997). Among the antecedents of student engagement, teachers' support is considered essential in elementary, middle, and high school (Marks, 2000) in promoting student participation and on-task behavior (Battistich, Solomon, Watson, & Schaps, 1997) and reducing the probability of dropping out of school (Croninger & Lee, 2001). Moreover, a great deal of empirical evidence has shown the significant role of trust in authorities in building effective, productive and well-managed schools (Bryk & Schneider, 1996). Trust in authorities predicts positive school climate, productive communication, willingness to go beyond in-role behaviors, and student achievement (Tschannen-Moran & Hoy, 2000). Definitions of trust are broad, but recent studies (Colquitt, Scott, & LePine, 2007) suggest the value of distinguishing among types of

trust, such as competence and benevolence. *Competence-based trust* captures the knowledge and skills needed to perform a specific job. *Benevolence-based trust*, by contrast, involves authorities' fairness, caring motives, and intentions. Empirical evidence (Hoy & Tschannen-Moran, 1999) has shown that all of these and other facets of trust are important aspects of intra-school relations, but their relative effect on engagement depends on the nature of the relationships. Trust may be based on perceptions of schools' economic motives, on institutional support conducive to building trust, on students' sense of identification and on other factors (Tschannen-Moran & Hoy, 2000). For instance, *unconditional* or *identification-based trust* emerges in an environment where parties have complete confidence and empathy, as well as common desires and intentions (Lewicki & Bunker, 1996). In summary, this chapter reviews research about engagement and trust in authorities in order to suggest potential determinants of a more inclusive and empowering educational system.

Chapter 4 - Behavior that disrupts the learning of the student or surrounding students (e.g., arguing, being out-of-seat, not following directions) is a prominent concern of teachers (Axup & Gersch, 2008; Ennis, 1996), and 50-68% of teachers believe they spend too much time managing problematic classroom behavior (Beaman, Wheldall, & Kemp, 2007). Disruptive behavior is stable without treatment (Campbell, 1995; McNeil, Capage, Bahl, & Blanc, 1999), and young children who display disruptive behavior may develop delinquent and antisocial behavior as adolescents or adults (Farrington, 1995; Loeber, Burke, Lahey, Winters, & Zera, 2000). Such students score lower on standardized tests than their compliant peers (Finn, Pannozzo, & Voelkl, 1995). In addition to the disruptive behavior of a child impacting his or her own academic achievement, a student's disruptive behavior adversely affects the whole class by requiring the teacher's attention resulting in decreased instructional time (Carr, Taylor, & Robinson, 1991). Additionally, teachers report that they feel overwhelmed and unprepared to handle the behavior problems that they face in the classroom (Kurtz, Fernandez, Miller, Madigan, Firpo, Dimotta, et al., 2010). Teachers report that disruptive behavior increases their job-related stress and believe that effective behavior management would decrease their stress levels (Axup & Gersh). Teacher-Child Interaction Training (TCIT) is an emerging program to help teachers of young children effectively manage the behavior in their classrooms. Proponents of TCIT have adapted Parent-Child Interaction Therapy (PCIT), an evidence-based treatment program for parents of children ages three- through six-years with disruptive behavior (Eyberg, Nelson, & Boggs, 2008; Hood & Eyberg, 2003; Nixon, 2001), for use with teachers. PCIT, and subsequently TCIT, is based on the two-phase model of parent training initiated by Constance Hanf in Oregon (Costello, Chengappa, Stokes, Tempel, & McNeil, in press; Hanf, 1969). Specifically, child-focused play skills that foster a warm, nurturing environment in the classroom are combined with consistent consequences to handle misbehavior. TCIT is being implemented primarily in preschools and kindergartens. Given that TCIT is a relatively new program, research groups differ in the approaches they have used to adapt the characteristics of PCIT to a classroom setting. For example, some train teachers in the classroom with students present, others train during workshops or in-service days, and others during the school day but outside of the typical classroom. Additionally, TCIT has been implemented as both a targeted intervention to improve the behavior of an identified child who causes significant disruption in the classroom and as a universal teacher training program to improve behavior management skills across the board for use with all students. One of the main challenges of adaptation is that PCIT focuses on the interactions of one parent with one child while teachers are responsible

for many children at once and have as many as 30 children in one classroom. The differences in implementation of TCIT will follow.

Chapter 5 - Teachers establish beliefs and skills during the first few years on the job. Even the most dedicated teachers in urban school face daily challenges in the classroom that can be defeating. Teaching requires much more than dedication. Many teachers in urban schools select the job because of availability, not first choice. Many teachers lack the contextual or personal experience to understand the culture of urban schools. The high turnover rate of teachers in urban schools is one consequence of the under-preparedness and limited supports available to novice teachers in urban settings. Yet, this consequence continues to be a foundational problem within the school. If schools have only novice teachers, there by availability and not by choice, who are learning how to teach, how can the school meet the goals and objectives of improving student learning outcomes and meeting adequate levels of academic and social proficiency? It is a self-perpetuating cycle that perplexes and frustrates urban school administrators. In this study, the administrative staff of an urban elementary school with a student population at a 99% poverty level set about to cultivate a new culture within the school. Their ambition was to build a climate of support for teachers by starting with the goal of improving teacher effectiveness in the classroom. In order to improve their instructional skill set, urban teachers volunteered to participate in a 2-year teacher-directed consultation designed to improve instructional efficacy in the urban classroom. The study began with novice teachers (less than 3 years urban teaching experience) completing a teacher survey which assessed their beliefs about urban students' abilities to learn. Following the survey, teachers were observed monthly throughout the school year using an Urban Classroom Checklist (UCC). The UCC, an ecological assessment, evaluated classroom environment, instruction, research-based practices, and feedback. After each observation, the authors consulted with teachers to provide (a) specific instructional feedback on their teacher behaviors during instructional time, (b) instructional recommendations, and (c) a written formative summary, from the UCC. Specific and individualized targeted pedagogical skills such as teacher transition time, teacher proximity, a ratio of positive/negative comments, and student opportunities to response were measured and discussed with the novice teachers. The strategy of (a) regular, on-going, monthly observations and (b) ongoing consultation, and (c) performance feedback and dialog, suggests that heightening teachers' self-awareness of their performance was an effective method for making measurable gains in teaching practices.

Chapter 6 - A long line of research finds consistently that African American students are significantly more likely than white students to be subjected to a range of negative school sanctions. Several researchers attribute this differential to racially biased appraisals of African American's behaviors by teachers and school administrators. Using data from the ECLS-K—the largest sample of kindergarten and first grade students ever created—we test whether there are statistically significant differences in social skills between whites and African Americans at the start of their educational careers. The authors then evaluate whether teacher characteristics, including their race, have any impact on their evaluations of student social skills. The findings provide no evidence suggesting that teachers are biased against black students. The data do reveal, however, that black students enter school with substantial social skills deficits.

Chapter 7 - In every society – past, present and probably also future –, knowledge was, is, and will undoubtedly continue to be transmitted through the process of speaking and

listening, i.e., a person transmitting knowledge orally to others who receive it. Notwithstanding current requirements for a variety of knowledge transmission techniques involving multimedia technologies, nothing can replace the teacher-student relationship that is basically involved in classrooms. It is therefore crucial for classrooms to provide optimal conditions for the development of activities inherent to education, which include the quality of classroom acoustics. The quality of transmitted and perceived verbal information is linked intrinsically to the acoustic performance of the room, which in turn involves the observance of several speech quality descriptors – Reverberation Time, Speech Transmission Index, Definition and Centre Time. This chapter on Classroom Acoustics describes the techniques required for *in situ* measurements of these parameters, which are crucial for verbal communication. These parameters, which are based on national and international technical standards, seek to establish reference values in order to achieve good acoustics in classrooms. Another tool presented is computational simulation, which enables acoustic solutions for classrooms to be tested while still in the design phase, as well as interventions in existing buildings. As a necessary part of the search for optimal classroom acoustics, real cases are presented whose objects of study are university classrooms.

Chapter 8 - This chapter compares two complementing approaches to the analysis of longitudinal data on the classroom social climate. How students perceive the social climate of their classroom is related to student academic achievement and well-being (den Brok, Brekelmans, & Wubbels, 2004; Church, Elliot, & Gable, 2001; Davis, 2003), and to the psycho-social development of students (Pianta, 2006; Wentzel 2002). While the importance of the classroom social climate in general is widely acknowledged, not much research is conducted on how the social climate differs and evolves between classroom lessons. A commonly used approach for studying developmental issues is to describe longitudinal data in terms of general trends over time (i.e., *multi-level growth curve modeling*). Thus, questions such as ‘do teachers get more directive during the school year?’ may be of interest in this regard. Rather than describing variability in the social climate between lessons by using a general trend (e.g., modeling a decline or increase in teacher or student variables), a second approach, called *multi-level process analysis* (Papp, 2004) can be used to examine whether factors other than time can account for variability in the classroom social climate. Questions such as ‘can classroom incidents account for between lesson variability in the classroom social climate?’ refer to this latter approach. In this chapter, both approaches are applied to a longitudinal data set on students’ perceptions of the classroom social climate during the first months of a school year (Mainhard, Brekelmans & Wubbels, 2011; Mainhard, Brekelmans, den Brok & Wubbels, 2010). First, some background information on classroom social climate and the data set used is provided.

Chapter 9 - A review of thermal comfort and air quality is the aim of this work. The numerical and experimental methodology is used in the evaluation of comfort in school buildings in the South of Portugal (Algarve region) with Mediterranean environment. In this work, results about comfort in three typical schools buildings, in Winter and Summer conditions, equipped with natural and crossed ventilation, are presented. The thermal comfort level is evaluated by the Predicted Mean Vote value, while the air quality is evaluated by the carbon dioxide concentration.

Chapter 10 - Classroom is the keystone of a formal education system. Conducting the aim of the education system depends on the success of the teaching-learning process in the classroom. The success of the learning-teaching activity depends on efficient classroom

management. Knowing the characteristics of students and arranging the process according to this, arranging in-class relationships, arranging the physical structure of the class, providing student motivation, managing in-class activities and learning processes, sustaining the discipline and managing student misbehaviors are among the functions of classroom management. Sustaining the discipline and managing student misbehaviors have great importance in the success of the learning-teaching process. Improving students' learning in classrooms requires teachers to be effective in coping with classroom misbehaviors (Ding et al. 2008; Ding et al. 2010). The authors cannot speak of the success of the teaching-learning process in a classroom where the teachers spend most of their times sustaining the discipline and preventing student misbehaviors. When a teacher who is responsible for the success of the learning and teaching process in the class feels himself inadequate in managing discipline and student misbehaviors may have depression, come down with psychosomatic diseases and even (for beginners, especially) may resign. In this sense, it is of great importance for teachers to be educated about managing discipline and student misbehaviors. In this study; classroom discipline, discipline strategies, student misbehaviors and coping strategies were elaborated. Moreover, a literature review of the writer on elementary school students' misbehaviors in Turkey was examined. 450 teachers who serve in elementary schools in Antalya participated in the study. A 5- graded likert-type scale named "Student Misbehaviors Scale" which was developed by the researcher himself, was used in the study. In the analysis of study, arithmetic average, standard deviation, t-test, one way ANOVA, LSD and Scheffe test were used. According to the result of the study, there are significant differences among the frequency level of student misbehaviors in the sense of gender, age, seniority, branch and technical means of classroom. Misbehavior which is observed most frequently in schools is the types of "student misbehaviors towards each other". Young teachers who are below 30 are exposed to these misbehaviors more than elder teachers. There are significant differences between misbehavior frequency in the sense of classes with poor and good technical means. As the technical means of classrooms increase, level of student misbehavior decrease.

## ***Chapter 1***

# **NEGOTIATING MATHEMATICS IN AN INTERACTIVE CLASSROOM**

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## **ABSTRACT**

This chapter draws on the findings of a larger study carried out in a Malaysian secondary school that aimed to cultivate an interactive classroom context and to investigate the patterns of discourse that had a positive impact on students' learning over a 10-month period. The Vygotskian school of thought provided the main framework to derive the three constructs of concept formation, student-student interaction and teacher-student interaction. The study was qualitative and the methodology was designed by incorporating the features of naturalistic inquiry, and the interventionist nature of action research. The samples were a mathematics teacher and one Form Four class of students aged between 16 and 17 years. We collected qualitative data through audio-visual recordings, observations and interviews. The comparative method suggested by Glaser (1978) was used to analyze the data.

Drawing on the analyses of discourse from the data collected, it was possible to change a traditional classroom to an interactive classroom by using a four-phase lesson plan consisting of whole-class discussion, group work, reporting back and summing up. With this lesson plan, the teacher managed to reach the full range of competencies in a multi-racial and large class. Hence, student-student and teacher-student interactions using the Zone of Proximal Development were enacted in the classroom.

During group work, the students were faced with the social problems of working together and the problems of solving the mathematical tasks in hand. The teacher used four strategies to initiate and guide the negotiation of his expectations for group work. First, he stopped by the non-collaborative groups to exert his authority on the students involved to act appropriately for group work. Second, he took these cases as opportunities during the reporting-back phase to preach to the class the obligations and expectations for group work. Third, he constantly reminded the students of their obligations and expectations when he moved around the classroom. Last, he approached every solution and explanation in a non-evaluative way. We identified relevant, adequate, timely, and understandable to be the features of student-student interactions that helped students to accomplish the mathematical tasks successfully. Finally, the analyses of data also yielded three types of instructional feedback facilitating the mathematics

growth of students, namely, feedback on the task, feedback on the process and feedback on regulation.

## 1. INTRODUCTION

Educators are realizing that adults in this information age require capabilities to join a workplace where intellectual teamwork is the norm. The thinking and actions of these adults need to show an appreciation of and regard for inquiry and openness to different and competing perspectives. To cultivate such capabilities, education has to change.

Mathematics education was primarily a process of transmission of knowledge. Educators believed that a fixed knowledge base existed out there and the aim of education was to deliver that knowledge to the learners. Drawing on the views of behaviorist models, the teacher's drill provided practice for this knowledge base that led to mastery (Freire, 1972). A typical mathematics lesson is characterized by a teacher briefly introducing and discussing the topic for the lesson, and demonstrating a procedure to solve a problem which students follow carefully in order to imitate it. Practice through many exercises follows, either from a textbook or a workbook. Learning is by memorization and reproducing mechanically the learned facts to solve these exercises. Students are not trained in calling to mind possible heuristics, rules or algorithms for mining the information given in a problem, turning them into different solutions and discriminating between them. Von Glaserfeld (1995) wrote as follows:

[Educators] have noticed that many students were quite able to learn the necessary formulas and apply them to the limited range of textbook and test situations, but when faced with novel problems, they fell short and showed that they were far from having understood the relevant concepts and conceptual relations. (p. 20)

This way of teaching and learning of mathematics has changed to a conception that students actively construct their own mathematics (Kilpatrick, 1987; von Glaserfeld, 1995). The construction process can be accomplished by students making connections, building mental schemata and developing new mathematics based on their prior knowledge through interactions with others (Vygotsky, 1978; Goos 2004). Such perspective assumes mathematics teaching and learning as social in nature.

The growth of the social constructivist movement, which assumes meaningful learning occurs in a context of social interactions, has a marked impact on classroom instruction. It advocates teaching mathematics in a way that encourages group cohesiveness rather than individualism, investigation rather than repetitive exercises, and students actively expressing their ideas. This perspective has inspired many studies on practices that capitalize on the social context of classrooms. They are investigating how the social context of teaching and learning enhances the construction process of mathematics meanings in students (Kieran, 2001; Gillies, 2003; Foman, 2003; Goos, 2004). Students make connections, build mental schemata and develop new mathematics through conversations or thinking aloud with another person about their ideas. The other person can be the peer or the teacher. In other words, how the teacher and students talk with one another in a classroom constitutes in large measure such practices. Martin (1985) wrote as follows:

A good conversation is neither a fight nor a contest. Circular in nature, cooperative in manner and constructive in intent, it is an interchange of ideas by those who see themselves not as adversaries but as human beings come together to talk and listen and learn from one another. (p. 10)

Group work is an extremely social form of practice, with peers interacting actively among themselves as they tackle an activity. Many studies have been focusing on the facilitating role played by group work in the teaching and learning of mathematics. Some studies found that students experienced cognitive conflicts that triggered them to re-examine their existing ideas, initiate a process of intellectual reconstructions and develop evolving knowledge bases (Teasley, 1995; Hershkowitz & Schwarz, 1997). Small-group settings also led students to higher engagement levels, improved attitudes and active mathematical communications (Leikin & Zaslavsky, 1997). However, other studies suggested that group work might not be conducive to mathematics learning. Students did not really work together, were never precise and explicit in their conversations, and were defensive of their own solutions during group work (Sfard & Kieran, 2001; Goos, 2002). The mixed results from these studies lead to many doubts about the dynamics of group work and how group work mediates the mathematical growth of students.

In the classroom, teachers face students who have a broad spectrum of needs, abilities, goals, interests and who are from different racial, ethnic, linguistic and economic backgrounds. This complexity poses a big challenge to a teacher in making pedagogical decisions tailored to the demands of students. If we want group work to play the role of a ‘powerful driver’ in the teaching and learning process rather than a ‘terminal event’, teachers need to capitalize on students’ constructions during group work in formulating instructional feedback for the further learning and enculturation into the mathematical way of negotiation of their students. According to Hattie and Timperley (2007), “If feedback is directed at the right level, it can assist students to comprehend, engage, or develop effective strategies to process the information intended to be learned” (p. 104). Surprisingly, few studies have investigated the power of feedback in the classrooms. Among others, Kluger and DeNisi (1996) did a very systematic study to investigate the impact of various types of feedback. They found that feedback is more effective when it is designed based on previous task to provide information for tackling the task successfully. Other forms of feedback such as praise, rewards and punishment appear to be ineffective.

Even though a large number of studies were done on group work in the classrooms, very few investigated the nature of the interactions among students and the types of instructional feedback constructed by teachers based on the outcomes of group work that could contribute to the mathematical growth of students. This chapter aims to contribute to these areas of study. It draws on the findings of a larger study carried out in a Form Four class of a Malaysian secondary school with the aims to cultivate an interactive classroom culture and to investigate the patterns of discourse that mediated meaning shaping and justification of ideas that had differential effects on the emerging mathematics learning of students within the interactions. These aims metted the sociocultural emphases proposed by Forman (2003) that instructional practices and learning outcomes are linked and mathematics meaning-makings occur in social context. The three guiding questions we used to examine the patterns of discourse are:

1. How a four-phase lesson plan that incorporates whole class and small group interactions helps to change a traditional classroom culture to an interactive classroom?
2. What is the nature of the interactions between students during group work that can enhance their mathematics learning in the classroom?
3. What types of instructional feedback can the teacher design based on the outcomes of group work to facilitate the mathematical growth of students?

The next section touches on Malaysian perspective of social context in the teaching and learning of mathematics. The third section is the literature review relevant to this chapter. We start with discussing the key concepts from Vygotsky's developmental approach and outlining the limitations of these concepts that have led to the developments in sociocultural theories for education in general. Then, the three constructs of concept formation, student-student interaction and teacher-student interaction are derived based on Vygotsky's developmental approach. The fourth section presents the details of the methods relevant here. The results of analyses are reported in three sub-sections of negotiating an interactive classroom culture, nature of student-student interaction and feedback. The chapter ends with a section on conclusion based on the three guiding questions.

## **2. MALAYSIAN PERSPECTIVE**

Education in Malaysia is always examination-inclined and mathematics education is still predominately a process of knowledge transmission. Malaysia took part in the Trends in International Mathematics and Science Study (TIMSS) for the years 1999, 2003 and 2007. Since the average mathematics scale scores dropped from 519 to 508 and 474, the performance of mathematics by our students has declined and they were classified under the Intermediate Benchmark where "students can apply basic mathematical knowledge in straightforward situations" (Gonzales et al., 2008, p. 13). Our teachers are urged to employ the different approaches of cooperative learning, inquiry learning, contextual learning and constructivism for effective mathematics learning in the classroom through in-service courses and seminars organized by relevant education authorities. However, the use of these approaches is still minimal at present.

Malaysian society is composed of a whole range of cultures and our cultures encourage obedience, self-restraint, and deference to elders. This social network is supportive of knowledge transmission which demands conformity to rules, quietness, a willingness to do repetitive exercises, and obedience to the teacher as authority in mathematics. In any mathematics class, we have groups of students who are different in their ethnic backgrounds, languages, attitudes, customs and mathematics ability. Many of the classes have more than 30 students. Interacting in such classrooms is a challenge and can be emotionally exhausting. Thus, it requires teachers to embrace change in the ways they teach and the ways they organize to teach. These issues may explain why teachers are unwilling to integrate these approaches into the teaching and learning process in any systematic way.

### 3. RELATED LITERATURE

Our understanding of how children develop and learn has undergone many changes. Of these changes, Vygotskian school of thought stands up and is generally agreed to have the most profound influence on the developments in sociocultural theory (Sfard, Forman & Kieran, 2001; Forman, 2003, Goos, 2004). There are basically three important elements in Vygotsky's developmental approach. First, Vygotsky argued that a child's cultural development is social, and involves another person and the society as a whole. Second, he claimed that any function in a child's development appears "... first between people as an interpsychological category and then inside the child as an intrapsychological category" (Vygotsky, 1978, p. 128). Third, speech, gestures, signs, tools and material mediate the development. Vygotsky (1978) also proposed the zone of proximal development (ZPD) as "... those functions that have not yet matured, but are in the process of maturation, functions that will mature tomorrow, but are currently in an embryonic state" (p. 86). Thus, development occurs within the ZPD of a child since the social interactions may awaken mental functions lying in an embryonic state.

Wood, Bruner and Ross (1976) were the first to apply Vygotsky's approach to educational study. They believed that the development of a child is an activity when the readily relevant skills are combined to solve new and more complex task. This problem-solving activity is successful with the scaffolding from a tutor. Since then, the metaphor of scaffolding was commonly associated with teacher-student interactions to facilitate a student's learning (Greenfield, 1984; Bruner, 1986). Greenfield (1984) defined the scaffolding process in a learning situation as "... the teacher's selective intervention provides a supportive tool for the learner, which extends his or her skills, thereby allowing the learner successfully to accomplish a task not otherwise possible" (p. 118).

This first generation of Vygotskian inspired studies was criticized for the limitations of scaffolding. First, the teacher is imposing a structure on the student. Too often, the teacher is the builder of the structure and the student is expected to accept a ready structure. Searle (1984) wrote as follows: "The children's understanding, valuing and excitement for the personal experiences were negated as the children were led to report the experience in an appropriate form" (p. 481). Second, the effectiveness of interactions relies on the nature of the communicative mechanisms such as the semiotic processes, interpersonal relations and goals of the participants that constitutes the scaffolding process (Rogoff, 1990; Stone, 1993). A learner is continually trying to interpret the adult's intervention, whether verbal or non-verbal in the context relevant to him. Unless the adult and the learner have a shared context at that point, the implications of the interaction cannot be realized. Rogoff and Gardner (1984) wrote as follows:

Without the creation of a context for interaction which is intelligible to the learner, given his or her current knowledge and skills, the dyad cannot communicate, and the teacher will not be able to lead the learner toward an understanding of the new information. (p. 98)

Third, implicit to the concept of scaffolding is the assumption that the teaching and learning process involves willing adults on the one hand and eager learners on the other. Unfortunately, this may not be true. Goodnow (1990) wrote as follows:

Where are the parents who do not see their role as one of imparting information and encouraging understanding? Where are the children who do not wish to learn or perform in the first place, or who regard as useless, what the teaching adult is presenting? (p. 279)

Since then, the second generation of such studies expands the metaphor to deal with these limitations and contributes to a new conception of sociocultural theory which recognizes the need to give attention to the context and the interpersonal relationships of social interactions (Forman, 2003). Some of these studies employed the sociocultural theory with a discursive perspective, emphasizing the dynamics of mathematical conversations in teacher-student interactions within whole-class settings or student-student interactions within small-group settings (O'Connor, 2001, Kieran, 2001; Goos, 2004). The focus is on the role of communication in mathematics learning and the link between instructional practices and learning outcomes (Lampert, 1990; Forman, 2003).

Based on the literature review, the three main constructs of concept formation, student-student interaction, and teacher-student interaction are derived to guide the formulation of the methods of the study.

### **3.1. Concept Formation**

The construct of concept formation is derived from Vygotsky's theory on everyday and scientific concepts. Everyday concepts evolve from everyday experiences and scientific concepts originate from classroom instruction or adult conversations. Meaningful knowledge is achieved when the everyday concepts of a child merge with the scientific concepts of an academic community and not by replacing the former with the latter as in knowledge transmission. Concept formation is influenced by the means with which the process is accomplished, including the use of tools and the mobilization of the appropriate means. Vygotsky (1978) wrote as follows:

The movement that previously had been the choice now serves only to fulfill the prepared operation. The system of signs restructures the whole psychological process and enables the child to master her movement. It reconstructs the choice process on a totally new basis. (p. 35)

This theory has great implications on classroom instruction. In any classroom, the ZPD of a student depends on the forms of instruction. The potential for learning is determined by the environment, resources, the teacher's role and the student's role in the teaching and learning process.

### **3.2. Student-student Interaction**

Vygotsky conceptualized the notion of the ZPD in terms of peer partnerships, noting that a child is able to accomplish a task in cooperation with more capable peers which is otherwise impossible. From an educational perspective, learning opportunities arise when students interact with one another, exchange ideas, take their peers' perspectives and regulate their own intellectual acts relevant to the task in hand. Forman and McPhail (1993) wrote as

follows: “Over time, … [students] took turns to listening, observing, explaining, critiquing and directing their common activities” (p. 225). This perspective has driven many studies on group work to investigate how student-student interactions can facilitate mathematics learning (Webb & Farivar, 1994; Slavin, 1995; Fall & Webb, 2000; Gillies, 2003).

Many researchers argued that group work provides the right condition for the free exchange of ideas and reciprocal feedback between mutually respected equals when tackling a task (Damon, 1984; Johnson & Johnson, 1999). The students speak to each other on a level that they can easily understand, speak directly in plain language and take the response of another student seriously. Furthermore, the communications between students are much friendlier as compared to the corrective advice from an adult, which can be emotionally threatening. As a result, students gain both social and cognitive benefits (Egan, 1997; Johnson & Johnson, 1999; Fall & Webb, 2000). The social benefits are the improvement in communication skills and the awareness of another student’s perspectives. The cognitive benefits are the urge to reshape one’s own ideas by considering the perspectives of others and the evolving understanding. Hence, it can foster students’ self esteem, pro-social behavior and scholarly achievement.

### **3.3. Teacher-student Interaction**

The third construct is drawn from the ZPD based on the distance between the cognitive levels when a child performs a task alone and in cooperation with adults. From an educational perspective, students require their teacher’s intervention to make progress in their learning. The term scaffolding became associated with such studies on teacher-student interactions. When the metaphor of scaffolding in the expanded landscape is enacted in the classroom, meaningful learning opportunities entail. Freire (1972) wrote as follows:

The teacher is no longer merely the one who teaches, but one who is himself taught in dialogue with the students, who in turn while being taught also teaches. They become jointly responsible for a process in which all grow. (p. 67)

During group work, students’ outcomes are derived based on their prior knowledge. It is important to recognize that these outcomes can be different, incomplete or invalid and in “an embryonic state”. Here, the teacher as the representative of the academic discipline plays a crucial role in selecting the outcomes to design interventional instruction for the successful constructions of scientific concepts.

In the classroom, the teacher is the adult and any student can always identify the more capable peers. The three constructs derived for the study emphasize active involvement of the classroom community in the teaching and learning process. Since it is impossible for a teacher to interact for sustained time with each student, an alternative approach that better fits classroom realities emphasizes interactions among the whole class. The study attempted to develop such an interactive classroom culture by employing group work and whole-class interaction as the basic instructional strategies.

## 4. METHODS

This study was qualitative and the methodology was designed by incorporating the features of naturalistic inquiry, and the interventional nature of action research.

### 4.1. Participants and Setting

Samarahan School in Sarawak accepted the offer to participate in this study. According to the school, the majority of the students came from families with average incomes. The school had a team of very experienced and dedicated teachers. Thus, the passing percentages for mathematics subjects were higher than the national passing percentages for the Lower Secondary Examination and the School Certificate Examination. After obtaining the permissions from the Educational Planning and Research Division of Malaysian Ministry of Education and Sarawak State Education Department to carry out the study in this school, the researchers met the principal to identify a teacher and students to be the participants of the study. The participants were told of the purposes of the study and they were not obliged to participate. If they wished to participate, their responses would remain anonymous and confidential.

A class of Form Four students, aged between 16 and 17 years, volunteered to participate in the study. All Form Four students have to take the subject mathematics, which is a prerequisite for entry into most university courses. Besides learning the different mathematical skills of the subject, other important emphases are problem solving, communication, application and connected knowing. Hence, students are assessed on their mastery of mathematics skills, and their ability to solve application problems and justify their methods.

The senior assistant of the school, who was a qualified mathematics teacher having 15 years' experience in teaching secondary school mathematics, offered to participate in the study. As a member of the management team of the school, one of his responsibilities was planning professional development programs for all the teachers in the school to include the different approaches of cooperative learning, inquiry learning, contextual learning and constructivism emphasized by Malaysian Ministry of Education. Hence, he welcomed any study on developing teaching and learning practices through which such approaches could be enacted in the classrooms.

### 4.2. Classroom Organization

The teacher agreed to start teaching as he normally would and react as he usually did to students' responses during lessons observed. We, as researchers assumed the role of a participant-observer, so that we shared as intimately as possible in the life and activities of the classroom (Patton, 1990). The basic instructional strategies were group work and whole-class interaction. Since the students were already paired in the seating plan before the study commenced, they were encouraged to stay in the same positions. If other students wanted to join any specific group for discussions, they were encouraged to do so at any time. Changes

in partners were made at the discretion of the teacher based on his intimate knowledge of the social interactions as well as the mathematical development of the students.

During the first 5 weeks of the study, the teacher conducted the lessons as he planned. Some lessons started with a whole-class discussion and ended with students working on problems individually. Others started with group work, followed by discussions on students' solutions and ended with individual work. Both the teacher and the researchers, were not satisfied with the way student-student interaction and teacher-student interaction using the ZPD, were enacted in the classroom. We deliberated a four-phase lesson plan consisting of a whole-class discussion, group work, reporting back and summing up, which was implemented fully in the classroom from the ninth week of the study. During the first phase of any lesson, the teacher held a whole-class discussion facilitating students to understand a problem and to come up with possible heuristics and strategies for a solution. Group work was the second phase that provided a chance for students to work productively together. At the third reporting-back phase, students were given an opportunity to explain and justify their solutions to the class. The final phase was the teacher summing up the lesson by discussing all solutions, justifying the legitimacy of each solution, and introducing new symbols and mathematical language.

### **4.3. Data Collection**

As the emphasis was on analyzing learning from group work and whole-class interaction, the fieldwork for this study consisted of observing the teacher and students in the classroom and discussing the work with the teacher. One important way to strengthen the validity of such research findings is through data triangulation – the use of a variety of data sources (Patton, 1990). We collected qualitative data through audio-visual recordings, observations and interviews.

A video camera with an external sound box and microphones was used to tape the lessons in the classroom. External microphones were used to increase the clarity of the audio recording of the interactions between target students when they were involved in group work. An audio-recorder was put in the pocket of the teacher to record his utterances throughout a lesson. We recorded one lesson of 80 min and two lessons of 40 min per week throughout the 10 months of the study. Excluding holidays, examinations, tests and sport weeks, a total of 58 lessons were recorded.

After each recording, the researchers viewed the tapes and identified information-rich episodes to be transcribed. These information-rich episodes were those from which we could learn a great deal about issues of concern for the study (Patton, 1990). Then, the tape was replayed to the teacher to seek his interpretations on these episodes. Any conflicting interpretation from the researchers and the teacher was negotiated. Recommendations to improve the lesson were agreed upon and implemented in subsequent lessons. Here, we were adopting the interventional nature of action research (Kemmis & McTaggart, 1988). Through this intervention, we were determined to provide support structures to the teacher's confidence and self-esteem emphasizing social interactions in the teaching and learning process. Such negotiations were audio-taped with portions being transcribed and inserted as field notes to the lesson concerned. For example, the teacher would not take up any non-collaborative interaction during group work for further discussions. However, the researchers

managed to convince the teacher on the importance of taking such cases to negotiate his expectations for group work with the students. After noticing the potential of such instruction to enhance students working productively together, he started to identify such cases to negotiate his expectations for group work with the students and to design feedback for the further learning of the students.

One of the shortcomings of using audio-visual recordings was that sometimes the researchers were unable to identify any information-rich episode from the target group. It was annoying to notice that groups that were not targeted were discussing actively. The researchers decided to make an ad hoc record of such cases. Such on-site observations and their interpretations were also verified with the teacher before inserting as field notes of the lesson. Some of the students and the teacher were also interviewed to get feedback about learning mathematics through social interactions. These interviews were audio-taped and transcribed to supplement the data collected.

#### **4.4. Data Analysis**

Qualitative study specifies a unit of analysis to be investigated so that the focus of data collection will be on what is happening to the participants in a setting and how these participants are affected by the setting (Patton, 1990). The analysis of data involved student-student and teacher-student interactions in the classroom. The data were gathered and analyzed as soon as possible, and interpretations were derived. The challenge was to make sense of the data, identify patterns and construct a framework to communicate the essence revealed.

The comparative method suggested by Glaser (1978) was used to analyze the data. As mentioned in the section on data collection, data analysis was performed on the data collected for each lesson immediately after the lesson ended. Each analysis for a lesson consisted of a three-stage process (Schoenfeld, 2000; Cobb & Whiteneck, 1996; Creswell, 2003). During the first stage, the researchers viewed the video-tape to capture episodes of interest for the three main constructs of concept formation, student-student interaction and teacher-student interaction to be transcribed. During the second stage, the contents of these episodes and the on-site observations were analyzed and interpreted. A negotiated outcome for each interpretation was reached with the teacher. This interpretation process enabled the researchers to identify patterns and their descriptions for each construct. The coding process took place by grouping the episodes, on-site observations and the interpretations into these patterns. As the study progressed, new patterns were founded and some of the episodes, on-site observations and the interpretations were regrouped. The process of capturing episodes, interpreting the episodes, identifying patterns and coding continued throughout the study. During the third stage, a continuous comparison and contrast of the episodes, on-site observations and the interpretations was performed to develop an overview of the progress on the various patterns in chronological order. One of the results was the developmental process of the four-phase lesson plan as the teaching approach that could cultivate an interactive classroom culture for the first guiding question.

## 5. NEGOTIATING AN INTERACTIVE CLASSROOM CULTURE

This part deliberates the findings for the first guiding question. The teacher was not the only one shaping the classroom context in the study. The students also played a very important role, from passive learners to active participants in mathematics sense-making and justification of ideas. Prior to the teacher participating in the study, he taught mathematics by direct instruction. Before the study commenced, the researchers and the teacher had a number of sessions discussing the possibility of applying Vygotsky's ZPD and socio-cultural theories to the teaching and learning process. The teacher commented:

To be frank, actually we as teachers normally try to encourage active participation from students since it's something that has been emphasized by our Ministry. Somehow, I think because of the time factor, we teachers end up solving the problem for our students.

Besides those sessions, the support that the teacher got for the study came from the many discussions on student-student interactions and teacher-student interactions from the lesson episodes. We negotiated our conflicting interpretations and changes were identified and implemented in subsequent lessons.

During the first three weeks of the study, the teacher used to take activities directly from the mathematics textbook or the mathematics workbooks recommended by him to students. Transcription 1 below shows an example of teacher-student interactions in one of such lessons.

### Transcription 1: Lesson on Sets

T: We will now study the operations for set. What are the four basic operations for whole numbers, fractions, decimals and the like?

S1: Subtract, add, divide and multiply.

T: Can we use these operations on sets?

S1: No.

T: We will see in the following example:  $\xi = \{\text{The months of a year}\}$ ,  $P = \{\text{The months starting with the letter J}\}$ ,  $Q = \{\text{The months with 31 days}\}$ ,  $R = \{\text{The months with 28 or 29 days}\}$ ,  $S = \{\text{The months with seven letters}\}$ . What are the months starting with the letter J?

S2: January and July.

T: Any other?

S2: No.

T: What are the months having 31 days?

S3: January, March, May, July, August, October, December.

T: Which months have 28 or 29 days?

S1: February.

T: What about the months with 7 letters?

S3: January and October.

T: Now we find the intersection of two sets  $P \cap Q = \{\text{January, July}\}$

How many elements in this set?

S3: Two.

T: What about  $P \cap R$ ?

S1: 0.

T: What about  $Q \cap S$ ?

S1: January, October.

The teacher led the students through the example so as to fulfill the objectives of the lesson. By doing so, he was trying to use the ZPD by means of teacher-student interaction in the teaching and learning process. The responses from students were either ‘yes’ or ‘no’, or ‘brief phrases’ such as ‘two’ and ‘January, October’. When the teacher was satisfied with the understanding of students, he made a brief summary on intersection and invited students to contribute their examples.

T: Hence, January and October are the results of  $Q$  intersect  $S$ . The intersection will result with the same elements in different sets. One of the operations that we can perform on sets is intersection. Anybody can give another example?

One of the students responded with the example of boys using neckties and spectacles. However, the teacher did not guide him to apply the operation of intersection. Instead, he started with union.

S3: The number of boys using neckties.

T: Boys using neckties and ...

S3: Spectacles.

T: Boys using spectacles? What is that?

S3: (No response)

T: OK. One of the operations that we can perform on sets is intersection. The other is union.

The teacher said that the suggestion was not probed further as he would not like the lesson being side-tracked into discussions on something not intended for the lesson or students involved in off-task talks and he had limited time to finish a tight syllabus for examination. As a result, learning happened along a well-marked path laid out by the teacher for the students. The teacher commented:

It often happens ... every student is talking ... they could easily get side tracked into off-task talking. Even though lots of good work can emerge but these are not necessarily what you wanted and you just have to be careful of that ... especially if you've a huge syllabus to cover.

During the discussion sessions, the researchers also suggested to the teacher formulating his own mathematics activities. In the following lesson, the teacher was aiming to introduce parallel lines to the class. He prepared the following activity and gave the students to work in groups. Here, he was using the ZPD through student-student interaction in the teaching and learning process.

T: This week, we are going to look at the relationship between straight lines. How's the gradient of one line when compared to another. You're given the handout. Let's look at the first activity, solve it yourself first. Then, compare the solution with your friends. You're asked to draw ... not to sketch ... Draw the following three straight lines with the same axes.

Transcription 2 below shows an example of teacher-student interaction during the reporting-back phase of the lesson.

### **Transcription 2: Lesson on Straight Lines**

T: OK? ... Who wants to try first? Nurul, can you draw one of the lines? You can choose to draw any of the three. Which one you choose?

S1:  $y = 2x + 2$  (and drawing the line).

T:  $y = 2x + 2$ . Everybody pays attention to the front. This is important because you must be able to imagine the shape of a straight line. Why you marked 2?

S1: y-intercept.

T: OK, y-intercept. Can you show how you get this point?

S1:  $2 = 2/1$ ,  $y = 2$  and  $x = 1$ .

T: 2 equals to  $2/1$ , right?

S1: Right.

T: Why is it y here?

S1: Find gradient.

T: OK ... What's the definition for gradient? The difference in y divided by the difference in x. OK ... You move 1 along the x-axis and then move up 2 units. Can we accept this?

In this activity, the teacher asked the student to justify the solution and he legitimized it by saying ‘we give her a clap’. Even though he helped the student to clarify a number of issues involved in the justification, this teacher was showing his willingness to let students assume more responsibility for their learning.

T: We give her a clap ... Is there any other method? I see one student putting up his hand.

S2: (Drawing the line)

T: OK, this is the first method, we can also use. This is the second method. He uses  $y = 0$ . We want to find the x-coordinate when  $y = 0$ . We put  $y = 0$ , we get  $x = -1$ . So the point is  $(-1, 0)$ .

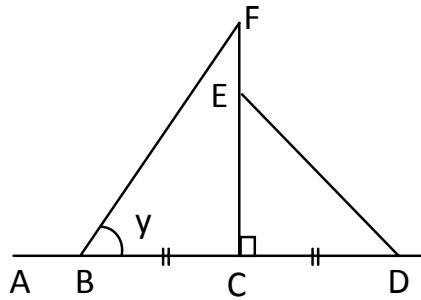
Again, the teacher also encouraged other solutions. This time, he legitimized the alternative solution as ‘the second method’. However, he did not insist that the student explain and justify the solution. Instead, the teacher explained ‘the second method’ to the class. Hence, the teacher was still unable to place the whole burden of explaining and justifying the solutions on the students at this juncture. The teacher commented:

I think that these lessons have made me more aware of what the students can do on their own and the sort of help they need from me to move on when they are stuck ... I actually have to be a little more prepared for ... It made me come up with some new ideas to introduce topics ... I'm thinking of the way we introduced gradient the other day by bringing my students out of the class and using the tiled floor as the coordinate grid ... The fact that we see students very willing to come up and share their solutions with the class ... It sort of encourages you to keep working to come up with the ideas ...

During the first five weeks of the study, we observed that some lessons started with a whole class discussion and ended with students working on problems individually. Others started with group work, followed by discussion on students' solutions and ended with individual work. The teacher was also 'walking a tightrope' in allowing students to pursue their personal mathematical constructions. On the one hand, he needed to listen and be sensitive to students' responses so as not to make interventions that would inhibit their thinking. On the other hand, he wanted his students to develop the taken-as-shared mathematical meanings of the wider society. During a discussion session, he voiced his concern about these issues and he wanted to follow the lesson format consisting of induction set, content and summary recommended by Malaysian Ministry of Education. However, we all agreed that both student-student and teacher-student interactions were beneficial to students' learning and such interactions should reach the whole class. It took the researchers and the teacher another three weeks to deliberate a four-phase lesson plan consisting of a whole-class discussion, group work, reporting back and summing up. By adopting this four-phase lesson plan, both student-student and teacher-student interactions using the ZPD could be enacted in the classroom. It was implemented from the ninth week.

In one lesson, students were asked to work on the following problem in groups: In the diagram, ABCD is a straight line. Given that  $CE = 3EF = BD/2$ , find the value of  $\cos y$ . Transcription 3 below is a part of this lesson.

### Transcription 3: Lesson on Trigonometry



S1: I'm blank.

T: Read the question carefully.

$CE = 3EF$ , what does this mean?

S1: The length of CE is three times that of EF.

T: Then, we have  $3EF = BD/2$ . How do we solve this problem?

S1: Correct.  $BD/2 = 3EF$ . Now, these are 4EF, 3EF and 5EF. We use Pythagoras Theorem.

S2: How do we find  $\cos y$ ?

S1: This is  $\cos$ . So, adjacent divided by hypotenuse.

S2:  $3/5$ .

S3: Again, how do you find  $\cos y$ ?

S1:  $CE = 3EF$ ,  $3+1 = 4$ . So,  $CF = 4EF$ .  $3EF = BD/2 = BC$ . The sides of the triangle are 3, 4 and 5 by using Pythagoras Theorem.

S3: So,  $\cos y = 3/5$ .

T: Cindy, what is your final answer?

S1:  $\cos y = 3/5$ .

T: Can you explain to the class how you get it?

S1:  $BC = 3EF$ ,  $CF = 3EF + 1EF = 4EF$ , by applying Pythagoras Theorem to triangle  $BCF$ ,  $BF = 5EF$ .  $\cos y = \text{adjacent divided by hypotenuse} = 3/5$ .

S1 explained the solution to S2 and S3. He reorganized his understanding and explained in a more understandable form to S3. He improved further his explanation to the class. Hence, the responses from students evolved from ‘brief phrases’ or ‘single disconnected sentences’ to explanations which ‘make sense’ to all. Now, the teacher put the whole burden on students to explain and justify their solutions, as well as to comment on the contributions of other students. He said:

Now I always remember to ask students why they do that particular step; in that way they will try to recall back and they will try to think of the reason as to why they do it. Then they will understand it better and I can assess their problem.

Throughout the study, the teacher encountered numerous situations that conflicted with his previous practice, but which were very productive in the mathematical learning of the students. For instance, he would write the solution of any problem for his students. Now, the students were given an opportunity first to work in groups, then present and justify their solutions to the class. As a result, they understood the concepts better and improved in communicating skills. These spurred him to value social interactions in the teaching and learning process. In other words, both the conflicts and dilemmas the teacher encountered in the classroom as he tried to enact student-student and teacher-student interactions using the ZPD, and the discussions on lesson episodes to resolve them, created a context for him to learn. The teacher’s learning and subsequent changes did not occur as isolated incidents, but consisted of connected continuous constructions and transformations. For instance, the teacher changed from frequently answering his own questions to the students to giving the students a chance to answer his questions and emphasizing that students should explain and justify their answers. Another instance is that the teacher was very willing to adopt any suggestion of students and led a whole-class discussion on those suggestions.

Two other issues were also addressed for successfully implementation of the four-phase lesson plan. First, there were some students who were often engaged in off-task talk during group work. Transcription 4 shows such an off-task talk.

**Transcription 4: Off-task talking**

S1: (Playing with his pen) I slept late last night.  
 S2: Where have you been?  
 S1: We went for a movie. Oh, I hate doing this.  
 S2: You can't, we're in front of the camera.  
 T: Josh (S1), have you got the answer?  
 S1: I can't understand the question.  
 T: Read the question  
 S1: (Reading it).  
 T: What should we do first?

The teacher was quite frustrated with the amount of off-task talking from the students. Not only did the off-task talking make the teacher worried about the progress of those students, but they also disturbed his concentration on interacting with other students. He decided to constantly remind the students of their work, ask them to present their solutions to the class, and attend to them and ask them questions related to the task when he sensed that the students were off task. By doing so, the teacher made clear to the students his expectations that they would discuss for a solution during group work and explain and justify the solution to the class during the reporting-back phase.

Second, the teacher needed to find ways to encourage students to express their thinking to others. For the students, it is one thing to think through a solution privately but quite another to express their thinking to others. One of the students commented:

There were times that I didn't like sharing my solutions with the class especially when I was not sure whether my solutions were right or not.

Unless the students are willing to express their thoughts and the methods with others and are willing to listen to the solutions of others, they will miss the opportunity to reflect on their work and reorganize their current conceptual level of understanding. As their thinking will be subjected to evaluations and criticisms, the students needed to feel 'safe' in expressing their thinking to others. The teacher pointed out that:

We try to inquire from students what they know about a concept ... before introducing to them that particular lesson. So, with that we are able to actually know the level to enter ... It's making the students quite vulnerable because often you're not sure that they've got it right ...

This aspect placed the teachers under the obligation of approaching the students' suggestions in a non-evaluative way and not imposing their ways of tackling the problem on the students. For instance, the teacher appreciated the solution put forward by the student drawing the line  $y = 2x + 2$  using the y-intercept and gradient method. That was why he said 'give her a clap'. As the students realized that their thinking and ideas were respected and accepted, they felt obliged to reconstruct their solutions and explain and justify them to others. As a result, they improved in doing so and gained confidence in themselves and their ability. One of the students commented:

When I feel easy, understand the subject and know my teacher, I'm always confident and not afraid to share with my classmates.

Hence, reciprocal obligations and expectations were negotiated implicitly during the teaching and learning process. The students were very optimistic towards such process as one of them commented:

Even though my marks haven't improved much, but I understand concepts better now. And I'm enjoying it ... I understand it and I'm asking a lot of questions. Even if I don't get the final answer right, I always know where I go wrong. Hopefully this year has given me confidence in mathematics and my marks will go up later.

## 6. NATURE OF STUDENT-STUDENT INTERACTION

This section discusses the insights we have gained for the second guiding question. The focus is on the negotiating process and the learning opportunities that transpired in the course of interactions when students were engaged in group work to complete their mathematical activities. First, we deliberate the continuous negotiating process of group work expectations, which was crucial for effective mathematics learning of students. Then, the features of collaborative interactions that created learning opportunities for students are presented.

### 6.1. Group Work Expectations

Prior to the teacher participating in this study, he taught mathematics by direct instruction, which would be notes, examples, exercises and tests. The students were well into a school career in which mathematics had been an endless series of passive learning. As the two main instructional strategies were group work and whole-class interaction, the teacher needed to change the ways he organized to teach. For the students, they were now faced with the social problems of group work and the problems of solving the mathematical tasks in hand.

Before the study commenced, the researchers and the teacher had a number of sessions discussing the possibility of applying the expanded metaphor of scaffolding and group work to the teaching and learning process. The teacher commented:

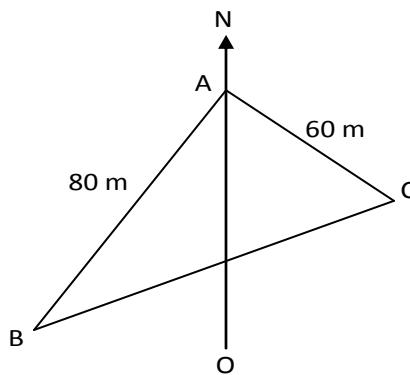
We know group work can be productive and we try to encourage students working together. But, they end up in all directions and I think because of the time factor, we prefer giving the methods and examples.

However, the teacher was determined to embrace the changes in the teaching and learning process that were inevitable. Through the many discussions on student-student and teacher-student interactions from the lesson episodes, the researchers were also determined to provide support structures to the teacher negotiating his expectations with the students. During group work, the teacher constantly moved around the classroom observing, encouraging and facilitating the students in their problem-solving attempts. As a result, he

was able to identify non-collaborative dialogues and initiated the construction of group work expectations with respect to these cases. We provide three non-collaborative examples to illustrate the processes by which the expectations of group work were continually negotiated and one collaborative example to show the learning opportunity that transpired during group work.

The first example is contained in transcription 5 below showing the interactions between two students in a lesson solving the problem: A, B and C are three points on the horizontal ground. The bearings of B from A and C from A are  $225^\circ$  and  $135^\circ$  respectively.  $AB = 80$  m.  $AC = 60$  m. Find BC.

### Transcription 5: Lesson on Bearing



S2: How to get  $\angle BAC$ ?

S1: Ah!  $360^\circ$  minus  $225^\circ$  and we get this.

S2: No.

S1: Correct, we get this first (Referring to  $\angle BAN$ ).

S2: Listen first. This is the same as this (Referring to  $\angle BAO$  and  $\angle CAO$ ).

S1: The question doesn't say so.

S2: We can assume it. Teacher, does this arrow bisect the angle?

T: Jane, can you explain that? Karen, you listen to Jane first.

S1: We can find  $\angle BAN = 135^\circ$  and  $\angle CAN = 135^\circ$ . Then,  $\angle BAO = 45^\circ$  and  $\angle CAO = 45^\circ$ . She's right. The two angles are equal.

Initially, both students did not benefit from the dialogue. They were not precise and explicit in their explanations, and were defensive of their own methods. S2 resorted to clarify her issue with the teacher and the teacher passed the onus of explaining the issue back to S1 and insisted S2 listening to the explanations tendered by S1. Later, S2 was asked to present their solution to the class and the teacher took the opportunity to comment on the collaborative behavior of S1 and S2.

S2:  $\angle CAN = 135^\circ$  (given). Bearing of B from A =  $225^\circ$ .  $\angle BAC = 225^\circ - 135^\circ = 90^\circ$ .

Using Pythagoras theorem,  $BC^2 = 80^2 + 60^2 = 10\,000$ .  $BC = 100$  cm.

T: Is this your work?

S2: (Smiling).

T: Can you tell us your own method?

S2:  $\angle CAO = \angle BAO = 45^\circ$ . So,  $\angle BAC = 45^\circ + 45^\circ = 90^\circ$ .

$BC^2 = 80^2 + 60^2 = 10\,000$ . BC = 100 cm.

T: If the bearing of B from A is  $230^\circ$ , are the two angles equal?

S2: Yah. I can't assume them.

T: Jane, what about yours?

S1: I was looking at  $\angle BAN$ . Then, we got  $\angle BAC$  by subtracting the bearing of C from the bearing of B.

T: I observed Jane and Karen just now. They were unwilling to listen to each other's explanations and both insisted having the correct method. You need to listen to your friend, then give your justification and agree on a solution. Now, they've a better solution. OK. Every group must have a solution. I can call on any one of you to present and the other to explain.

Here, the teacher capitalized on this non-collaborative case to convey to the class the obligations and expectations of them during group work. In the second example, the teacher was aiming to introduce parallel lines to the class. Transcription 6 below shows the collaborative dialogue of a pair of students working on the activity.

### **Transcription 6: Lesson on Straight Line**

S1: (Marking two points).

S2: How do you get these points?

S1: Gradient-intercept method.

S2: What's that?

S1: (continue drawing the line).

S2: (Drawing the line using his own method).

S1: The y-intercept is  $-1$ . Gradient is  $2$  and  $2/1$ . So, x is  $1$  and y is  $2$ .

S2: Indistinct (Drawing his line).

As the explanation of the gradient-intercept method was tendered later, it was ignored by S2 as he was drawing the line using his own method. Transcription 6 is continued with the interactive dialogue during the reporting-back phase of the lesson given under transcription 2. The two students were asked to present their solutions, with S1 first followed by S2. After the presentations, the interaction continued as follows:

T: Listen here. You are working together. What are you going to do with different methods?

S3: Compare.

T: Compare and ...

S4: Explain.

T: Right. I want you to explain and help your partner to understand your method. It's your responsibility to make sure that both of you understand and agree with the methods.

The two students used different methods to draw the straight lines and they did not really work together. Here, the teacher took this non-collaborative case as the context to initiate a discussion with the whole class on the obligations and expectations during group work. When the teacher was invited to comment on this lesson episode, he said:

I need to be very observance in these lessons. And I think I'm now better in identifying problematic cases for discussions ... However, the students could be insulted because often you're getting them to present something that they're not sure that they've got it right. So, we've to be a little bit more careful of this and that's why I've called on students who I think can take the knock to share their answers. I'll discuss their solutions, pose questions to make them aware of their mistakes and point out their responsibilities.

In the third example, a pair of students was engaged in off-task talking during group work given under transcription 4. The teacher was very concerned with the progress of the students involved in off-task talking. These off-task dialogues also disturbed his concentration on facilitating the collaborative moves of other students. He decided to constantly remind the students of their work, attend to them and ask them questions related to the task when he sensed that the students were off task. By doing so, the teacher conveyed to the students their obligations and expectations to discuss for a solution and to explain and justify the solution to the class during the reporting-back phase.

The teacher often approached the solutions and explanations of the students in a non-evaluative way. In transcription 5, the teacher did not comment on the method used by S1. Instead, he posed the question "If the bearing of B from A is  $230^\circ$ , are the two angles equal?" to S1. As the students realized that their solutions and explanations were respected and accepted, they were very keen to work in groups and the amount of off-task talk also decreased. One of the students commented:

You are working on the same question ... So, if you come to different answers, you can compare and you have time to compare and see where you differed ... And you can have a fight over who's right.

From these examples, the teacher used four strategies to initiate and guide the negotiation of his expectations for group work. First, he stopped by the non-collaborative groups to exert his authority on the students involved to act appropriately for effective mathematics learning. Second, he took these cases as opportunities during the reporting-back phase to preach to the class the obligations and expectations for group work. Third, he constantly reminded the students of their obligations and expectations when he moved around the classroom during group work. Last, he approached every solution and explanation in a non-evaluative way.

As the study progressed, the students demonstrated more collaborative behavior in working together such as stating their ideas freely, listening to each other, letting their defenses down and accomplishing a shared purpose. The following example illustrates such a collaborative case when a pair of students tackled the problem: The diagram below shows a right pyramid with a rectangular base. The vertex V is vertically above O, the midpoint of the

plane PQRS. Find (a) the height of OV, (b) the angle between the straight line VR and the plane PQRS and (c) the angle between the planes PQV and PQRS.

### Transcription 7: Lesson on Lines and Planes in 3-dimension

S1: We use 5 for this line.

S2: Why 5?

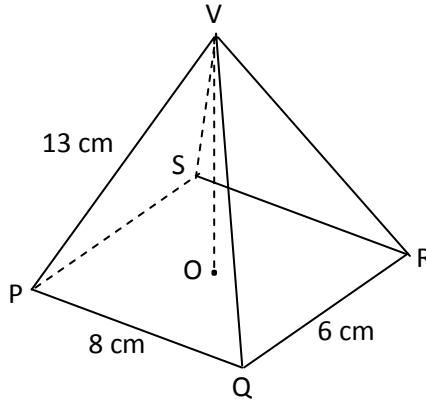
S1: This is the midpoint.

S2: How? Do we use this triangle?

S1: Yes, this is 10 (referring to PR).

Because O is the midpoint, this line is 5.

S2: OK. After this ...



S1: This is  $\Delta VOR$ , we get 5, 12, 13.

S2: How do you know that is 12? Use Pythagoras theorem?

S1: Yes.

S2: That's easy. Do we have to show all these?

S1: Yes. Draw  $\Delta PQR$ .

S2: Why? Oh! I know 6, 8 and 10.

The verbal interactions facilitated the mathematics learning of S2 in that the collaborative moves were supportive, took the trouble to elicit the lack of understanding of S2 and extended what had been said by S2 further. When the students were aware of their obligations and expectations during group work, they developed a sense of task interdependence and group responsibility. As a result, they worked productively together and the collaborative interactions facilitated each other's learning.

## 6.2. Collaborative Interactions

Having resolved the social problems of group work, the students were only faced with solving the mathematical task in hand. During group work, the students encountered a variety of problematic situations such as resolving obstacles that arose when they attempted to make

sense of a problem based on their current ability, accounting for different methods, verbalizing their thinking process, elaborating their ideas, taking conflicting points of view and accommodating different solutions. How should they interact to resolve these task-related issues? It turned out that the students were giving and receiving explanations during the collaborative interactions. We identified relevant, adequate, timely, and understand and use to be the features of the explanations during group work that could create learning opportunities for students.

### **6.2.1. Relevant**

The first feature is that the explanations must be relevant to the target student. In transcription 5, both students did not benefit from the dialogue as they were defensive of their own methods and the explanations tendered were not relevant to the problematic situations faced by them. However, the collaborative interactions in transcription 7 benefited S2. The explanations were relevant to the problematic situations faced by S2 and hence created the learning opportunity for S2. The explanations supported S2, elicited the lack of understanding of S2 and extended what had been said by S2 further.

### **6.2.2. Adequate**

The next feature of collaborative interactions creating learning opportunities for students is that the explanations must be adequate for the target student. Inadequate explanations included answers, and simple but appropriate responses. Adequate explanations consisted of descriptions of how to solve a problem or a part of it. The lesson excerpt in Transcription 8 shows the interactions between two students working on the problem: P, Q and R are the points (1, m), (2, 1) and (5, -5) and  $\angle PQR = 90^\circ$ . Find the value of m.

### **Transcription 8: Lesson on Straight Line**

- S1: I don't understand the question.
- S2: Use gradients to find m.
- S1: Gradients?
- S2: Indistinct (busy writing out his solution)
- S1: (Finding gradients for PQ, PR and QR).
- S2: m is 1/2.
- S1: (Continue to work out his own solution).

Obviously, the student requesting for help could not clarify the lack of understanding through the inadequate explanation of "use gradient to find m" tendered by S2. In another lesson, students were asked to work on the following problem in groups: In the diagram, ABCD is a straight line. Given that  $CE = 3EF = BD/2$ , find the value of  $\cos y$ . Part of the student-student interactions during group work is given under transcription 3.

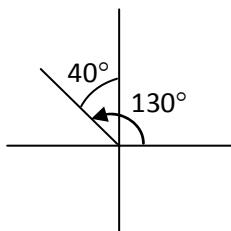
Both S2 and S3 benefited from the adequate explanations tendered by S1. It seems that receiving inadequate explanations was not sufficient for learning. Furthermore, these inadequate explanations frustrated the target student and consequently led him to tackle the problem on his own. The explanations needed to be sufficiently detailed to enable the

receiving student to overcome the misunderstanding or the lack of understanding through such exchanges during group work.

### 6.2.3. *Timely*

As the teacher could not always be available at the precise moment when any of his students was stuck in problem solving, he was less likely to provide timely tips. However, the students had the potential for giving timely understandable explanations to their partners during group work. In transcription 6, the clarification on the gradient-intercept method was not timely for S2. It was ignored as S2 was drawing the line using his own method. The next transcription shows the interactions between two students working together during a lesson on trigonometry.

### Transcription 9: Lesson on Trigonometry



S1:  $\cos 130^\circ = -\cos 40^\circ = -0.7660$ .

S2: It's not  $40^\circ$ .

S1: What?

S2: Your diagram is wrong.

S1: You mean this angle.

S2: Yah.

S1: So, it's  $180^\circ - 130^\circ$  for second quadrant. ASTC. Negative.

S2: Yes.

The timely help tendered by S2 corrected the misunderstanding on basic angle of S1. If the explanations were not offered at an appropriate time, the learning opportunities would not arise for the target student. At a later time, the student requesting for help would be at a different stage in the process of solving the problem. By then, either the target student might have a method for the answer, or he might be occupied with other processes. This example also shows that students were very likely to provide unsolicited explanations. A possible reason for this is that when the students worked together, they were well tuned-in to each other's problem-solving process and provided timely explanations without being explicitly requested.

### 6.2.4. *Understand and Use*

During group work, many students tendered relevant, adequate and timely explanations to their friends. The receiving students would only benefit from these explanations if they understood and used them to solve the problem correctly. In the examples given in

transcriptions 5 and 6, the target students did not attempt to understand and use the explanations as they were either defensive of their own methods or getting a solution using their own methods. In transcription 7, S2 followed through the explanations tendered by S1. He understood and used the explanations. That is why he said “Oh! I know 6, 8 and 10”. These examples illustrate the importance of the target students in understanding and using the explanations in order to overcome their difficulties.

So far, we have discussed the benefit acquired by the students receiving the explanations. Students giving the explanations also benefited from these collaborative exchanges. In transcription 5, S2 found  $\angle BAN = 360^\circ - 225^\circ = 135^\circ$  first. Then, she calculated  $\angle BAO$  and  $\angle CAO$  to find  $\angle BAC$ . However, they realized that  $\angle BAC$  could be obtained “by subtracting the bearing of C from the bearing of B”. To the teacher, “they’ve a better solution”. In transcription 3, S1 was asked to present the solution during the reporting-back phase. S1 explained the solution to S2 and S3. She reorganized her understanding and explained in a more understandable form to S3. She improved further her explanations to the class. Hence, her responses evolved from ‘brief phrases’ or ‘single disconnected sentences’ to explanations which ‘make sense’ to all. A number of processes accounted for these changes. In explaining and justifying to the friends, she needed to clarify, organize the thinking and reorganize the material tailored to the needs of those seeking the explanations. In doing so, she discovered gaps in her own understanding or discrepancies with her previous understanding. When the students were asked to comment on the benefit of group work to their mathematics learning, one of them said:

I get all sorts of ideas from friends to solve a problem. Moreover, I have a chance to help my friends. But, sometimes it can be tough when my friends don’t have the basic. I need to teach them from the beginning to the solution.

## 7. FEEDBACK

In this section, we present the findings to the third guiding questions. In the teaching and learning process, feedback is conceptualized as the information provided by a teacher regarding aspects of students’ performance or understanding. For the purpose of this chapter, it was part of the teaching and learning process that happened during group work, and the whole-class interaction during the reporting-back phase after the students had presented their solutions. The focus was on the feedback tendered by the teacher based on the outcomes of group work to fill a gap between what was achieved and what was intended for the students. The analysis of data yielded three types of instructional feedback that could facilitate the mathematical growth of students, namely, feedback on the task, feedback on the process and feedback on regulation.

### 7.1. Feedback on the Task

This feedback was about clarifying the information in a task and building understanding on the information, and the correctness of the solution. One of the examples is contained in the teacher-student interaction at the beginning of transcription 3. The feedback given by the

teacher probed S1 to clarify and understand the given information  $CE = 3EF = BD/2$  to solve the problem successfully. The next example illustrates how the teacher capitalized on the solution of the students during the reporting-back phase to design feedback related to the correctness of the solution. Transcription 10 contains part of the whole-class interaction during the reporting-back phase after the students solving the problem: Given  $AP = BQ$ , find the perimeter of the shaded region.

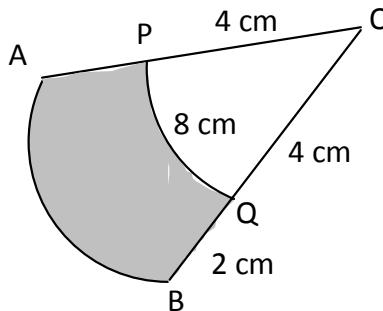
### Transcription 10: Lesson on Circle

S1  $S = r\theta$ ,  $\theta = S/r = 8/4 = 2$  rad.  $QB = AP = 2$ .

$PQ = 8$  cm.  $AB = 6(2) = 12$  cm.

Perimeter =  $2^2$  cm + 8 cm + 12 cm = 24 cm.

T: Where do you get  $2^2$ ?



S1:  $2 + 2$ .

T: Is  $2 + 2 = 2^2$ ?

S2: The answer is the same, but it's unsuitable.

T: Yes. It's true for 2 only. If you don't believe, is  $3 + 3 = 3^2$ ?

S1: No.

T: So, we must write  $2 + 2$ .

In finding the perimeter, the group wrote  $QB + AP = 2^2$  instead of  $QB + AP = 2 + 2$ . The teacher gave another example to help the students realize that  $QB + AP$  should not be written as  $2^2$ . Later, in an interview, the teacher commented:

I feel I'm better at dealing with students' misconceptions. You need to put forward an example to students that can show them that their conception is not right and that's difficult because sometimes you can't think of one ... I need to think of an example that I can give to the students. They will do it and find out for themselves that it doesn't work. Because I say 'No, that's wrong', they might accept it but they won't understand why ... I'm confident that these lessons have definitely enhanced the involvement and understanding of the students.

## 7.2. Feedback on the Process

The teacher capitalized on the solutions of students to design feedback related to the processes of obtaining the solutions. The teacher-student interaction of transcription 5 is such

an example. The teacher asked the students to tell the class their own methods. In this case,  $\angle BAO$  is equal to  $\angle CAO$ . Then, the teacher posed the question “If the bearing of B from A is  $230^\circ$ , are the two angles equal?” for the students and the whole class to realize that  $\angle BAO$  may not be equal to  $\angle CAO$ . The more effective strategy to find  $\angle BAC$  is “by subtracting the bearing of C from the bearing of B”. Transcription 11 shows another example of feedback on the process.

### Transcription 11: Lesson on Circle

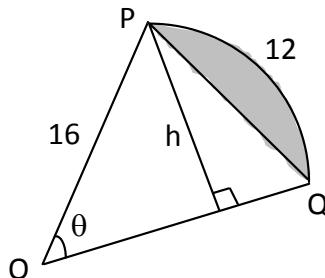
T: Is there any other method? Yes, John?

S1: (Writing)

T: OK. This is the 1<sup>st</sup> method. This is the 2<sup>nd</sup> method.

S2: Why do we use  $1/2r^2\sin\theta$  and not  $1/2 \times \text{base} \times \text{height}$ ?

T: Jane, can you draw the height of the triangle POQ?



S3: (Drawing)

T: Now, express h in terms of  $\theta$ .

S3:  $\sin\theta = h/16$ ,  $h = 16\sin\theta$ .

T: What do you get for the area by using this?

S2: It's the same.

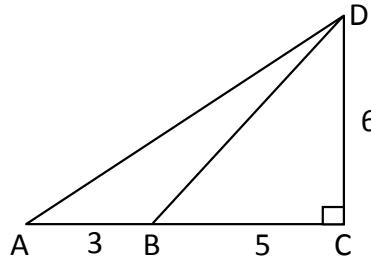
T: Good. Can you use both formulas? Give him a clap.

Through this feedback, not only Jane, but the other students in the class understood that  $1/2r^2\sin\theta$  is derived from  $1/2 \times \text{base} \times \text{height}$ . By doing so, the students noticed that they could use different strategies to solve the problem.

### 7.3. Feedback on Regulation

Last, but not least, is feedback on regulation. This instructional feedback drawn from the solutions of the students addressed the ways they should monitor, direct and regulate actions toward success. In a lesson, students were working on the figure below to find  $\angle DAB$ . Transcription 12 shows part of the reporting-back phase.

### Transcription 12: Lesson on Trigonometry



T: What is the answer?

S1:  $\tan \angle DAB = 6/8$ .  $\angle DAB = 36.9^\circ$ .

S2: (Having  $\sin \angle DAB = 6/10$ ) Why do we use tan?

Why don't we use sin or cos?

T: That's a good question. Why?

S1: We don't have the hypotenuse.

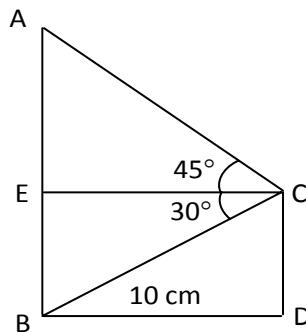
T: Can't we find it?

S3: Use Pythagoras theorem to find it.

T: Yah. Then, we can use sin or cos. Since we can use tan for the given values, why must we waste time to find the hypotenuse?

The teacher framed the outcomes of this reporting-back phase as the context to discuss with the students in choosing the strategy to solve a task based on the information given. In the end, the students noticed that it would take them more time to accomplish the task if they used sine or cosine instead of tangent. In another lesson, the students were asked to solve the following task in groups: AB and CD are two vertical poles on a horizontal plane. These poles are 10 m apart. The angle of elevation of A from C is  $45^\circ$  and the angle of depression of B from C is  $30^\circ$ . Find the height of AB. Transcription 13 contains part of the teacher-student interactions during the reporting-back phase.

### Transcription 13: Lesson on Angles of Elevation and Depression



S1:  $AE = EC = BD = 10 \text{ cm}$ .  $BE/10 = \tan 30^\circ$ .

$$BE = 10\tan 30^\circ = 5.8 \text{ cm.}$$

$$AB = 10 + 5.8 = 15.8 \text{ cm.}$$

T: Can you tell us what did you get initially?

S1: We wrongly labeled the angle  $30^\circ$ .

T: What else? How did you find AE?

S1: Rose said  $AE/10 = \tan 45^\circ$ .

But, I thought  $AE = EC$  since  $\Delta AEC$  is an isosceles triangle.

T: Good. These are the things that you must do. Make sure that you interpret the question correctly. Look for the easiest steps. And most importantly, check your solution again.

The teacher capitalized on the outcomes of this group work to emphasize to the students the importance of regulation for accomplishing a task successfully. During an interview session, one of the students commented:

At the beginning, I didn't have any confidence as the topics were new. Usually, our teacher gave us the notes first and we solved the problems later. Now, we're asked to solve the problems first. I get many suggestions from friends and I like it as I can learn different methods in solving a problem. On top of these, I also learn how to discriminate between these methods for a good solution.

## CONCLUSION

Learning mathematics anchored in Vygotskian theory has been actively studied by researchers interested in identifying how the social context of teaching and learning can foster students making connections, building mental schemata and developing new mathematics through thinking aloud with another person. This chapter attempts to contribute to this body of literature by investigating how group work and whole-class interaction help to realize such meaningful constructions of mathematics. The study reported here was conducted on a Form Four class over a 10-month period. The involvement of the upper secondary schooling is very significant since the pressure for teachers to help their students gain the highest performance at high-stakes assessment favors knowledge transmission. Bridging the individual and the social was the main theme of the chapter, and social, in our sense, referred to more than one individual actively participating in the teaching and learning process. The emphases of the analysis were on the partnered activities, the collaborative dialogues engaged in by the teacher and the students, and the learning opportunities created for the students.

The sociocultural theory, developed from Vygotsky's concepts, recognizes the need to give attention to the context and the interpersonal relationships of social interactions. Within the sociocultural perspective, the optimum learning of a student occurs in his or her ZPD, which according to Vygotsky is the difference between the cognitive levels of a student's problem-solving ability when tackling a task alone and in cooperation with an adult or a more capable peer. Hence, in any classroom, the ZPD of a student depends on his or her cognitive level and the forms of instruction. Instruction must proceed progressively to create learning opportunities for students and the classroom culture under which the instruction takes place determines the potential for learning.

Concept formation, student-student and teacher-student interactions were the three main constructs drawn from Vygotsky's concepts guiding the formation of the research design for the study. The basic instructional strategies were group work and whole-class interaction. As the participating students were "to exercise in class their curiosity and inventiveness, to imagine mathematics classes in which mathematics is discovered rather than covered" (Schwartz, 1994, p 6), the teacher needed to change the ways he organized to teach. For the students, they were now faced with two types of problem solving, namely, the problems of working productively together and the problems of solving the mathematical task.

In our view, the classroom culture for the students working productively together came into being through the continuous negotiation by the teacher and the students in the course of their social interactions. The expectations and obligations that made it possible for the students to act appropriately in the teaching and learning process created learning opportunities for them. Barnes and Todd (1977) wrote as follows:

[Collaborative] moves are mutually supportive: by taking the trouble to elicit an opinion from someone else, or by utilizing what has been said by extending it further, the group members ascribe meaningfulness to one another's attempts to make sense of the world. (p. 36)

When the students worked collaboratively together, each was obliged to make his or her emergent thinking available to the partner. The assisting student assumed the role of a teacher and tendered explanations that supported the problem-solving attempts of the other student. Learning opportunities arose as they clarified and revised their own thinking, and attempted to reach a consensus on the understanding of the task in hand. In doing so, they were showing a valuing of self and others, respect for self and others and responsibility for self and others. Thus, they created a ZPD enabling both students to accomplish a shared solution for the task in hand which could be different if they tackled the task alone.

The students learned as they participated with the knowledge they possessed, no matter how rich or sparse. They internalized information as their solutions were verified and clarified. It is important to recognize that their understanding built up during group work was "not yet matured". The teacher as the representative of the academic discipline needed to select the outcomes of group work to design instructional feedback for the successful constructions of scientific concepts. The students developed understanding by making their thinking visible, talking aloud, verifying and clarifying understanding, and contributing clues as the learning conversations evolved. Here, the teacher and the students created a ZPD enabling the students' understanding to move from "not yet matured" through "the process of maturation" to a full-blown state. The teaching and learning of mathematics became a social process of negotiation rather than imposition. The teacher's role changed from the sole source of mathematical knowledge to facilitator in the development of the students' mathematical constructions. The students became active participants in the teaching and learning process rather than passive receivers of the teacher's knowledge.

## REFERENCES

- Barnes, D. and Todd, F. (1977). *Communicating and learning in small groups*. London: Routledge & Kegan Paul.
- Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press.
- Cobb, P. and Whitenack, W. (1996). A method for conducting longitudinal analyses of classroom video-recordings and transcripts. *Educational Studies in Mathematics*, 30, 213 – 228.
- Creswell, J. W. (2003). *Research Design*, Sage, London.
- Damon, W. (1984). Peer education: The untapped potential. *Journal of Applied Developmental Psychology*, 3, 331 – 343.
- Egan, G. (1997). *The skilled helper: A systematic approach to effective helping* (6<sup>th</sup> ed.). Pacific Grove, CA: Brooks.
- Fall, R. and Webb, N. (2000). Group discussion and large-scale language arts assessment: Effects on students' comprehension. *American Educational Research Journal*, 37, 911 – 941.
- Forman, E. A (2003). A sociocultural approach to mathematics reform: Speaking, inscribing and doing mathematics within communities of practice, in J. Kilpatrick, W. G. Martin and D. Schifter (Eds.), *A research companion to principles and standards for school mathematics*, Reston, VA: NCTM, pp 333 – 352.
- Forman, E. A. and McPhail, J. (1993). Vygotskian perspective on children's collaborative problem solving activities, in C. A. Stone, N. Minick and E. A. Forman (Eds), *Context for learning: Sociocultural dynamics in children's development*, NY: University Press, pp 213 – 229.
- Freire, P. (1972). *Pedagogy of the oppressed*. Harmondsworth: Penguin Books.
- Gillies, R. M. (2003). Structuring cooperative group work in classroom. *International Journal of Educational Research*, 39, 35 – 49.
- Glaser, B (1978). *Theoretical sensitivity*. Mill Valley, CA: The Sociology Press.
- Gonzales, P., Williams, T., Jocelyn, L., Roey, S., Kastberg, D. and Brenwald, S. (2008). *Highlights from TIMSS 2007*. Washington, DC: National Center for Education Statistics, Institute of Education Science, U. S. Department of Education.
- Goodnow, J. (1990). The socialization of cognition: What's involved, in J. W. Stigler, R. A. Shweder & G. H. Herdt (Eds), *Cultural psychology: Essays on comparative human development*, NY: Cambridge University Press, pp 259 – 286.
- Goos, M. (2002). Understanding metacognitive failure. *Journal of Mathematical Behavior*, 21, 283 – 302.
- Goos, M. (2004). Learning mathematics in a classroom community of inquiry. *Journal for Research in Mathematics Education*, 35(4), 258 – 291.
- Greenfield, P. M. (1984). A theory of the teacher in the learning activities of everyday life, in B. Rogoff and J. Lave (Eds.), *Everyday cognition: Its development in everyday context*, Cambridge, MA: Harvard University Press, pp 118 – 138.
- Hattie, J. and Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77 (1), 81 – 112.

- Hershkowitz, R. and Schwarz, B (1997). Unifying cognitive and sociocultural aspects in research on learning the function concept. *Proceedings of the 21<sup>st</sup> International Conference for the Psychology of Mathematics Education*, Finland, Vol. 1, pp 148 – 164.
- Johnson, D. W. and Johnson, R. T. (1999). Making cooperative learning work. *Theory into Practice*, 38 (2), 67 – 74.
- Kemmis, S. and McTaggart, R. (1988). *The action research planner*, Geelong, Victoria: Deakin University Press.
- Kieran, C. (2001). The mathematical discourse of 13-year-old partnered problem solving and its relation to the mathematics that emerges. *Educational Studies in Mathematics*, 46, 187 – 228.
- Kilpatrick, J. (1987). What constructivism might be in mathematics education. *Proceedings of the Eleventh International Conference on the Psychology of Mathematics Education*, Montreal, Vol. 1, 3 – 27.
- Kluger, A. N. and DeNisi, A. (1996). The effect of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin*, 119 (2), 254 – 284.
- Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American Educational Research Journal*, 27, 29 – 63.
- Leikin, R. and Zaslavsky, O. (1997). Facilitating student interactions in mathematics in a cooperative learning setting. *Journal for Research in Mathematics Education*, 28, 331 – 354.
- Martin, J. (1985). *Reclaiming a conversation: The ideal of the educated woman*. New Haven, CT: Yale University Press.
- O'Connor, M. C. (2001). Can any fraction be turned into a decimal? A case study of a mathematical group discussion. *Educational Studies in Mathematics*, 46, 143 – 185.
- Patton, M. (1990). *Qualitative evaluation and research methods*. Newbury Park: Sage Publications.
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. NY: Oxford University Press.
- Rogoff, B. & Gardner, W. (1984). Adult guidance of cognitive development, in Rogoff, B. & Lave, J. (Eds.), *Everyday cognition: Its development in everyday context*. Cambridge, MA: Harvard University Press.
- Schoenfeld, A. H. (2000). Purposes and methods of research in mathematics education. *Notices of the AMS*, 47(6), 641 – 649.
- Schwartz, J. L. (1994). The role of research in reforming mathematics education: A different approach, Chapter 1 in A. Schoenfeld (Ed.), *Mathematical thinking and problem solving*. Hillsdale, NJ: Lawrence Erlbaum.
- Searle, D. (1984). Scaffolding: Who's building whose building? *Language Arts*, 61(50), 480 – 483.
- Sfard, A., Forman, E. A. and Kieran, C. (2001). Learning discourse: Sociocultural approaches to research in mathematics education. *Educational Studies in Mathematics*, 46, 1 – 11.
- Sfard, A. and Kieran, C. (2001). Cognition as communication: Rethinking learning-by-talking through multi-faceted analysis of students' mathematical interactions. *Mind, Culture, and Activity*, 8 (1), 42 – 76.

- Slavin, R. (1995). *Cooperative learning: Theory, research and practice* (2<sup>nd</sup> ed.). Boston: Allyn and Bacon.
- Stone, C. A. (1993). What is missing in the metaphor of scaffolding?, in C. A. Stone, N. Minick and E. A. Forman (Eds.), *Context for learning: Sociocultural dynamics in children development*, NY: University Press, pp 169 – 183.
- Teasley, S. D. (1995). The role of talk in children's peer collaborations. *Developmental psychology, 31* (2), 207 – 220.
- Von Glaserfeld, E. (1995). *Radical constructivism: A way of knowing and learning*, London: Falmer Press.
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*, Cambridge, MA: Harvard University Press.
- Webb, N. and Farivar, S. (1994). Promoting helping behavior in cooperative small groups in middle school mathematics. *American Educational Research Journal, 31*, 369 – 395.
- Wood, D., Bruner, J. S. and Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89 – 100.

## ***Chapter 2***

# **FACTORS AFFECTING HELP-SEEKING AND LEARNING GAINS IN TECHNOLOGY-ENHANCED INQUIRY-LEARNING: THE EFFECTS OF THE CLASSROOM SCRIPT AND GENDER COMPOSITION**

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## **ABSTRACT**

The use of collaborative inquiry in classrooms is increasing, despite the fact that the conditions for its effectiveness have not been systematically studied. It has been claimed that inquiry-learning environments with minimal guidance are less effective than those with additional instructional support, especially for learners with little prior knowledge. It has also been argued that collaborative working, working with computers, and learning scientific content may involve gender factors. However, with regard to collaborative web-based inquiry-learning, there has so far been little research on how students' learning and collaboration is supported or hindered by differently structured interaction patterns, and the gender composition of groups. The present chapter deals with technology-enhanced collaborative inquiry-learning. In this context, we examine the influence of the classroom -script structure (high structure vs. low structure) on the help-seeking of single-gender and mixed-gender pairs, and also look at the learning gains achieved. The data are drawn from 54 student pairs in secondary science education. We analyzed screen- and audio-capturing videos according to a model of the help-seeking process. Pre- and post-tests were applied in order to measure the students' learning gains. Overall, the single-gender and mixed-gender pairs under the high-structured classroom-script condition sought less help, but learnt more than those under the low-structured classroom-script condition. The results indicate that in terms of both help-seeking and learning gains, the structure of the classroom script has a greater effect than the gender composition of the classroom.

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However, mixed-gender pairs seemed obtain particular benefit from the high-structured classroom script in terms of learning gains – a result that would merit further investigation with a larger sample. In addition, a qualitative analysis of successful and unsuccessful pairs was conducted with respect to learning gains, to determine whether there could be differences between gender pairs and their ways of working. In fact, no clear gender differences were found, but students' behavior in successful pairs could be characterized as task-relevant behavior. In conclusion, we discuss the challenges pertaining to the structuredness of the classroom script and the role of the teacher in technology-enhanced inquiry-learning classrooms.

**Keywords:** Collaborative Inquiry-Learning; Gender; Help-Seeking; Education; Secondary School

## INTRODUCTION

In education, increasing use is being made of collaborative inquiry methods, although the conditions for their effectiveness have not been systematically studied. In science education, collaborative inquiry-learning requires learners to engage actively in scientific activities such as searching for literature, gathering and interpreting scientific data, and building hypotheses. These activities are considered to be highly demanding and even excessively challenging if they are not adequately supported, for example by scaffolding, small-group scripting, expert support, and so on (e.g. Kollar, Fischer, and Slotta, 2007; Linn, 2006; van Joolingen and Zacharia, 2009). It has been argued that inquiry-learning environments with minimal guidance are less effective than those with additional instructional support, especially for learners with little prior knowledge (Kalyaga, 2009; Kirschner, Sweller, and Clark, 2006). Different instructional approaches can result in varying classroom interaction patterns, and these may in turn differentially influence individual students or students in small groups, for example, students working in mixed or single-gender groups in science education (e.g. Harskamp, Ding, and Suhre, 2008; Scanlon, 2000). However, there has so far been little research on how, within collaborative inquiry-learning, students' help-seeking and learning can be supported or hindered by different patterns of classroom interaction (also termed classroom scripts; but see Mäkitalo-Siegl, Kohnle, and Fischer, 2011), and the gender composition of groups (single-gender or mixed-gender).

Methodologically speaking, help-seeking research has so far been primarily questionnaire-based, and there is a clear need for empirical studies – including measures of help-seeking behavior and consequential learning outcomes – in real learning contexts (Baumeister, Vohs, and Funder, 2007; Mäkitalo-Siegl and Fischer, 2011). In the present chapter, we examine this broad question with respect to collaborative inquiry-learning within the science-education classroom. We look at the effects of different classroom scripts on help-seeking among single-gender vs. mixed-gender pairs (in terms of both behavior and learning outcomes).

Variation in students' learning and academic success can be partially explained by different patterns of classroom socialization, including teacher-student or student-student interactions, and teacher and student expectations (e.g. Brophy and Good, 1986; Nie and Lau, 2010). The term "script" developed by Schank and Abelson (1977), refers to both culturally shared and personal knowledge regarding, for example, how persons act in a particular situation, such as in a restaurant or in a classroom (see also Kollar et al., 2007). Both teachers

and learners have certain cognitive representations of typical lesson structures and sequences of learning activities in the classroom (Webb and Mastergeorge, 2003). In the classroom, both teachers and students bring to the situation their pre-existing cognitive structures; these are unique to the individual in question, but are likely to interact with those of the broader group (Rajaram and Pereira-Pasarin, 2010). In this chapter, we refer to the cognitive representations of typical lesson sequences as *classroom scripts*. These scripts guide both teachers and students in their understanding of how to act in specific classroom situations (see also Seidel, Rimmele, and Prenzel, 2005).

Classroom scripts can be regarded as one mechanism by which teaching and learning practices are transferred from one generation to the next, and as students we all acquire scripts based on over a thousand hours of experience (Britzman, 1991). What we call the classroom interaction pattern is the one that can actually be observed in the classroom; it is influenced by the classroom scripts of the participating students and teachers, and also by the constraints and affordances of the instructional context at hand. In practice, classroom interaction patterns may well to a large extent be determined by the cognitive classroom scripts of participants, since mental representations have been found to be rather similar among persons in a given instructional situation, and the constraints and affordances in western classrooms are impressively homogeneous and constant over time (Schratzensaller, 2010).

In inquiry-learning, students are expected to actively engage in knowledge-construction processes, by building hypotheses, collecting evidence, and interpreting results. Hence this is seen as a fairly student-centered form of learning. Being innovative and student-centered, it sets challenges for teachers, who are often not well trained in applying this form of learning. Poor adaptations of this innovative form of learning may result from “technology assimilation”: the teacher is in this case guided by her own traditional classroom script, using materials for inquiry-learning to support her own more or less teacher-centered method of instruction (see Cognition and Technology Group at Vanderbilt, 1997; Slotta and Linn, 2009). Alternatively, an unfavorable situation may result from a “replaced-by-technology” mindset. Here, the teacher activates a kind of “spectator script,” according to which the technology itself takes on the role of the instructor. In such a case, the physical presence or absence of the teacher does not actually seem to influence students’ learning outcomes, or that at least was the conclusion drawn from a small-scale study on web-based inquiry-learning (Martiny, 2005). It may be that when the teacher takes such a passive role, students, too, accept the new role distribution. From this, one might infer that whereas the teacher was previously the one possessing domain knowledge, the “new” classroom interaction pattern poses a barrier in terms of teachers and learners being able to use this knowledge. This phenomenon could be termed “expertise inhibition.”

Web-based inquiry-learning environments, such as the Co-Lab (Savelsbergh, van Joolingen, Sins, de Jong, and Lazonder, 2004) or the Web-based Inquiry Science Environment (WISE; Slotta and Linn, 2000), include teacher instructions regarding how to embed the environment within the overall lesson structure. However, previously learnt and incompatible cognitive classroom scripts can hinder teachers in implementing these ideas. Moreover, such externally represented classrooms scripts or lesson plans have so far rarely been empirically tested in terms of their effectiveness. As an example, de Jong’s (2006) inquiry-learning model can serve as a prototypical inquiry classroom script. It includes five phases: (1) orientation, (2) hypothesis generation, (3) information collection, (4) conclusion drawing, and (5) evaluation. Classroom-level (or plenary) instruction can further vary

between *low-structured* and *high-structured*. A low-structured classroom script means that students work independently from the teacher; they engage in self-directed and collaborative activities after receiving an introduction to the topic and to the web-based environment. A high-structured classroom script involves the active role of the teacher, who introduces, sequences, and evaluates learning activities. The teacher introduces the main inquiry activities to the classroom plenary in a sequenced manner, and gives instructions on how to proceed in the web-based environment; she then allows students to work on one of the activities and return with their results to the classroom plenary.

It has been argued that open, experience-based learning environments with minimal guidance often do not lead to effective learning (Kirschner et al., 2006) unless they are supported by additional instructions. This, it is suggested, helps to reduce the cognitive load imposed by problem-solving, thus enabling knowledge construction (Kalyuga, 2009). We could therefore expect that different classroom patterns will promote or hinder learning processes, and for example students' help-seeking behavior. This would be in line with previous research on help-seeking, indicating that teacher behavior and the resulting classroom discourse may indeed substantially encourage or hinder help-seeking (Butler, 2006; Karabenick and Newman, 2009; Oortwijn, Boekaerts, Vedder, and Strijbos, 2008). Nevertheless, there has been little actual research on the effects of classroom scripts on help-seeking. With this in mind, we have endeavored to reach a better understanding of how different classroom patterns (high-structured, low-structured) may influence learners' help-seeking processes.

Research on inquiry-learning has repeatedly shown that the inquiry process can be demanding and challenging for students, and may thus hinder further learning (e.g. van Joolingen, de Jong, Lazonder, Savelbergh, and Manlove, 2005). One reason for this may be that learners are unable to deal with such demanding processes through seeking help from peer learners or the teacher. We suggest that the processes associated with such problems may be conceptualized as *help-seeking processes*, and we refer to the model developed by Nelson-Le Gall (1981) in which different stages of help-seeking are distinguished: (a) becoming aware of a problem, (b) making a decision to seek help, (c) identifying an appropriate source of help, such as peers, the teacher, or technology, (d) implementing strategies for getting help, and (e) evaluating the help received.

Learners who are able to control and monitor their learning processes are also able to identify their problems and to evaluate whether and what kind of help they need; they can ask for help in order to solve a task or problem successfully (Nelson-Le Gall, 1981; Newman, 1998; Puustinen, 1998). Self-regulated learners are rather less likely to seek help when help is needed (Karabenick and Knapp, 1991). It has been noted that in particular those learners who seek instrumental help by asking for explanations and hints learn more than those who seek merely executive help by asking directly for answers (Nelson-Le Gall, 1981; Ryan and Shim, 2006; Webb, Ing, Kersting, and Nemer, 2006). Help-seekers also need to formulate a request in such a way that the help-givers can respond in a meaningful way, and will be willing to assist (Webb et al., 2006). After receiving the help, help-seekers should utilize it in order to solve a problem or a task.

These kinds of help-seeking processes – in which learners seek explanations and hints for solving a task or problem by themselves – also enhance learners' independence in the learning process (Nelson-Le Gall, 1981; Newman, 1998). Increasing learners' independence can indeed be regarded as one of the aims of inquiry-learning. It is seen as a somewhat

student-centered form of learning, one aimed at leading learners to formulate hypotheses, gather evidence, and interpret data. In inquiry classrooms, learners are expected to take responsibility by being active and self-directed in their learning processes. However, the inquiry-learning process can be highly demanding for students. When they struggle with their learning, students often refrain from seeking help from the multiple resources (e.g. teacher, peer learners, computer) available in the classroom, and this may further hinder learning (van Joolingen et al., 2005).

Not asking for help when it is needed is a phenomenon which is widespread across a variety of educational settings (Aleven, Stahl, Schworm, Fischer, and Wallace, 2003; Newman, 2000; Ryan, Pintrich, and Midgley, 2001). In the classroom context, there are several factors determining whether help is avoided or sought. Help-seeking is a highly interactive process, and patterns of classroom interaction, teacher-student interaction, and student-student interaction can affect students' help-seeking or avoidance of it (Aleven et al., 2003; Butler and Shibaz, 2008; Karabenick and Newman, 2009; Newman, 1998; Ryan and Shin, 2011; Webb and Mastergeorge, 2003). In order to receive help, it is necessary for a student to approach others and to ask for help. This is a step which might be experienced as intimidating by many learners, which may to some extent explain why help-seeking is often avoided (Butler, 2006; Karabenick and Newman, 2009; Ryan et al., 2001). With respect to gender, studies so far have revealed contradictory results on the effects of a fellow-learner's gender within learning and collaborative situations (Aleven et al., 2003; Harskamp et al., 2008; Light, Littleton, Bale, Joiner, and Messer, 2000; Scanlon, 2000; Underwood, Underwood, and Wood, 2000).

Working successfully in groups demands a lot from group members. Learners must listen to one another, share and jointly build knowledge, actively work towards a joint goal, and help one another during collaboration (see Barron, 2003; Webb and Mastergeorge, 2003; Webb and Palincsar, 1996). According to previous literature the gender composition of groups may set some additional demands on group members. It seems that students behave differently when working in single-gender and mixed-gender groups, and that this can have some effects on students' learning outcomes. Overall, several studies have shown that students' achievements in single-gender conditions are superior to those in mixed-gender conditions (Harskamp et al., 2008; Light et al., 2000). However, in a study by Underwood et al. (2000), mixed-gender groups acted differently but did not perform worse than single-gender groups. One reason for the different patterns of classroom interaction in these different groups may be that males were favored both by science as a subject and by computers as tools to be used (Greenfield, 1997; Newman, 1998; Whitley, 1997). At least in the past, males had more positive attitudes towards computers, felt more competent in computer-supported tasks, and felt themselves to be entitled to use technology – all factors that might enhance their performance (Underwood et al., 2000; Whitley, 1997). As regards collaboration and gender, it has been argued that females prefer to work together, whereas males would rather work independently; consequently it has been thought that collaborative learning may favor females (e.g. Harskamp et al., 2008).

There are indications that help-seeking behavior, too, is influenced by gender (Arroyo, Beck, Beal, Wing, and Woolf, 2001; Butler, 1998; Newman and Goldin, 1990; Ryan, Gheen, and Midgley, 1998). Females have been found to be more willing than males to seek help in the classroom when they need it (Ryan et al., 1998). In addition, a study by Butler (1998) showed that male students want to demonstrate their competence, and therefore rarely ask for

help. Newman and Goldin (1990) reported that gender differences in help-seeking depend on the domain; in terms of asking for help, females are more worried about their displayed competence in mathematics classes than in reading classes. Previous research also indicates that males and females prefer different kinds of help from the help systems in interactive learning environments (Arroyo et al., 2001): females prefer interactive and elaborated feedback, whereas males prefer less interactive and briefer feedback.

Previous research has further shown differences in interaction gender patterns with regard to science learning, using computers and the collaborative learning approach. One may surmise that mixed-gender groups will face particular problems in learning together, given the different styles of interaction, and different types of help-seeking, attitudes, and interests among males and females. This might explain the different learning outcomes in single-gender and mixed-gender groups. On the one hand, female students do seek more help – yet in science learning, it may be that females are more concerned about their competence, a factor that could inhibit them from seeking help in science classes (Newman and Goldin, 1990). On the other hand, male students rarely ask for help, and this could be expected to hinder progress in learning. It should be noted, however, that these earlier studies on students' help-seeking behavior mostly investigated student-teacher interaction in teacher-centered classrooms – locations where students are expected to ask help from the teacher, and where the teacher is assumed to be the only reasonable source of help. In classrooms focusing on computer-supported collaborative inquiry-learning, a number of help sources are available to students; however, up to now, we know little about how these sources will be utilized in a real classroom situation. Despite the increased use of computer-supported collaborative inquiry-learning in education, there are hardly any studies on the help-seeking behavior and learning of gender groups in the collaborative inquiry-learning classroom.

## AIMS OF THE STUDY

In this study, we investigated the effects of classroom patterns (i.e. classroom scripts) on single-gender pairs (female-female and male-male) vs. mixed-gender pairs (female-male) on help-seeking processes and on learning gains in science classrooms. The following research questions were formulated:

*Research Question 1:* To what extent does a differently structured classroom script (high structure vs. low structure) affect single-gender and mixed-gender pairs' help-seeking processes in inquiry-learning?

The first hypothesis was that single-gender groups will seek help less often than mixed-gender groups (Hypothesis 1a). This was based on the assumption that mixed-gender groups face more problems (because of gender factors bound up with different ways of working and different degrees of interest in science and computers); hence they will seek help more often than single-gender groups (Greenfield, 1997; Harskamp et al., 2008; Light et al., 2000; Newman 1998; Whitley, 1997). By contrast, single-gender groups will seek help less often – because males do not usually ask for help (Butler, 1998; Ryan et al., 1998) – and those

females who do usually ask for help will not do so because of the science class context (Newman and Goldin, 1990).

In addition, we hypothesize that a low-structured classroom script (with lower levels of teacher guidance) will lead to a higher frequency of help-seeking than a high-structured classroom script (Hypothesis 1b). This is based on the assumption that students need less help when they receive more support and instruction.

It should be noted that the literature does not provide any basis for specific hypotheses with respect to the relative frequencies of other variables in the help-seeking process; hence we tested the variables above in order to find if there are any differences between the gender groups.

*Research Question 2:* What are the effects of the gender composition of groups (single-gender vs. mixed-gender pairs) on learning gains in collaborative inquiry-learning environments in the science classroom?

The hypothesis for this question was that single-gender groups will show higher learning gains than mixed-gender groups (Hypothesis 2a). Based on the literature, we could assume that single-gender groups will face fewer problems than mixed-gender groups because of their similar working styles and interests; this will allow single-gender groups to focus more on content. Hence they will learn more than mixed-gender groups (Harskamp et al., 2008; Light et al., 2000).

Furthermore, we hypothesize that a high-structured classroom script (with high levels of teacher guidance) will lead to a higher learning gains than a low-structured classroom script (Hypothesis 2b). This is based on the literature indicating that inquiry learning environments with minimal guidance are less effective than those with additional instructional support (Kalyuga, 2009; Kirschner et al., 2006).

*Research Question 3:* What are the differences between successful and unsuccessful single-gender and mixed-gender pairs' ways of working?

Prior studies (Harskamp et al., 2008; Light et al., 2000; Underwood et al., 2000) have indicated that students in different gender compositions may come to their successes or failures through quite different working processes. We conducted a qualitative analysis on seven pairs who were selected according to their quantitative learning gains. The qualitative analysis was largely exploratory in character. Our aim here was to determine if there were differences between genders and their ways of working.

Note that all the process-related data with regard to help-seeking processes and learning gains have been re-analyzed for the purposes of both the gender perspective and the qualitative analyses. Thus they are original, and not part of the Mäkitalo-Siegl et al. (2011) overview.

## METHODS

### Sample and Design

The participants were 108 secondary education students, aged 16 to 19. The participants worked in pairs ( $N = 54$ ). Five classes were randomly assigned to different classroom-script conditions (high structure vs. low structure), with female and male students within a single class being randomly assigned to single-gender and mixed-gender groups.

In the *high-structured classroom-script condition* (2 classes;  $n = 19$  dyads: single-gender  $n = 16$ , mixed-gender  $n = 3$ ), an inquiry-learning model was introduced to the students, and students' small-group activities were interspersed with teacher-led plenary activities.

In the *low-structured classroom-script condition* (3 classes;  $n = 35$  dyads: single-gender  $n = 17$ , mixed-gender  $n = 18$ ), the inquiry cycle was not introduced by the teacher. Instead, students worked in pairs in the learning environment, after being informed about the learning environment and the task.

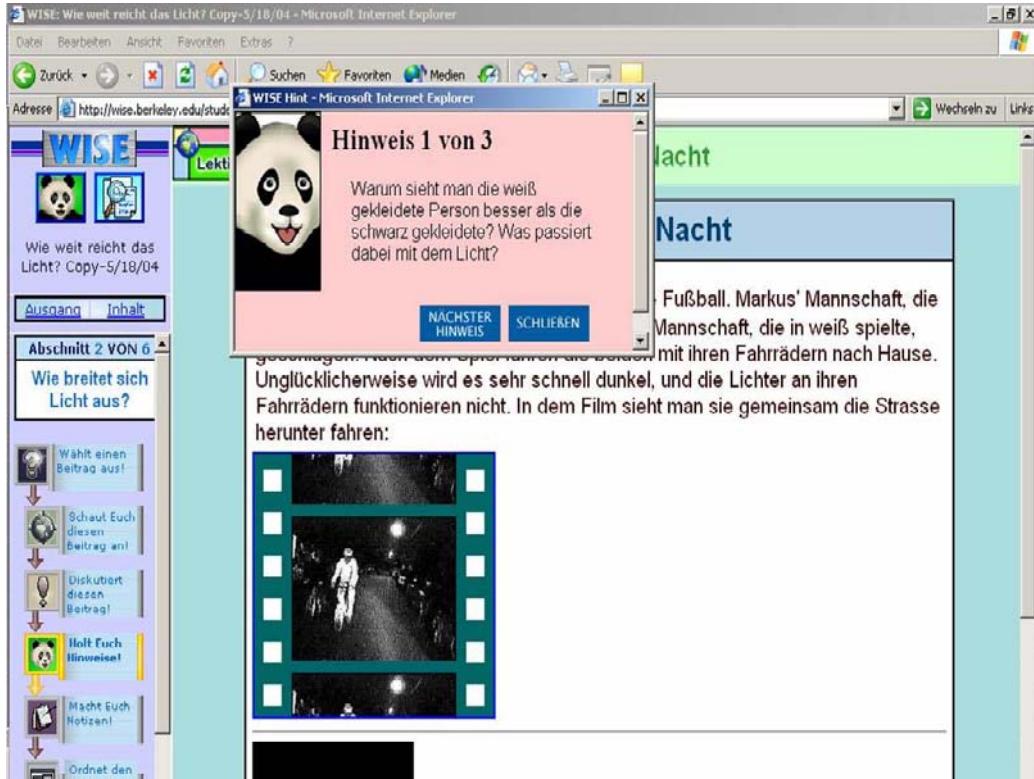


Figure 1. Screen capture showing the WISE project “How far does light go?” and one of the cognitive hints: “*Why can we see the person dressed in white better than the person dressed in black – what happens to the light?*” (viewed as a help function for the students).

## The Web-based Inquiry Science Environment (WISE)

The students in each dyad used a shared laptop computer. They worked on a module of the Web-based Inquiry Science Environment (WISE; Slotta and Linn, 2000; translated into German; see Figure 1). In WISE, the five phases of inquiry-learning are embedded in a web-based learning environment (see de Jong, 2006). The students' task was to test two contradictory hypotheses – “light dies out” versus “light goes on forever” (Bell, 2004). Students selected one of these two hypotheses and tested it using different sources of information (texts, videos) offered by the online learning environment. Students were able to click on prompts in order to receive hints (seen as a help function) regarding the interpretation of the information presented, such as *“Think about something that is similar to attempting to see in a dark room. Why is it so difficult?”* and also regarding what they should do next, for example: *“Discuss with your partner.”* The entire task took up 130 minutes of study time under both conditions.

## Structuredness of the Classroom Scripts

Under the *high-structured classroom-script condition*, the inquiry process was structured into five teacher-initiated phases of inquiry-learning: (1) Orientation phase and introduction of the learning environment, (2) Hypothesis generation phase, (3) Information collection phase, (4) Phase of conclusion drawing, and (5) Evaluation phase. Each phase commenced at the plenary level, with the teacher giving an introduction and providing clear instructions on what was expected of the students in their dyadic inquiry. Each phase ended with an evaluation of the hypotheses, the results, and the findings which students had collected and formulated during their small-group work.

- (1) *Orientation phase and introduction of the learning environment* (15 min.). After a short PowerPoint presentation on the topic “Light propagation” the teacher introduced students to the problem: “How far does light go?”. The prior knowledge of the students was activated by questions such as “What sources of light do you know?”, “How does light propagate?”, and “What happens to the light when it leaves the light source?” The WISE learning environment was then introduced and the students were instructed to read and make notes on two competing theses, “Light dies out” and “Light goes on forever.” In addition, they were encouraged to discuss the hypothesis with their learning partner.
- (2) *Hypothesis generationphase* (5 min.) in class plenary. In this phase the students were supposed to present examples of the hypotheses they had formulated in pairs. They were asked to utter assumptions and ideas on the propagation of light rays and to give their own opinion on the two competing ideas of how light propagates.
- (3) *Phase of collecting information* (75 min.). The class worked with a number of items of evidence provided in the project “How far does light go?” Before the dyads worked on their own, the teacher showed them how to cope with the pieces of information. Using the first topic, “searchlight,” the five phases of the inquiry cycle were illustrated by means of an example (20 min.). The learners became familiar with questions that were intended to help them to organize their learning process

within the five phases of the inquiry cycle: “What is the topic about?”, “What do I already know about the issue?”, “How are A and B connected?”, “What assumptions do I have?”, “How can I prove my assumptions?”, “What does the information have to do with my question?”, “Is the information reliable?”, “What conclusions can I draw?”, “Did I answer my original questions successfully?”, and “What could be improved next time?”. After this, all dyads were supposed to work with the next topic (called “on the soccer field”) independently. They then presented their results and got some feedback from the teacher (20 min.). After that the pairs worked on their own in the WISE learning environment (35 min.).

- (4) *Phase of drawing conclusions* (15 min.). The lesson continued with the phase of drawing conclusions, in which the students completed the last part of the project “How far does light go?”. They were then asked to decide on one of two competing hypotheses and write down three arguments giving strong evidence for the selected hypothesis, plus three arguments which were either against or not quite clear. As preparation for the subsequent discussion in the classroom plenary, the learners wrote their arguments on cards of two different colors.
- (5) *Evaluationphase* (20 min.). In the last phase, the evaluation phase, there was a discussion on whether light dies out or goes on forever. The students presented their arguments for and against the original hypotheses, “Light dies out” and “Light goes forever.” The initial hypotheses were confirmed, and a decision in favor of one of the two hypotheses was reached. In addition, the proceedings of the dyads in the learning environment were evaluated and discussed. Successful strategies were compared with less successful ones, and suggestions for improvement were considered.

In the *low-structured classroom-script condition*, the inquiry process was not introduced by the teacher. Instead, students were informed about the structure of the environment and the task, before working in pairs in the learning environment, without any plenary phases. WISE included the same domain information, and also the same information on the inquiry process steps, as the information provided by the teachers under the high-structured classroom-script condition.

A teacher with previous experience of using inquiry-learning in her classroom taught in all five classes, but the students in these classes did not have any prior experience of inquiry-learning or of WISE. The teacher was not aware of the research aim – she was instructed to follow the procedure outlined in the classroom script, but no further instructions were provided regarding how she should behave in the classroom. In each lesson, appropriate implementation of the classroom scripts was observed under both conditions.

## **Instruments**

### ***Analysis of the Help-seekingProcess***

Nelson-Le Gall's (1981) model of the help-seeking process was applied in a quantitative analysis of 54 screen- and audio-capturing videos of the first lessons. Using a time-sampling method, four 5-minute intervals out of the 90-minute videos were analyzed for each pair (intervals at 25–30, 40–45, 55–60, and 70–75 minutes from the beginning of the video). The coding process was conducted as follows: Help-seeking events in which the students

indicated that they needed help were identified (e.g. directly asking for help: “Is this right?” or expressing a lack of understanding: “I do not understand this”). These indications were categorized as *help sought*. Then the *content of help sought* was examined, including domain knowledge (e.g. questions such as “Is my solution right?”) or inquiry-learning (“How do I formulate the hypothesis?”, or technical problems (“This video is not working”)). *The type of help sought* was coded with respect to whether it was executive (refers to students seeking direct answers, for example, “Is this right?”) or instrumental (no direct answers sought but rather hints and guidance on how to figure out the problem for themselves, for example, “Could you give me a hint?”). The analysis then focused on the source from which help was sought, regarded as a *resource for help* (teacher/fellow-learner/other student/WISE). The data were coded according to the *type of help received*: executive (receiving complete answers, helper takes over and solves the task or writes a solution) versus instrumental (hints). Thereafter, the *usage of the help received* was analyzed. Help was used, for example, if students followed the instructions given by a help-giver, entered the information they had received, performed a “drag and drop” action based on the help they had received, and so on. Not using the help received was coded, if students did not attempt to follow the given instructions or advice. Finally, the *solution of the problem* was coded in terms of whether students solved the problem based on the help they had received (they were able to perform the activity, write down the hypothesis, play the video, etc.). If so, the problem was coded as solved. If students failed to take the actions required to solve the problem (failing to write text in the appropriate text boxes, to perform the “drag and drop” action, etc.) the problem was coded as still existing. Agreement between two coders (determined on the basis of 10% of the data) ranged between 74% and 98%.

### ***Students' Learning Gains in Physics***

Identical pre- and post-tests were used to measure students' knowledge of physics on an individual basis. The Domain-Specific Knowledge test (Bell, 2004), which was specifically developed for the content of the WISE, consists of distinct scales which measure different curriculum aspects. Seven multiple-choice items (one point/each correct answer) and three items with a free-response format (0–2 points) were applied; the overall score range was 0–13. The multiple-choice items covered information which the students were supposed to collect while working in the online learning environment, for example, “Telescopes can be used to observe things, such as the moon. Which of the following explanations best describes how a telescope works?” and contained four options, for example, “A telescope gets you closer to the moon.” The mean score of the two individuals in each pair (see Cress, 2008) was used for the calculation of learning gains.

The learning gain was calculated by subtracting the pair's mean pre-test score from its mean post-test score; hence it could be either positive or negative. Cronbach's alpha was .74 in the pre-test and .80 in the post-test. Inter-rater agreement between two coders for the open items ranged from 86% to 99%.

### ***Statistical Analysis***

Non-parametric tests were used, because the requirements for ANOVA were not met (unequal group size). The Kruskal-Wallis test was used to compare the four gender groups in the different classroom-script conditions with respect to learning gains and the variables of the help-seeking process. The benefit of using the Kruskal-Wallis test is that all possible

combinations can be tested at once. However, the Kruskal-Wallis test merely indicates that a difference exists, and post hoc tests are needed to show where the differences lie. For this reason, we used the Mann-Whitney tests to follow up the Kruskal-Wallis test. The Monte Carlo exact test was used along with the non-parametric tests, and the level of significance was set at 95%. The unit of analysis consisted of pairs.

### ***Qualitative Approach***

A qualitative approach was used in order to explore further differences in the ways of working between unsuccessful and successful single-gender and mixed-gender pairs, and it was mainly exploratory in nature. We used a similar approach to that by Mäkitalo, Weinberger, Häkkinen, Järvelä, and Fischer (2005), involving a case-based analysis with the focus of the qualitative analysis targeted at the units which had first been analyzed using the quantitative approach. The help-seeking events were transcribed and analyzed in order to explore the pairs' ways of working, i.e. looking at their task-relevant behavior or task-irrelevant behavior (Hijzen, Boekaerts, and Vedder, 2007). The behavior of students who were actively working with the task was characterized as task-relevant behavior; this meant that students were active and focused on the task (e.g. asking questions and explanations, reading the text, using their own words when writing the assignments, and not using copy-paste tactics). By contrast, the behavior of students who were not actively working with the task was characterized as task-irrelevant behavior, meaning that students did not work hard (e.g. selected the easiest activities, used copy-paste tactics), gave up easily, and engaged in task-irrelevant behavior such as chatting or disturbing others (Hijzen et al., 2007). We also explored whether there were any indications in the data as to females having more problems with computers than males, or whether there were any differences in attitudes and interests towards computers and science, or whether females were better at collaboration (see Greenfield, 1997; Harskamp et al., 2008; Whitley, 1997).

## **RESULTS**

Our preliminary data analysis show that there was no difference between the gender groups' prior knowledge under the different conditions,  $H(3) = 3.69, p > .02$ . Under the high-structured classroom-script condition, collaborative pair-work comprised 36% and teacher-led activities 64% of the total sampling time. By contrast, under the low-structured classroom-script condition, pair-work comprised 94% and teacher-led activities 6% of the total sampling time.

### **Single-gender and Mixed-gender Pairs' Help-seeking Processes under Differently Structured Classroom-script Conditions**

Our first research question was: To what extent does a differently structured classroom script (high vs. low) affect single-gender and mixed-gender pairs' help-seeking processes in inquiry-learning?

The Kruskal-Wallis test revealed that the difference between the groups with respect to the amount of help sought was significant,  $H(3) = 8.84, p < .05$  (see Table 1). The Mann-Whitney tests were used to follow up this finding. The difference between the single-gender pairs in the high-structured classroom-script condition and the mixed-gender pairs in the low-structured classroom-script condition was significant,  $U = 70.00, z = -2.58, p < .01, r = -.44$ . There was also a significant difference between the single-gender pairs under the high-structured classroom-script condition and the low-structured classroom-script condition,  $U = 72.00, z = -2.35, p < .05, r = -.41$ . We did not find any significant differences between the single-gender and mixed-gender pairs under similar conditions – thus tending to support the idea that the condition matters more than the gender. Overall, these results do not support our hypothesis that single-gender pairs will seek less help than mixed-gender pairs (Hypothesis 1a). Rather, the results support our hypothesis that irrespective of gender, pairs in a high-structured classroom-script condition will seek help less often than in a low-structured classroom-script condition (Hypothesis 1b).

The Kruskal-Wallis tests revealed a few other significant differences between the groups with regard to the variables in the help-seeking process. There was a significant difference between the groups on the help sought regarding domain knowledge under the two conditions,  $H(3) = 12.92, p < .05$ . The Mann-Whitney test indicated that the difference lay between the single-gender pairs under the high-structured classroom-script condition and the mixed-gender pairs under the low-structured classroom-script condition. This difference was significant,  $U = 54.00, z = -3.33, p < .001, r = -.57$ . There was also a significant difference between the single-gender pairs under the high-structured classroom-script condition and under the low-structured classroom-script condition,  $U = 71.50, z = -2.59, p < .05, r = -.45$ . The difference was also significant between the mixed-gender pairs under the two conditions,  $U = 6.00, z = -2.16, p < .05, r = -.47$ . The Kruskal-Wallis test also showed significant differences between the four groups related to using a computer as a resource for help,  $H(3) = 8.38, p < .05$ . In following up this finding, the Mann-Whitney tests revealed a significant difference between the single-gender pairs under the two conditions ( $U = 79.50, z = -2.61, p < .05, r = -.45$ ), but did not reveal any statistically significant differences between the other pairs. Again, all these results indicate that the condition matters more than the gender, since no significant differences were found between the single-gender and mixed-gender pairs under similar conditions. The differences between the four groups with regard to other variables in the help-seeking process were not statistically significant; hence, only the mean ranks of the help-seeking variables are presented in Table 1.

## **Learning Gains of Single-gender vs. Mixed-gender Pairs under Differently Structured Classroom-script Conditions**

Our second research question was: What are the effects of the gender composition of groups (single-gender vs. mixed-gender pairs) on learning gains in collaborative inquiry-learning environments in the science classroom?

There was no statistically significant difference between the single-gender dyads and the mixed-gender dyads under different classroom-script conditions with regard to learning gains ( $U = 314.00, r = -.08, ns$ ). This result does not support our hypothesis (Hypothesis 2a), according to which we assume that single-gender groups will learn more than mixed-gender

groups. However, the mixed-gender group in the high-structured classroom-script condition scored better than the other three groups (see Figure 2). In interpreting Figure 2 we could expect that there might be a slight tendency towards an interaction effect of gender composition and classroom script. However, because of the small amount of data, no significant difference could be found in this regard. Overall, students under the high-structured classroom-script condition ( $M = 0.60$ ,  $SD = 0.96$ ) showed greater gains than those under the low-structured classroom-script condition ( $M = 0.11$ ,  $SD = 0.89$ ) and this difference was significant,  $U = 219.00$ ,  $z = -2.15$ ,  $p < .05$ ,  $r = -.29$ . This is a finding which can be considered to support Hypothesis 2b. On the basis of these results, it would seem that the classroom-script condition has a greater effect than gender on students' learning gains.

**Table 1. Mean rank of the help-seeking variables of single-gender and mixed-gender pairs under different classroom-script conditions**

|                               | Single-gender pair  |  | Mixed-gender pair  |  |
|-------------------------------|---|--|--|--|
|                               | High-structured classroom script<br>(n = 16)<br>Mean rank | Low-structured classroom script<br>(n = 17)<br>Mean rank | High-structured classroom script<br>(n = 3)<br>Mean rank | Low-structured classroom script<br>(n = 18)<br>Mean rank |
| Amount of help sought*        | 18.72   | 30.44  | 21.50  | 33.53  |
| <i>Content of help sought</i> |   |  |  |  |
| Domain knowledge*             | 14.96   | 25.09  | 10.00  | 31.38  |
| Inquiry knowledge             | 27.67   | 22.32  | 41.50  | 20.84  |
| Technical problems            | 25.13   | 25.71  | 20.25  | 21.81  |
| <i>Type of help sought</i>    |   |  |  |  |
| Executive                     | 24.83   | 25.68  | 27.00  | 21.22  |
| Instrumental                  | 21.50   | 24.29  | 21.50  | 25.88  |
| <i>Resource</i>               |   |  |  |  |
| Fellow-learner                | 23.54   | 22.15  | 29.75  | 25.59  |
| Teacher                       | 25.75   | 24.97  | 25.75  | 21.44  |
| Other student                 | 20.00   | 26.97  | 20.00  | 24.34  |
| Computer (WISE) *             | 16.50   | 28.76  | 26.50  | 24.25  |
| <i>Type of help received</i>  |   |  |  |  |
| Executive                     | 24.45   | 22.77  | 10.50  | 22.77  |
| Instrumental                  | 20.55   | 22.47  | 34.50  | 22.23  |
| <i>Usage of help received</i> |   |  |  |  |
| Help used                     | 24.19   | 22.18  | 29.50  | 18.23  |
| Help not used                 | 18.81   | 20.82  | 13.50  | 24.77  |
| <i>Solution</i>               |   |  |  |  |
| Problem solved                | 22.53   | 34.32  | 22.33  | 26.33  |
| Problem not solved            | 23.25   | 25.68  | 28.00  | 32.92  |

\*significant difference,  $p < .05$

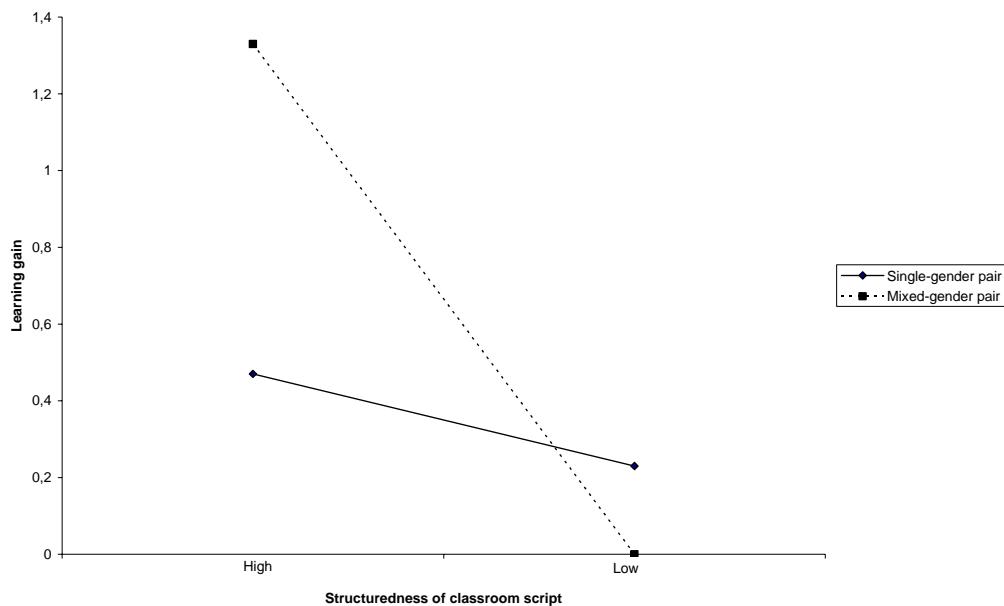


Figure 2. Single-gender and mixed-gender pairs' learning gains under high- and low-structured classroom-script conditions.

### Qualitative Analysis of Successful and Unsuccessful Single-gender and Mixed-gender Pairs

We selected five single-gender pairs and two mixed-gender pairs (the names of the students have been changed) from two conditions, on the basis of who had the best scores (1 or higher scores) and the worst scores (0 or minus scores) in the learning gains. Our aim here was to determine whether there were differences in the ways of working in the collaborative inquiry-learning situation (case-based analysis, Mäkitalo et al., 2005), and especially whether the differently-composed pairs might achieve their success in different ways. The number of pairs, and also the number of events, was so small that it would be inappropriate to use the results as anything other than a pilot study, with an explorative character. The main question was: What are the differences between the successful and unsuccessful single-gender and mixed-gender pairs' ways of collaborating in inquiry-learning situations?

In comparing these selected seven pairs and their ways of working, it was found that the three female-female pairs sought help 3–6 times, the two male-male pairs sought help 1–2 times, and the two mixed-gender pairs 3–4 times during the four 5-minute time samples. There was not very much difference in the amount of help sought between the successful and unsuccessful single-gender and mixed-gender pairs; however, the male pairs under both conditions sought help less often than the other pairs.

In comparing students' ways of working, it seems that unsuccessful pairs worked in a different manner from successful pairs. They selected something easy, ignoring anything that was more complicated (Excerpts 1 and 2), or used copy-paste tactics (Excerpt 2), or else moved to discussing something other than the topic (Excerpt 3). In other words, the behavior

of students who avoided a “hard” work could be characterized as task-irrelevant behavior (Hijzen et al., 2007).

Excerpt 1. Unsuccessful female-female pair in the high-structured classroom-script condition (Dyad C18; starting time 01.11.35)

Elise: What are we going to do next?

Sabine: We work on galaxies, don't we?

Elise: Oh no...[opening the web site of the galaxies]

Sabine: Should we work on something different?

Elise: yes...

Sabine: ...*let's work on something easy* and then we'll take up the time...[she reads aloud] “Thomas notices the stars”

Elise: oh, so beautiful...

Sabine: *Let's just copy it.*

Excerpt 2. Unsuccessful female-female pair in the low-structured classroom-script condition (Dyad B03; starting time 00:25:15)

Maria: Do we have to discuss this?

Kathy: Discuss.

Maria: I see.

Kathy: This one, right? [They select the hypothesis]

Maria: This is... it's all Greek to me...

Kathy: ...*let's sit back, we'll just copy it* and then do something more...

[slightly later]:

Maria: If they ask what we're taking, we'll take the (...) – *this is much easier*

Kathy: Uhuh, so you want...

Excerpt 3. Unsuccessful male-male pair in the high-structured classroom-script condition (Dyad C13; starting time 01.13.30)

Kevin: Why isn't it possible to click on it?

Mike: Sorry?

Kevin: Why isn't it possible to click on it?

Mike: Don't know, right...*a one-week holiday*

Kevin: Soccer ground, soccer ground. *This is great, all day on the beach, only 305 euros for five days...now if you are up to it?*

Mike: *I've no idea, was the food good?*

Excerpt 4. Unsuccessful female-male pair in the low-structured classroom-script condition (Dyad B15; starting time 26.20)

Sarah: Sure...come on write something down

Peter: We think...[Peter writes the notes]

Sarah: *Do we have to write it differently?*

Peter: Uhuh, so write down the thesis, the thesis in the left parenthesis is right, is right... [slightly later]:

Sarah: *Ask somebody why we believe this is right?*

[a few minutes later]:

Peter: I haven't got a plan now, perhaps we should read on or something...

Sarah: *What did he write...look he's doing the second one already... [referring to the student next to them]*

The unsuccessful male-male pair focused more on discussing matters off-topic than on-topic, and neither learner was really interested in working on the topic (Excerpt 3). As Excerpt 4 shows, the female student in the female-male pair was not working very efficiently with the topic, but rather finding other ways – by copying or asking somebody else – to complete what should be done or written. The male student tried to suggest that they should read on or do something to complete the task, but the female student ignored his suggestion (see Excerpt 4). Poor participation in the learning activities was fairly common for all the unsuccessful pairs under both conditions. The male-male pair was less likely than the other pairs to work on the topic. However, the other three pairs did try to perform some of the activities. Despite this, their working methods, which involved, for example, copying the text, probably did nothing to enhance their learning.

By contrast, the help-seeking excerpts below illustrate that the students in the successful gender groups worked differently from the unsuccessful gender groups. There were no indications that they would prefer to copy the text or that they would select the easiest topic to work with, except in the male-male group (see Excerpt 10). Instead of selecting the easiest working methods, they asked “why” questions, and they seemed to attempt to understand and explain the phenomenon to themselves and their fellow-learner. The behavior of students who engaged in the task could be characterized as task-relevant behavior (Hijzen et al., 2007). The single-gender pairs did not ask for any help from the teacher, but the mixed-gender pair asked for the teacher for help on two occasions, in order to clarify instructions regarding what they were expected to do (see Excerpt 5 and 6).

Excerpt 5. Successful female-male pair in the low-structured classroom-script condition

(Dyad D24; starting time 00:27:18)

Janica: There it says “discuss.”

Eric: [reading] “What is your opinion?” ...*Don't we have to write it down?*

Teacher: We are talking about this.

Janica: *Don't we have to write it down somewhere?*

Teacher: Later, you will have different opinions, at the moment you should only talk about it.

In the mixed-gender pair, the male student (Eric) first asked the teacher a clarifying question about the instructions, concerning whether they should write down their response. Then, when the teacher’s help was not adequate, the female student (Janica) repeated the question. In the second help-seeking event (Excerpt 6), the mixed-gender pair not only obtained the answer from the teacher regarding how many texts they should work on, but also important information about how to work with the texts.

Excerpt 6. Successful female-male pair in the low-structured classroom-script condition

(Dyad D24; starting time 00:28:55)

Eric: *Are we only allowed to work on one, or can we work on several texts?*

Teacher: You are allowed to work on several texts, as many as you can manage in this and the next lesson, but it is more important for us that you discuss the stuff in detail and write something down, than just work on every text superficially.

Later, the mixed-gender group, and especially the female student, insisted that they should read the text first and then write about what they know (Excerpt 7). The male student wanted to proceed in a more straightforward way and skip the text, which was already known to them. However, the female student proposed that the text should be read first, since they were already on the text page. She asked for the male student's opinion on this point. In the mixed-gender pair, both learners, regardless of their gender, participated equally in the collaboration. There were no signs that the male student was dominant, either because of the domain or because of the computer. Furthermore, it seemed that collaborative work did not cause a problem for the male student in the mixed-gender pair. He apparently had good collaboration skills, in that, for example, he took his fellow-learner into account by asking for confirmation on his answer (see Excerpt 7).

**Excerpt 7. Successful female-male pair in the low-structured classroom-script condition  
(Dyad D24; starting time 00:43:30)**

Eric: Sense Maker is up next "Searchlights," The "light goes on forever" thesis.

Janica: We have worked with the galaxy, so now you have to establish where it will fit in.

Eric: Yes.

Janica: We haven't worked on this, the galaxy...

Eric: Yes, I have the wrong...

Janica: This goes....oh no...

Eric: *The light goes on forever, right?*

Janica: *Exactly*

...

Janica: *We have to read that first*, then go through things, and if we know something we can put it here.

Eric: Yes, but you know a lot of things already.

Janica: Let's look at the Hubble Telescope, *while we are here* [i.e. at the text page for the Hubble Telescope], *right?*

Whereas the mixed-gender pair refined the instructions from the teacher and discussed how they should proceed, the single-gender pairs talked about the content. They asked themselves "why" questions in order to understand the content, and then asked for confirmations or explanations from their fellow-learner (Excerpt 8, 9 and 11).

**Excerpt 8. Successful female-female pair in the low-structured classroom-script condition  
(Dyad D03; starting time 00:41:33)**

Laura: Inquiry diary, *what does this have to do with the question of how you can recognize the light?* Save the booklet, yes...you can recognize Stefan better, because he is white, Stefan is more visible because of his white clothes. *But why?* What does this have to do with the question how far the light goes? This supports the ...what is the other thesis called? Light dies out and Light goes on forever...

Susan: Light fades because it's getting weaker and...

Laura: So, this dark thing rather supports the second thesis that the light, I would say it has nothing to do with that, we just don't have an explanation for it...

[Slightly later]

Laura: I see, I have no idea, I would say the light is swallowed by the dark color.

Susan: All right.

Laura: [Enters text into the inquiry diary]. The light is swallowed by the dark color of the clothes, the light will be swallowed by the dark clothes, *do you want to add anything?*

Susan: I have no idea.

Laura: I see you're really motivated...

Susan: *I'm not keen on this.*

Excerpt 9. Successful female-female pair in the low-structured classroom-script condition  
(Dyad D03; starting time 00:54:59)

Susan: *Stars are light, aren't they?* And a telescope makes this light source bigger.

Laura: Yes, telescopes enlarge the light of the stars...enlarge the light of the stars. *But what is this? In the Sense Maker? What? Galaxy...*

Susan: Light goes on forever.

Laura: yes...no that isn't right, because it is a strong light source, because the star is an unbelievably strong light source, that's silly, but one thinks...I assumed that as well to begin with... if the star is a strong light source, if it had less light it wouldn't shine this far, the sun is only shining down here because it's a strong light source....

In the female-female pair, Laura seemed to be more active than Susan. Laura clarified their understanding (see Excerpt 8 and 9), and also put a lot of effort into engaging her fellow-learner in the process by asking her opinion and thoughts, although the latter indicated that she was not interested in working (Excerpt 8).

The successful male-male pair performed some learning activities, but not so actively as the other two successful gender pairs. Male students did not seem to be interested in putting too much effort into the learning, and they indicated quite clearly that they had little interest in working on the topic (Excerpt 11). However, they did seek explanations and they seemed to understand and be able to explain the phenomenon (Excerpt 11).

Excerpt 10. Successful male-male pair in the high-structured classroom-script condition  
(Dyad E18; starting time 01:12:07)

Markus: *This is too much text.*

[Slightly later]

Benjamin: Inquiry diary...which one should we pick?

Markus: *Something easy.*

Excerpt 11. Successful male-male pair in the high-structured classroom-script condition  
(Dyad E18; starting time 01:14:04)

Markus: *What does this have to do with the question?*

Benjamin: *...white clothes are better at absorbing light than black clothes...*

Markus: *...I hate this...*

In the successful mixed-gender group, both students seemed to be active in the learning process, so there was no need for the fellow-learner to push the other to participate (see Excerpt 5 and 7). Students in the successful single-gender pairs, and also in the mixed-gender pair, did take into account their fellow-learner's opinion, for example, making sure that they agreed on the answers. In fact, the male-male pair showed quite clearly that they had no interest in working with the topic; nevertheless, there was a brief event in which they discussed the content by providing a correct explanation, indicating that they did engage in working with the task.

The first impression when reading the excerpts of the single-gender and mixed-gender pairs is that there are differences between the gender pairs, whereby the successful single-gender pairs had more discussion about the content, with the successful mixed-gender pair giving more attention to the procedures (for example wondering what should be done). However, we need to look beyond the help-seeking processes and take into account students' ways of working and participating in learning activities. All in all, it seems that the students in the unsuccessful gender groups worked in a fairly similar manner, demonstrating irrelevant task behavior, in contrast to the students in the successful gender groups, whose behavior was more task-relevant; it was merely that the students in the unsuccessful gender pairs put less effort into the learning activities than the students in successful gender pairs. They tended to use shallow working methods, such as selecting the easiest topics, copying the text, or asking somebody else. In contrast, the successful gender pairs engaged in working activities where they asked "why?" questions and provided explanations in their own words, rather than simply copying out the text.

This qualitative analysis gave no indication of any remarkable differences between the gender groups; in fact the differences occurred rather between unsuccessful and successful groups and their ways of working. In the female-male pairs in particular, it seemed that the male students were able to work in pairs as well as the female students. Nor is there any indication of females having more problems than males in the use of the computer, or evidence that females are better at collaborating (Harskamp et al., 2008; Whitley, 1997). In fact, both male and female students showed little interest in working with the topic, and we could not find any evidence that females might be less interested in working with computers or with scientific material than males (see Greenfield, 1997; Scanlon, 2000; Whitley, 1997). However, the short episodes in the 5-minute time samples do not offer very rich data for an analysis of the gender pairs' ways of working, and this might partly explain why differences between the gender groups' ways of working could not be identified. It should be noted once again that our qualitative analysis was mainly exploratory in its nature, and hence that the results should be interpreted with caution.

## CONCLUSION

Web-based inquiry-learning is challenging for learners. Compared with traditional science-learning classrooms, this more student-centered approach is considered to have the potential to promote high-level aspects of knowledge and skill to a far greater degree (see Linn, Lee, Tinker, Husic, and Chiu, 2006). In the study reported here, we investigated the help-seeking of single-gender vs. mixed-gender pairs in differently structured inquiry-

learning environments, and also looked at the learning gains achieved. Taken together, our findings indicate hardly any differences that could be attributed to the gender composition of the pairs. With regard to help-seeking, the results provide evidence of a generally low frequency of appropriate help-seeking behavior in web-based inquiry-learning classrooms. Help was rarely sought by the single-gender or mixed-gender pairs; nor did the pairs differ substantially in the frequency of help-seeking, in the type and content of help sought, or in the help source approached.

The learning gains were generally fairly modest, but the differences that were found between the students could not be adequately explained by whether they had learned with a same-gender or different-gender learning partner. The qualitative analysis revealed differences in the way successful gender pairs worked with the task compared to unsuccessful gender pairs; nevertheless, we could not find any specific indications of gender-related factors that might have caused differences in the way of working – i.e. differences such as females having more problems than males with using computers, or being less interested in working with computers or scientific material, or in terms of females being better at collaborating (see Greenfield, 1997; Harskamp et al., 2008; Scanlon, 2000; Whitley, 1997). Of course, the results of the study have to be interpreted with caution in this regard, given the relatively small sample size and hence the relatively small possibilities for identifying differences. In addition, the qualitative part of the study was set up primarily as a pilot study, so far focusing merely on seven successful and unsuccessful pairs, and on the transcriptions of only brief help-seeking events. Our future aim would thus be to obtain more data, examining collaboration between more pairs.

We observed that the gender pairs generally exhibited low levels of help-seeking behavior under both conditions (high-structure/low-structure). However, it is interesting to note that both the single-gender pairs and the mixed-gender pairs under the high-structured classroom-script condition (where there were higher levels of teacher guidance) sought less help than the gender pairs under the low-structured classroom-script condition – and at the same time, learnt more. This might be explained by a low level of student help-seeking skills and by a reduced need for such skills in the highly structured inquiry-learning environment. In environments with a high level of structure, students are able to focus on understanding; hence they do not have to allocate cognitive resources (Kirschner et al., 2006) to help-seeking processes that are generally ineffective due to a lack of high-level help-seeking skills. However, it might also be that a high level of structure could actually promote students' engagement, and that a low level of structure is linked to increased motivation problems among low-achieving students. In the more student-centered and open classroom script, students hardly sought help from the teacher at all, which would seem to reflect distinct barriers affecting both the teacher and the learners in terms of making use of the teacher's domain expertise. This might be an instance of the "expertise inhibition" referred to in the Introduction.

In order to fully make use of the potential of web-based collaborative inquiry-learning, it would seem necessary to identify and further develop external classroom scripts, i.e. scripts that can more effectively embed web-based inquiry-learning, and which can adjust the support provided at different instructional levels (Tabak, 2004). Such classroom scripts should include a focus on developing help-seeking and help-giving skills, and should also be targeted towards unleashing the teacher's expertise, without returning to expository teaching patterns.

For effective learning, it is not enough merely to bring web-based inquiry-learning into the science classroom, including theory-guided inquiry software plus a set of laptops. Unless the technology is embedded in an appropriate inquiry classroom script, the effects on learning processes and outcomes may well be sub-optimal. At least among learners possessing a lower learning base, classroom scripts should offer a higher degree of structure, with the teacher specifying the inquiry-learning steps at the whole-classroom plenary level.

The literature suggests that the beliefs of the teacher play an important role in technology integration (see Liu, 2011); thus teachers with constructivist pedagogical beliefs are more likely to use technology in their classrooms than teachers with traditional pedagogical beliefs (Ertmer, 2005; Sang, Valcke, van Braak, and Tondeur, 2010). However, the studies also indicate that their teaching activities do not match the principles they adhere to (Harris and Grandgenett, 1999; Zhao and Cziko, 2001). This chapter might partly explain inconsistencies of this type, in so far as it highlights the important role of the internalized classroom script – a script which both teachers and students have learnt at the beginning of their school years and which they bring to the classroom situation. The great challenge for teachers is to actually recognize prevalent classroom scripts, so that they can adapt appropriate classroom scripts when embedding new pedagogical approaches and technological innovations into their lessons. The best way to recognize these existing classroom scripts might be in collaboration with their colleagues in the workplace. Here, novice teachers and more experienced teachers could reflect on and revise their current practices, and – given continuous support – could develop their professional skills, including the incorporation of technology into their teaching (Mekota, Fischer, Kahlert, and Mäkitalo-Siegl, 2010; see also Ermeling, 2010). This kind of collaboration might have a positive effect on the overall school culture and on the ways in which both teachers and students communicate and behave. For example, one could anticipate that close collaboration could encourage teachers and students' help-seeking behavior in a way that will enhance learning.

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## REFERENCES

- Aleven, V., Stahl, E., Schworm, S., Fischer, F., & Wallace, R. (2003). Help seeking and help design in interactive learning environments. *Review of Educational Research*, 73(3), 277-320.
- Arroyo, I., Beck, J. E., Beal, C. R., Wing, R., & Woolf, B. P. (2001). Analyzing students' response to help provision in an elementary mathematics intelligent tutoring system. In R. Luckin (Ed.), *Papers of the AIED-2001 workshop on help provision and help seeking in*

- interactive learning environments.* Retrieved October 6, 2008, from <http://www.herc.ed.ac.uk/aied2001/workshops.html>
- Barron, B. (2003). When smart groups fail. *Journal of the Learning Sciences, 12*(3), 307-359.
- Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behaviour? *Perspectives on Psychological Science, 2*(4), 396-403.
- Bell, P. (2004). Promoting students' argument construction and collaborative debate in the science classroom. In M. C. Linn, E. A. Davis, & P. Bell (Eds.), *Internet environments for science education* (pp. 115-143). Mahwah, NJ: Lawrence Erlbaum.
- Britzman, D. (1991). *Practice makes practice: A critical study of learning to teach*. Albany, NY: State University of New York Press.
- Brophy, J., & Good, T. (1986). Teacher behaviour and student achievement. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 328-375). New York: MacMillan.
- Butler, R. (1998). Determinants of help seeking: Relations between perceived reasons for classroom help-avoidance and help-seeking behaviors in an experimental context. *Journal of Educational Psychology, 90*(4), 630-643.
- Butler, R. (2006). An achievement goal perspective on student help seeking and teacher help giving in the classroom: Theory, research and educational implications. In S. A. Karabenick, & R. S. Newman (Eds.), *Help seeking in academic settings: Goals, groups, and contexts* (pp. 15-44). Mahwah, NJ: Lawrence Erlbaum.
- Butler, R., & Shibaz, L. (2008). Achievement goals for teaching as predictors of students' perceptions of instructional practices and students' help seeking and cheating. *Learning and Instruction, 18*(5), 453-467.
- Cognition and Technology Group at Vanderbilt. (1997). *The Jasper Project: Lessons in curriculum, instruction, assessment, and professional development*. Mahwah, NJ: Lawrence Erlbaum.
- Cress, U. (2008). The need for considering multi-level analysis in CSCL research. An appeal for the use of more advanced statistical methods. *International Journal of Computer-Supported Collaborative Learning, 3*(1), 69-84.
- de Jong, T. (2006). Technological advances in inquiry learning. *Science, 312*(5773), 532-533.
- Ermeling, B. A. (2010). Tracing the effects of teacher inquiry on classroom practice. *Teaching and Teacher Education, 26*(3), 377-388.
- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.
- Greenfield, T. A. (1997). Gender- and grade-level differences in science interest and participation. *Science Education, 81*(3), 259-275.
- Harris, J. B., & Grandgenett, N. (1999). Correlates with use of telecomputing tools: K-12 teacher beliefs and demographics. *Journal of Research on Computing in Education, 31*(4), 327-340.
- Harskamp, E., Ding, N., & Suhre, C. (2008). Group composition and its effect on female and male problem-solving in science education. *Educational Research, 50*(4), 307-318.
- Hijzen, D., Boekaerts, M., & Vedder, P. (2007). Exploring the links between students' engagement in cooperative learning, their goal preferences and appraisals of instructional conditions in the classroom. *Learning and Instruction, 17*(6), 673-687.

- Kalyuga, S. (2009). Knowledge elaboration: A cognitive load perspective. *Learning and Instruction, 19*(5), 402-410.
- Karabenick, S. A., & Knapp, J. R. (1991). Relationship of academic help seeking to the use of learning strategies and other instrumental achievement behavior in college students. *Journal of Educational Psychology, 83*(2), 221-230.
- Karabenick, S. A., & Newman, R. S. (2009). Generalizable self-regulatory process and social-cultural barometer. In M. Wosnitza, S. A. Karabenick, A. Efklides, & P. Nenniger (Eds.), *Contemporary motivation research: From global to local perspectives*. Goettingen, Germany: Hogrefe & Huber.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75-86.
- Kollar, I., Fischer, F., & Slotta, J. D. (2007). Internal and external scripts in computer-supported collaborative inquiry learning. *Learning and Instruction, 17*(6), 708-721.
- Light, P., Littleton, K., Bale, S., Joiner, R., & Messer, D. (2000). Gender and social comparison effects in computer-based problem solving. *Learning and Instruction, 10*(6), 483-496.
- Linn, M. C. (2006). The knowledge integration perspective on learning and instruction. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 243-264). New York: Cambridge University Press.
- Linn, M. C., Lee, H.-S., Tinker, R., Husic, F., & Chiu, J. L. (2006). Teaching and assessing knowledge integration in science. *Science, 313*(5790), 1049-1050.
- Liu, S.-H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education, 56*(4), 1012-1022.
- Martiny, S. E. (2005). *Wissenserwerb und Lernmotivation beim computerunterstützten kooperativen Inquiry-Lernen: Differenzielle Effekte von Kooperationsskripts auf Jungen und auf Mädchen* [Knowledge acquisition and learning motivation in computer-supported collaborative inquiry learning: Different effects of collaboration scripts on boys and girls]. Unpublished master's thesis, University of Tübingen, Germany.
- Mekota, A., Fischer, F., Kahlert, J., & Mäkitalo-Siegl, K. (2010). Kooperation zwischen Generationen. 2AgePro - Generationswechsel an den Schulen. [Cooperation between generations. 2AgePro - generational change in schools]. *Pädagogische Führung - Zeitschrift für Schulleitung und Schulberatung, 6*(21), 221 - 224.
- Mäkitalo, K., Weinberger, A., Häkkinen, P., Järvelä, S., & Fischer, F. (2005). Epistemic cooperation scripts in online learning environments: Fostering learning by reducing uncertainty in discourse? *Computers in Human Behavior, 21*(4), 603-622.
- Mäkitalo-Siegl, K., & Fischer, F. (2011). Stretching the limits in help-seeking research: Theoretical, methodological, and technological advances. *Learning and Instruction, 21*(2), 243-246.
- Mäkitalo-Siegl, K., Kohnle, C., & Fischer, F. (2011). Computer-supported collaborative inquiry learning and classroom scripts: Effects on help-seeking processes and learning outcomes. *Learning and Instruction, 21*(2), 257-266.
- Nelson-Le Gall, S. (1981). Help-seeking: An understudied problem-solving skill in children. *Developmental Review, 1*(3), 224-246.

- Newman, R. S. (1998). Adaptive help seeking: A role of social interaction in self-regulated learning. In S. A. Karabenick (Ed.), *Strategic help seeking: Implications for learning and teaching* (pp. 13-37). Mahwah, NJ: Lawrence Erlbaum.
- Newman, R. S. (2000). Social influences on the development of children's adaptive help seeking: The role of parents, teachers, and peers. *Developmental Review*, 20(3), 350-404.
- Newman, R. S., & Goldin, L. (1990). Children's reluctance to seek help with school-work. *Journal of Educational Psychology*, 82(1), 92-100.
- Nie, Y., & Lau, S. (2010). Differential relations of constructivist and didactic instruction to students' cognition, motivation, and achievement. *Learning and Instruction*, 20(5), 411-423.
- Oortwijn, M. B., Boekaerts, M., Vedder, P., & Strijbos, J.-W. (2008). Helping behaviour during cooperative learning and learning gains: The role of the teacher and of pupils' prior knowledge and ethnic background. *Learning and Instruction*, 18(2), 146-159.
- Puustinen, M. (1998). Help-seeking behaviour in a problem-solving situation: Development of self-regulation. *European Journal of Psychology of Education*, 13(2), 271-282.
- Rajaram, S., & Pereira-Pasarin, L. P. (2010). Collaborative memory: Cognitive research and theory. *Perspectives on Psychological Science*, 5(6), 649-663.
- Ryan, A. M., Gheen, M. H., & Midgley, C. (1998). Why do some students avoid asking for help? An examination of the interplay among students' academic efficacy, teachers' social-emotional role, and the classroom goal structure. *Journal of Educational Psychology*, 90(3), 528-535.
- Ryan, A. M., Pintrich, P. R., & Midgley, C. (2001). Avoiding seeking help in the classroom: Who and why? *Educational Psychology Review*, 13(2), 93-114.
- Ryan, A. M., & Shim, S. (2006). Social achievement goals: The nature and consequences of different orientations towards social competence. *Personality and Social Psychology Bulletin*, 32(9), 1246-1263.
- Ryan, A. M., & Shin, H. (2011). Help-seeking tendencies during early adolescence: An examination of motivational correlates and consequences for achievement. *Learning and Instruction*, 21(2), 247-256.
- Sang, G., Valcke, M., van Braak, J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education*, 54(1), 103-112.
- Savelsbergh, E., van Joolingen, E., Sins, P., de Jong, T., & Lazonder, A. (2004, April). *Co-Lab, design considerations for a collaborative discovery learning environment*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (NARST), Vancouver, Canada.
- Scanlon, E. (2000). How gender influences learners working collaboratively with science simulations. *Learning and Instruction*, 10(6), 463-481.
- Schank, R. C., & Abelson, R. P. (1977). *Scripts, plans, goals and understanding*. Hillsdale, NJ: Lawrence Erlbaum.
- Schratzentraller, A. (2010). The classroom of the past. In K. Mäkitalo-Siegl, J. Zottmann, F. Kaplan, & F. Fischer (Eds.), *Classroom of the future: Orchestrating collaborative spaces* (pp. 15-39). Rotterdam, the Netherlands: Sense Publisher.
- Seidel, T., Rimmele, R., & Prenzel M. (2005). Clarity and coherence of lesson goals as a scaffold for student learning. *Learning and Instruction*, 15(6), 539-556.

- Slotta, J. D., & Linn, M. C. (2000). How do students make sense of internet resources in the science classroom? In M. J. Jacobson, & R. Kozma (Eds.), *Learning the sciences of the 21st century* (pp. 193-226). Mahwah: NJ: Lawrence Erlbaum.
- Slotta, J. D., & Linn, M. C. (2009). *WISE science: Web-based inquiry in the classroom*. New York: Teachers College Press.
- Tabak, I. (2004). Synergy: A complement to emerging patterns of distributed scaffolding. *Journal of the Learning Sciences, 13*(3), 305-335.
- Underwood, J., Underwood, G., & Wood, D. (2000). When does gender matter? Interactions during computer-based problem solving. *Learning and Instruction, 10*(5), 447-462.
- vanJoolingen, W. R., de Jong T., Lazonder, A. W., Savelsbergh, E. R., & Manlove, S. (2005). Co-Lab: Research and development of an online learning environment for collaborative scientific discovery learning. *Computers in Human Behavior, 21*(4), 671-688.
- vanJoolingen, W. R., & Zacharia, Z. C. (2009). Developments in inquiry learning. In N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, & S. Barnes (Eds.), *Technology-enhanced learning: Principles and products* (pp. 21-37). Dordrecht, the Netherlands: Springer.
- Webb, N. M., Ing, M., Kersting N., & Nemer, K. M. (2006). Help seeking in cooperative learning groups. In S. A. Karabenick, & R. S. Newman (Eds.), *Help seeking in academic settings: Goals, groups, and contexts* (pp. 45-88). Mahwah, NJ: Lawrence Erlbaum.
- Webb, N. M., & Mastergeorge, A. (2003). Promoting effective helping behaviour in peer-directed groups. *International Journal of Educational Research, 39*(1-2), 73-97.
- Webb, N. M., & Palincsar, A. S. (1996). Group processes in the classroom. In D. Berliner, & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 841-873). New York: MacMillan.
- Whitley, B. E. Jr. (1997). Gender differences in computer-related attitudes and behaviour: A meta-analysis. *Computers in Human Behavior, 13*(1), 1-22.
- Zhao, Y., & Cziko, G. A. (2001). Teacher adoption of technology: A perceptual control theory perspective. *Journal of Technology and Teacher Education, 9*(1), 5-30.

### **Chapter 3**

# **FRAMING STUDENT ENGAGEMENT THROUGH PERCEPTIONS OF JUSTICE: THE ROLE OF TRUST IN AUTHORITIES IN EDUCATIONAL CONTEXTS**

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## **ABSTRACT**

Social psychology research provides evidence that people's engagement in groups is related more to their perception of authorities than to economic assurances (De Cremer & Tyler, 2007; Tyler & Degoey, 1995). In educational contexts, Berti, Molinari, and Speltini (2010) have shown that a sense of justice impacts engagement as well as students' identification, motivation, and dialogue in class. Furthermore, survey and laboratory studies show that students who identify more closely with their university report more engagement when university authorities treat them fairly (Berti, Di Battista, & Pivetti, 2010; Smith, Olson, Agronick, & Tyler, 2009; Tyler, Boeckmann, Smith, & Huo, 1997). Among the antecedents of student engagement, teachers' support is considered essential in elementary, middle, and high school (Marks, 2000) in promoting student participation and on-task behavior (Battistich, Solomon, Watson, & Schaps, 1997) and reducing the probability of dropping out of school (Croninger & Lee, 2001). Moreover, a great deal of empirical evidence has shown the significant role of trust in authorities in building effective, productive and well-managed schools (Bryk & Schneider, 1996). Trust in authorities predicts positive school climate, productive communication, willingness to go beyond in-role behaviors, and student achievement (Tschannen-Moran & Hoy, 2000). Definitions of trust are broad, but recent studies (Colquitt, Scott, & LePine, 2007) suggest the value of distinguishing among types of trust, such as competence and benevolence. *Competence-based trust* captures the knowledge and skills needed to perform a specific job. *Benevolence-based trust*, by contrast, involves authorities' fairness, caring motives, and intentions. Empirical evidence (Hoy & Tschannen-Moran, 1999) has shown that all of these and other facets of trust are important aspects of intra-school relations, but their relative effect on engagement

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depends on the nature of the relationships. Trust may be based on perceptions of schools' economic motives, on institutional support conducive to building trust, on students' sense of identification and on other factors (Tschannen-Moran & Hoy, 2000). For instance, *unconditional* or *identification-based trust* emerges in an environment where parties have complete confidence and empathy, as well as common desires and intentions (Lewicki & Bunker, 1996). In summary, this chapter reviews research about engagement and trust in authorities in order to suggest potential determinants of a more inclusive and empowering educational system.

## INTRODUCTION

Much of our day-to-day life is spent within social institutions, such as schools, courtrooms, work organizations and town or municipal meeting halls. Group membership and interaction within groups are central to the lives of many citizens. In order to achieve the best functioning of groups, some amount of interpersonal affiliation and cooperation is required. However, personal and collective interests are complexly woven, and it is not always easy to reach a compromise between self and social goals. Engagement benefits groups by enhancing the coordination of people's actions and goals. It reduces friction, improves group performance, and increases efficiency (Tyler & Blader, 2000). Engagement is a kind of cooperation in which people involve themselves, in terms of time, effort, and resources, and in return, they hope to obtain various benefits, both economic and socio-emotional. The construct of engagement is defined as "active involvement, commitment, and concentrated attention, in contrast to superficial participation, apathy or lack of interest" (Newman, Wehlage, & Lamborn, 1992, p.11).

Psychological engagement, described by Tyler and Blader (2000; 2003), is a summary concept that involves either mandatory or discretionary cooperation, including the amount of personal investment in making an extra effort. They define engagement as a *value-added behavior*, falling along a continuum from mandatory cooperation (i.e. obedience and limitation of a group's harms) to altruistic cooperation (i.e. promoting group's objectives and viability). The authors confirm that groups function better when their members engage cooperatively.

Successful cooperation depends heavily on the motivation of those involved. Formal organizations and groups in general benefit by their members' engagement and this benefit is maximized when engagement is based, to some extent, on intrinsic, rather than only extrinsic, motivation. External or instrumental or self-interested motivations concern the human desire to maximize gain and minimize loss in social exchanges. A reward-driven incentive system is indeed necessary because it encourages desired behaviors; on the other hand, a punishment-driven sanctioning system discourages undesired behaviors. The internal motivations are personal reasons to adhere with and to follow a legitimate group's rules, goals, values or attitudes. A reward-driven incentive system or a punishment-driven incentive system is more expensive and dependent on having total control and on the ability to use resources to monitor actions. Maintaining control through the distribution of resources and through the use or threat of force is not always possible and effective, especially in periods of scarcity of resources or in complex organizations, which, in many instances, call for individual autonomy, flexibility, and responsibility. Nevertheless, instrumental motivations are weak in increasing cooperation and engagement compared with internal motivations. In other words,

people do not need to receive incentives or to face a risk of sanctions, because in engagement, the personal reward is identity-based. Internal motivations are influenced by status judgments such as people's sense of pride, respect and identification that are communicated by other members of the group and by authorities. Group authorities in particular play a fundamental role in fostering members' sense of justice, respect and identification in intra-group conditions. Authorities' treatment communicates members' inclusion and importance within the group. Numerous studies (De Cremer & Tyler, 2007; Tyler & Degoey, 1995; Tyler & Lind, 1992) provide evidence that people's engagement in groups is related more to their perception of authorities' treatment than to economic assurances. Authorities' treatment, based on trustworthiness, dignity and respect, neutrality and consistency of action, communicates to members their own value in the group (Tyler & Lind, 1992). Authorities' fair treatment elevates members' sense of justice, and sense of authorities' legitimacy; that, in turn, increases engagement and support for authorities, even in the face of unfavorable results. As we know, the value of a sense of justice and engagement with respect to the efficacy of groups in work organizations has been abundantly studied (for a review see: Haslam, van Knippenberg, Platow, & Ellemers, 2001; Greenberg & Cropanzano, 2001). The same notable attention has not been given to educational settings (Sabbagh, Resh, Mor, & Vanhuysse, 2006), despite the important role of a sense of justice and engagement within all social settings. Educational settings are contexts in which justice norms, distribution rules, and interpersonal elements characterize everyday life. Schools and universities need to foster a sense of justice and, in particular, one of trust in their management in order to motivate students' willingness to go beyond the minimum requirements of learning and obedience. Trust is one of the most important elements of a good sense of justice in authorities (Tyler & Lind, 1992). Although trust appears to be difficult to achieve and maintain, it plays a pivotal role in educational improvement (Tschanne-Moran & Hoy, 2000). Students who do not trust their teachers or professors may disengage from learning tasks and can become alienated from school activities in general. Students who feel unsafe devote additional energy to self-protection and less to learning or engagement, and may even exhibit aggression toward authorities and peers (Tschanne-Moran & Hoy, 2000). Sabbagh and colleagues (2006) highlight how an elevated sense of justice and fair treatment by authorities in schools or universities can increase students' motivation, satisfaction and engagement. By contrast, a sense of educational injustice may lead to increases in students' anger, asocial behaviors, and alienation, or even spark protests (Chory-Assad & Paulsel, 2004a; 2004b). Surveys and laboratory experiments in the educational field confirm that students report more engagement when university authorities treat them fairly (Tyler & Blader, 2000; Tyler, Boeckmann, Smith, & Huo, 1997; Tyler & Lind, 1992). Furthermore, a great deal of empirical evidence has shown trust in authorities predicts positive school climate, productive communication, willingness to go beyond in-role behaviors, and student achievement (Tschanne-Moran & Hoy, 2000). Thus, the role of trust in educational authorities appears vital for predicting student engagement.

In summary, this chapter reviews contemporary research about engagement and trust in authorities in order to suggest potential determinants of a more inclusive and empowering educational system. Social justice research offers the theoretical basis for a rethinking of what teachers or professors can do in class. Specifically, the focus of the work is to observe, among the antecedents of student engagement, the significant role of students' trust in educational authorities who build effective, productive and well-managed schools and universities, and

thereby promote student participation. Our aim is not to review the entirety of extant literature on student engagement and trust, but to suggest how trust in authorities and students' identification can relate to engagement. We intend to highlight the importance of engagement in elevating students' motivation, achievement, and participation.

In the first section, we intend to present models of social justice that explain the role of a sense of justice within groups, such as organizations and institutions, mainly focusing on the fairness of treatment by authorities.

In the second section, we intend to present a definition of student engagement in terms of how it is observed inside schools and universities. The third part constitutes a revision of the concept of trust in authorities and trust in school authorities, as a factor that can increase students' level of engagement. We present a definition of the concept of trust in authorities as exposed in literature, and his distinction in facets. However, we highlight how trust may not be sufficient to elicit engagement without consideration of the role of identification. Identification transforms students' interests from the personal to the group level. A condition of identification-based trust may offer the best prospects in an educational context.

The final section offers useful insights into how the management of schools and universities might relate to the potential for improvement in student performance and well-being, and a corresponding reduction in student alienation and failure.

## 1. SOCIAL JUSTICE RESEARCH ON ENGAGEMENT

### 1.1. Models of Psychology of Justice on Engagement

Justice is a theme in our daily life and intuitively related to ethical standards that describe how we should treat others (Folger & Cropanzano, 1998). One specific example of justice involves the question of whether groups use fair procedures in making decisions and allocating outcomes: that is procedural fairness (Leventhal, 1980; Thibaut & Walker, 1975). In terms of interpersonal justice, people infer a sense of justice from the interpersonal treatment that they receive from the group and from the group authorities (Tyler & Lind, 1992).

In social psychology, the procedural and interpersonal senses of justice have become central to the study of motivations involving both immediate and long-term engagement within groups, organizations, institutions, legal and educational settings, and societies (Lind & Tyler, 1988; Tyler & Blader, 2000; 2003). A sense of justice or fairness leads to many desirable social attitudes, behaviors and feelings. The likelihood that people will interact in a positive and productive way with their fellow group members and authorities is shaped by their sense of procedural and interpersonal fairness. A series of models have already proposed the importance of non-instrumental value of concerns psychology of social justice. For instance, the *group value model* (Lind & Tyler, 1988) is focused on procedural fairness as a signal of a symbolic message that one is a valued member of the group and that, as such, one can use the group as a reference point to define him/herself. The *relational model of authority* (Tyler & Lind, 1992) focuses on the psychological factors shaping reactions to fair treatment by group authorities, and supports the idea that treatment by authorities is a key to people's

connection to the group and to group authorities. The way authorities behave is more important than their capacity to distribute rewards and punishments and manage resources. Authorities' behaviors tell people about their own value as members of the group, on the basis of three main elements: 1) trustworthiness and benevolence of authorities' actions and intentions (benevolence); 2) dignity and authorities' respect for all members (status recognition); 3) neutrality and consistency of an authority's action (neutrality). A fair treatment communicates to members the message that they are important and included within the group, but the same information should not be very important if one does not care about the group. Tyler and his colleagues' studies (2000; 2003; 2009) define the *group engagement model*, which predicts that people's willingness to cooperate - especially in a discretionary manner - flows from the identity information they receive from the group. In their conceptualization, identity information is hypothesized to emanate not only from material rewards, but mainly from evaluations of procedural and interpersonal fairness. Procedures would have the potential to motivate people toward psychological and behavioral engagement because they are a key factor to which people look in social self-definition. Social identity is considered to be a primary factor in the impact of procedural evaluations on attitudes, values, and behaviors. The "*social identity mediation hypothesis*," applied to the factors of the group engagement model, refers to the prediction that identity evaluations mediate the relationship between fairness and engagement. Social identity assurance is stronger in favoring a "group-mode" behavior, compared to an "individual-mode" behavior (Lind, 2001). Reviewing procedural fairness models, De Cremer and Tyler (2005) conclude that authorities' procedures and treatments undertaken within the group have an influence on the social self. They integrate psychological models of justice into a unifying framework answering two questions: How does fairness guide people's behaviors such as engagement? How are these behaviors maintained over time? Engagement seems reinforced where members have positive expectations within the group (trust) and where the interests of the group are viewed as one's own interests (identification). The goal of achieving engagement is not sufficient to achieving cooperation, because the expectation that other people will cooperate is also necessary. Thus, having a sense of identification, having a goal of mutual cooperation and expecting others to cooperate are functional conditions to reducing free-riding and to eliciting engagement (De Cremer & Tyler, 2005; De Cremer & Stouten, 2003; Pruitt & Kimmel, 1977). This corpus of research is mainly performed in work organizations. Surveys and laboratory experiments in the educational field show that students who are more closely identified with their university report more engagement when university authorities treat them fairly as well (Tyler & Blader, 2000; Tyler, Boeckmann, Smith, & Huo, 1997; Tyler & Lind, 1992).

In a study within the American university context (Smith, Tyler, Huo, Ortiz, & Lind, 1998), treatment by authorities was related to discretionary behavior for closely identified students. How fairly students felt the university staff treated them was related to feelings of respect and, in turn, to cooperation, for highly identified students. That is, identification played a moderating role. Moreover, a recent study (Smith, Olson, Agronick, & Tyler, 2009), with outcome favorability, quality of authorities' treatment, and students' affiliation as variables, has revealed similar results: better authorities treatment is linked with a students' better reaction. Moreover, student identification with the university predicts positive academic engagement, intention to stay and a greater feeling of respect. These results confirm the hypothesis of the relational model of authorities (Tyler & Lind, 1992) that an authority communicates information about members' value in the group and influences their

engagement. Thus, the fairness of treatment by authorities has a variable impact on engagement depending on the students' level of identification.

## 1.2. Classroom Justice

Universities and schools are the first places where children are confronted with and where students are engaged in making sense of research concerning justice (Berti et al., 2010). In schools, students are attentive to the legitimacy of authority and to authorities' treatment (Thorkilsden, 1989). The more legitimate they consider authorities to be, the less likely they are to engage in rule-breaking behaviors (Emler & Reicher, 2005). In educational contexts, Berti, Molinari, and Speltini (2010) have shown that a sense of justice impacts engagement as well as students' identification, motivation, and dialogue in class. Moreover, in a study conducted in Italy on classroom justice (Gouveia-Pereira, Vala, Palmonari, & Rubini, 2003), high school students' perceptions of teachers' interactional justice had a significant effect on school processes such as the development of positive attitudes towards school authorities.

Chory-Assad and her collaborators (Chory-Assad 2002; Chory-Assad and Paulsel 2004a,b; Chory, 2007) give a first definition of *classroom justice*. Following from Cropanzano and Greenberg's (1997) definition of organizational justice, they define *classroom justice* as "perceptions of fairness regarding outcomes or processes that occur in the instructional context" (Chory-Assad & Paulsel, 2004a, p. 254). Thus, classroom justice is referred to as a sense of justice concerning procedures and distribution rules in educational settings, those related to students' learning motivation, respect and obedience, and trust of teachers. The authors give particular consideration to the application of the three well-known components of justice within the educational field. *Distributive classroom justice* is described as students' perceptions of fairness with regard to the principles of equality, equity, and need. For example, the distribution of grades could be perceived as fair or unfair by students, compared to those of their peers or to what they expected. The criteria of differentiation among students' evaluations could be based on students' efforts, merits, or family backgrounds and these criteria may be different in schools with specific orientations of values and aims, such as individual and competitive values, or communitarian and supportive ones. *Procedural classroom justice* refers to students' perceptions of fairness regarding the criteria and processes used by their teachers or school authorities, for instance the opportunity to have a voice in the assignment of grades and evaluation of students. Finally, *interactional classroom justice* refers to students' perceptions of fairness in the interpersonal treatment received by school authorities in terms of respect and dignity (Berti et al., 2010; Sabbagh et al., 2004).

In her studies of school settings, Chory-Assad (2007) clearly defines the role of teachers as authorities in the educational field, who may be more or less credible in students' perceptions. Chory-Assad shows that credibility enhances the sense of justice. She defines teachers' credibility as composed of three main factors: competence, character, and caring. Competence refers to perceived expertise and knowledge in the subjects that he/she is teaching. Character refers to perceived trustworthiness and benevolence. Finally, caring refers to perceived attention to and interest in students' needs and welfare. Chory-Assad clarifies that competence is related to the sense of interactional justice; caring is related to the sense of

procedural and interactional justice; and character is related to every component of justice, making it the most consistent predictor of classroom justice. Thus, the study of perceived trustworthiness is the primary goal of the study of classroom justice.

## 2. STUDENT ENGAGEMENT

Engagement appears in the literature in a series of constructs, definitions, and measures. In the educational context, students' engagement is the tendency to be involved in academic activities and in school activities. Finn and Rock (1997) articulated a general definition of engagement as "participation in the social, extracurricular, and athletic aspects of school life in addition to or in place of extensive participation in academic work" (p. 222).

Our aim is not to revisit this literature in detail, but to provide a general definition of the concept and some of its antecedents and consequences.

There is evidence in the research literature of the association between engagement and positive academic outcomes (Fredericks, Blumenfeld, & Paris, 2004). Engagement has also been described as an antidote to dropping out, students' disaffection and boredom (Thijs & Verkuyten, 2009). Studies demonstrate a strong relationship between engagement and performance (e.g. standardized tests, grades) in elementary, middle, and high school (Connel, Spencer, & Aber, 1994). Newmann (1981; 1986; 1992) explains that even students who have the necessary academic abilities and skills may become disaffected with school. Thus, educators cannot assume that students with a satisfactory level of academic success are also engaged. Newmann suggests that what is needed to engage students is not necessarily learning that is fun, but learning activities in which students may be both involved and interested. Achievement outcomes are also found when students do more work than is required, or participate in classroom discussions (Finchman, 1989). Engaged students demonstrate more effort, feel more positive emotions, and show more interest in their classrooms compared with their less engaged peers (Fredricks, Blumenfeld, & Paris, 2004; Reeve, Jang, Carrell, Jeon, & Barch, 2004). Thus, engagement increases the incidence of positive outcomes and it is also expected that positive outcomes increase engagement. According to these views, as schools become more effective, students are more engaged and academic performance is hence improved. Therefore, greater student engagement is a sign of effective school improvement (Zyngier, 2008).

Finn (1989) presented a model of student engagement with two central components (*participation* and *identification*) that influence one another. Participation, the behavioral component, includes behaviors such as the student's acquiescence to school and class rules, arriving in class on time, attending to the teacher, and responding to teacher's directions and questions. Other levels of participation include initiative-taking on the part of the student, and participation in the social, extracurricular, athletic and governance aspects of school life. Identification, the affective component, refers to students' feelings of belonging in the school setting and valuing the opportunities that school can provide, such as access to post-graduation education and employment. Students' participation is linked to the development of a sense of belonging, which, in turn, promotes positive outcomes such as student engagement.

A more specific and articulated definition of engagement approaches it as a multi-dimensional construct, encompassing behavioral, affective, and cognitive dimensions

(Appleton, Christenson, Kim, & Reschly, 2006; Finn, 1989; Fredricks, Blumenfeld, & Paris, 2004). The observable aspects of engagement are often referred to as behavioral engagement, while other aspects of engagement, such as interest in school, perceptions of academic efficacy, or intrinsic motivation, are more psychological (Appleton et al., 2006; Finn, 1989).

*Behavioral engagement* includes participation and respect for rules, as well as involvement in academic, social, and extracurricular activities. It entails three kind of student conduct: 1) positive conduct with respect for norms and rules and avoidance of disruptive behaviors; 2) involvement in learning tasks with effort, persistence, concentration, attention, asking questions and contributing to classroom discussion; 3) participation in extra-curricular activities such as school governance. Behavioral engagement can be also viewed as a continuum varying from simply adhering to rules to participation in classroom activities or even to involvement in extra-curricular activities (Fredricks, Blumenfeld, & Paris, 2004).

*Affective and emotional engagement* encompasses the spectrum of positive and negative reactions that influence student interest in and feelings toward the educational context, such as a sense of belonging. It reflects students' active involvement and investment in school, and their attitudes toward academic content, teachers, and friends. It also describes feelings and reactions to school and authorities in the classroom, such as liking or disliking school, teachers or work, as well as student interest, anxiety, boredom, and happiness. Sometimes, emotional engagement is defined as *identification* (Finn, 1989), indicative of a sense of belonging to the school or the university and value that a student has about school-related outcomes. Four components of value can be described (Eccles, 1983; Fredricks, Blumenfeld, & Paris, 2004): 1) interest in school activities; 2) attainment value involving the self-schema; 3) sense of utility of the task for the future; 4) negative cost of engaging

Finally, cognitive aspects of engagement involve the idea of investment, comprising students' motivation, effort and strategy, and beliefs relating to academic capability. *Cognitive engagement* describes investment in learning, understanding and mastering knowledge, as well as the desire to go beyond the basic requirements. It includes being strategic and self-regulating in undertaking tasks, being flexible, demonstrating a preference for hard work, and showing the ability to cope and respond constructively in the face of failure (Fredricks, Blumenfeld, & Paris, 2004).

Engagement is a concept that can range in intensity and duration. For example, behavioral engagement can vary from doing homework and respecting rules to participating in student assemblies. Emotional engagement can vary from simple liking to identification with the institution. Finally, cognitive engagement can range from memorization of information to a deep understanding and use of learning strategies. Research on behavioral engagement links it to student conduct and on task behavior (Karweit, 1989; Peterson, Swing, Stark, & Wass, 1989), while emotional engagement seems to be an antecedent of student attitudes, interests, and values (Yamamoto, Thomas, & Karns, 1969), and cognitive engagement appears to be related to motivational goals and self-regulated learning (Zimmerman, 1990; Fredricks, Blumenfeld, & Paris, 2004).

Researchers consider it important to distinguish engagement at the *situational* level from engagement at the *personal* level (Krapp, Hidi, & Renninger, 1992). According to the *self-system model of motivation* applied in the classroom setting (Connell & Wellborn, 1991; Skinner & Belmont, 1993), engagement is dependent on the extent to which an individual's psychological needs are met. The model assumes that people need to feel competent, securely related to their social setting, and autonomous in the activities they accept. Social settings

play a crucial role in satisfying these needs, and instructors are important agents in a student's educational environment. It is notable that engagement is strongly dependent on the context and varies with it. Engagement is the result of an interaction between students and their educational environment. Family, peer, culture and educational context can be factors that impact engagement in a positive or negative manner. We primarily focus on the role of school authorities' treatment and support.

Studies have found significant relationships between the dimensions of teacher behavior and students' academic engagement (Furrer & Skinner, 2003). Teacher involvement or teacher support behavior involves affection and assistance with respect to the academic and interpersonal needs of students. This kind of support involves not only an effort to maintain students' attention, interest, and enthusiasm, but also the fostering of students' involvement and initiative. In this way, teachers appear to be facilitators in the construction of knowledge. They show an interest in what students have to say, and adapt teaching to individual needs, socio-cultural backgrounds, and lived experiences. A high level of teacher support is also assumed to promote students' sense of relatedness to their social environment, with the aim of achieving the best possible relationships between students and authorities, peers, and the institution itself (Furrer & Skinner, 2003). Support for students' autonomy is a fundamental element of support as well. It consists of independent decision-making, choice, and the absence of high external control such as could be imposed through a system of rewards or punishments. Another relevant dimension of skillful teaching refers to the clarity of teacher expectations for academic and social behavior and the consequences of falling short of these expectations. It involves clear demands and expectations with respect to student performance, as well as formal and informal rules. The elaboration of clear expectations is thought to increase students' feelings of competence and all facets of engagement (Fredricks et al., 2004).

Empirical research confirms that teacher support can elevate student engagement (Connell, Spencer, & Aber, 1994; Connell & Wellborn, 1991), and laboratory experiments have demonstrated that high external control can diminish interest, a preference for challenging work, and persistence, all of which are aspects of engagement (Fredricks et al., 2004).

Newmann (1992) theorized that, in an educational setting, engagement is higher when the task is authentic; provides opportunities for collaboration; gives students a role in conceiving, completing and evaluating their contributions; permits the expression of competence and talent; and conveys the message that learning can be fun and meaningful. Finally, Leary (1957) suggested that teachers' interpersonal styles have to consist of two orthogonal dimensions: *control* (i.e., power, dominance, and structure) and *affiliation* (i.e., warmth, friendliness, and involvement). Furthermore, Skinner and Belmont (1993) have shown that teacher involvement positively correlates with student engagement, but also that higher levels of student engagement elicit higher levels of teacher involvement. These approaches posit student engagement as "something students *do* and that teachers can *organize for them*" (Zyngier, 2008).

Research in the field (Furrer & Skinner, 2003; Osterman, 2000) indeed supports the notion that students will be more engaged in a supportive and caring classroom context and when authorities meet each individual's need to learn and to be valued as well as each individual's needs involving inclusion, acceptance and respect.

In the following section, we introduce the concept of trust and its role in engagement.

### 3. TRUST AS A PREDICTOR OF ENGAGEMENT

In recent years, life for many has grown in complexity amid changing expectations. Economic reality has increasingly dictated a highly skilled, resourceful, and efficient workforce that must be able to solve complex problems, and work in groups. That is, our complex and interdependent society has been witness to increased competition and the need for frequent and adaptive changes. In addition to seeking more predictable outcomes collectively, we have, at the individual level, increasingly demanded equality of opportunity and expected that outcomes will be available to people coming from a variety of social strata. In such a climate, trust can help schools, like other institutions and organizations, to be more effective, cooperative, cohesive, and well-managed because this construct plays an important role in reducing uncertainty and heightening confidence in authorities' competence and good intentions (Baier, 1986). Baier described trust as reliance on other's competence and good intentions regarding the things we care about most. What we care about can be tangible (e.g. money), or intangible (e.g. respect).

Trust has emerged as a subject of study in sociology (Coleman, 1990), economics (Fukuyama, 1995), and organizational science (Kramer & Tyler, 1996; Rousseau, Sitkin, Ronald, & Camere, 1998). It is recognized as an important element in the functioning of groups and organizations, and as promoting effective cooperation and communication and productive relationships (Kramer & Tyler, 1996). Researchers have shown that trust correlates with high levels of work performance and commitment, a sense of justice (in particular interactional justice), and employee satisfaction (Haslam, Van Knippengberg, Platow, & Ellemers, 2001). Trust is recognized also as a vital element in educational contexts (Tschannen-Moran & Hoy, 2000).

The cost of distrust could be high, because in the absence of trust, people demand greater protection and control, and insist on costly sanctioning mechanisms (Tyler & Kramer, 1996). Rousseau, Sitkin, Ronald and Camere (1998) define trust as a psychological condition based on a positive and confident expectation of another person's intentions, and on the willingness to be vulnerable. Trust is neither a behavior (e.g. cooperation) nor a choice (e.g. choice to take a risk), but is a psychological state that could be the cause or consequence of a behavior or a choice. The objects of trust would be other members of a group, authorities such as professors, leaders, supervisors, and also institutions and organizations. Rousseau and collaborators (1998) highlighted that there are two essential conditions underlying the realization of trust: a condition of *risk*, and an *interdependent* condition. Risk creates an opportunity for trust, because trust is not necessary if one has complete knowledge of another's intentions. Furthermore, higher levels of risk entail a greater need for trust and a larger impact on behaviors and attitudes. On the other hand, social certainty and higher identification decrease the need for trust, and its impact on cooperation is diminished. Trust also involves interdependence among members of a group because the goals of an individual often cannot be reached without the support of other group members.

Furthermore, Colquitt, Scott, and LePine (2007) say trust is based on a cognitive process that discriminates between people and groups that are trustworthy, distrusted, or unknown. The authors distinguish trustworthiness (the perception of ability, benevolence, and integrity in a trustee), from trust (the willingness to accept vulnerability based on positive expectations of a trustee's actions). Trustworthiness is the antecedent of trust, and is composed of two

elements: the ability and character of a trustee. Competence or ability captures the knowledge and skills needed to do a specific job. Character is a multi-faceted construct that comprises honesty, fairness, openness, caring motives and intentions, and preventability. The authors separate character into two other components. The first component is benevolence (loyalty, openness, caring, and supportiveness), defined as the extent to which a trustee is believed to want to do good, distinct from any profit motives. The second component is integrity (fairness, justice, consistency, and promise fulfillment), defined as the extent to which a trustee is believed to adhere to moral and ethical principles. Ability can be described as the “can-do” component of trustworthiness by describing whether one has the skills and abilities to act appropriately. Character is the “will-do” component of trustworthiness that describes whether one will choose to use those skills and abilities to act in the best interests of others. Mayer and Davis (1995) also define trust as composed of three facets. The first facet comprises the ability, competence, and perceived expertise that enable a party to have influence within some specific domain. Benevolence, loyalty, openness, caring, receptivity, and availability are the second facet of trust, defined as the extent to which the trustee is believed to want to do good on behalf of the trustor, aside from a profit motive. Integrity, fairness, consistency, promise fulfillment, reliability, value congruence, and discreetness are, finally, the characteristics of the third facet, involving the perception that the trustee adheres to a set of principles that the trustor accepts.

It is important to observe that trust is not a static element but one that could change over time and in different social contexts. It can increase or decrease in magnitude and strength within a relationship (Kramer & Tyler, 1996). At early stages of a relationship, trust is at a calculus-based level (*calculus-based trust - CBT*). In other words, an individual will carefully calculate how the other party is likely to behave in a given situation depending on the rewards for being trustworthy and the deterrents against untrustworthy behavior. As the parties come to a deeper understanding of each other through repeated interactions, they may become aware of shared values and goals. This allows trust to grow to a higher and qualitatively different level. When trust evolves to the highest level, it is said to function as *identification-based trust (IBT)*. At this stage, trust has been built to the point that the parties have internalized each other's desires and intentions. Identification-based trust becomes more important for people who identify highly with a group compared with less highly identified people (Kramer & Tyler, 1996).

Tschannen-Moran and collaborators (2000) demonstrate that trust can be vital not only in work organizations, but also for well-managed schools. Their review confirms that all facets of trust are important in the functioning of schools. *Willingness to risk vulnerability* is a particularly fundamental part of trust in hierarchical relationships such as those found in a school environment. Trust is a condition of risk in interdependence wherein the interests of one individual cannot be realized without reliance upon others. For example, students cannot avoid depending on the work of their teachers even if they are not sure about their competencies and intentions. Students have to maintain a certain degree of trust to achieve their goal of adequate instruction. *Confidence* is another element of trust. It is the degree to which people can stay in an uncertain condition, for a given period of time, waiting to see if their expectations will or will not be fulfilled. The most common facets of trust in school include *benevolence*, involving the expectation that others have good intentions and will not exploit one's vulnerability, or take advantage for their own gain. *Reliability* is the predictability of a behavior, but must be combined with benevolence because one can also

predict a malicious, self-serving, or dishonest behavior. *Competence* is the facet of trust that captures the knowledge and skills needed to perform a specific job. For example, a teacher can communicate to students adequate levels of skills, knowledge, and expertise to enhance students' learning and well-being. *Honesty* is a component of trust referring to a person's integrity, character, and authenticity. For example, a teacher who accepts responsibility and does not distort the truth is considered honest. *Openness* is the final facet of trust. It involves one's willingness to share information and ability to trust others.

Although every facet of trust is important, the weight of a particular facet can depend on the particular context and nature of the relationship within the school or university. Hoy and Tschannen-Moran (1999) suggest that all facets of trust together constitute a unitary factor of trust in school. A person can trust another person in a certain domain of interdependence but not in others. Furthermore, each facet has a threshold that can be variable but beyond which trust can turn to distrust.

Benevolence is among the most important facets of trust in the educational field (Tschannen-Moran & Hoy, 2000). In such a context, trust can be based on *calculative purpose*: for instance, behaving in a trustworthy manner is convenient because sanctions exceed any benefits of an opportunistic behavior that breaches trust. In this case, teachers' punishment and deterrents have to be available in order to control behavior. In *knowledge-based trust*, trust emerges on the basis of the quality of recurring social exchanges between trustor and trustee over a period of time in which each individual is careful not to violate the other's expectation of trust, such as during a course of academic study. *Institution-based trust* is based on the belief that the environment will play an important role in fulfilling our expectations because formal and informal structures such as licenses, certifications, guarantees, insurance, contracts and others mechanisms, confer a sense of trust. Finally, *unconditional trust or identification-based trust* emerges when all individuals identify with one another's desires and intentions and where there is a comprehension about expected reciprocal behavior, for instance in a community in which students are highly connected and strongly identify with their school (Tschannen-Moran & Hoy, 2000).

Empirical research has shown that trust appears vital to student achievement (Goddard, Tschannen-Moran, & Hoy, in press), positive school climate (Hoffman, Sabo, Bliss, & Hoy, 1994), teachers' sense of efficacy in facilitating student learning and achievement (Bandura, 1993; 1997; Tschannen-Moran & Goddard, 2000), productive communication, and participative decision processes (Hoy & Tschannen-Moran, 1999). On the other hand, when trust is absent, the institution comes to rely upon a profusion of rules and norms, which can be counterproductive with respect to school and academic engagement.

## CONCLUSION

Have students have become disengaged and distrustful of their institutions and authorities?

Since the late 1960s, people have gradually become disillusioned and suspicious of institutions and their authorities. Business and religious leaders, politicians, educational authorities, the medical field and non-profit executives are evaluated on the basis of a fragile sense of trust. According to Barber (1983; in Tschannen-Moran & Hoy, 2000), this decline in

public trust stems from three factors. The first involves the powerful knowledge and capacity vested in these professions and authorities and their attendant ability to influence people; the second factor involves the growing focus on equity and equality in modern society. A third factor is increased education and collective knowledge. Thus, people look critically at the discrepancies between the ideals and reality of equality in society, supplemented by greater access to global information and education. In the educational field, one witnesses the same sense of distrust. Many years after the *Brown vs. Board of Education* ruling (1954; in Tschannen-Moran & Hoy, 2000), the educational system continues to be a source of public distrust and disillusionment even if, currently, a significant proportion of students earn a graduate specialization. The authors (Tschannen-Moran & Hoy, 2000) suggest that schools and universities are vested with higher ideals of equality and equal opportunity for all students, coming from all socioeconomic strata. Within schools and universities, students and their parents rely upon professional knowledge and expertise from those charged with educating all learners, including those with disabilities, those who are marginalized and those who come from lower socioeconomic levels. The values of equality promoted by schools and universities sometimes seem at odds with the values of a different social reality. Although the aspiration of participating in economic prosperity and an environment of equal opportunity is widespread, and numerous innovations and reform efforts aimed at providing greater opportunity have emerged, a sense of failure within the educational system persists in many quarters (Tschannen-Moran & Hoy, 2000). Growing distrust in schools, universities and their authorities is evident in many Western countries, and it is a serious impediment to educational reforms when divergent interests among competing parties produce a negative climate of disengagement and even aggressive student behavior.

How can schools and universities facilitate student engagement, identification and trust?

It is vital to reduce student alienation by giving students a stronger voice, according them respect and availing them of opportunities for participation and for collaborative learning. Classrooms must be structured, to the extent possible, as fair and just environments emphasizing students' performance, predispositions, and needs. A common expectation is that educational goods (such as grades and credentials) be significant and relevant to the demands of the modern workforce. From this point of view, schools and universities have to promote not only a meritocratic competition for best grades but capacities of collaboration, communication and participation which impact students' learning, socialization, educational career, future work, occupation, and life chances (Sabbagh et al., 2006). Tschannen-Moran (2009) highlights the need for a bureaucratic structure to organize the complex tasks of education with a hierarchy of authority and rules. However, an authority's professionalism orientation that has specialized and expert knowledge and responsibility for the welfare of students may affect the quality and vitality of the entire educational community. Furthermore, in such a climate, students may demonstrate a greater willingness to trust their teachers or professors, because such professional authorities exercise fair judgments in response to a variety of student needs. Thus, the role of trust in educational authorities appears vital in predicting student engagement. Moreover, the facets of trust are complex, articulated through competence, benevolence and in other ways. Thus, sometimes a member of a group could consider an authority's competence more relevant and their benevolence less relevant, depending on their level of identification. For this reason, the role of identification in the positive relationship between trust and engagement could be highly variable, depending on

what is considered more relevant and valuable for members of a group such as students. Empirical studies may fill this gap.

## REFERENCES

- Appleton, J.J., Christenson, S.L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement instrument. *Journal of School Psychology*, 44, 427-445.
- Battistich, V., Solomon, D., Watson, M., & Schaps, E. (1997). Caring school communities. *Educational Psychologist*, 32, 137-151.
- Baier, A. (1986). Trust and antitrust. *Ethics*, 96(2), 231-260.
- Barber, B. (1983). *The Logic and Limits of Trust*. New Brunswick, NJ: Rutgers University Press.
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, 28(2), 117-148.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Berti, C., Di Battista, S., & Pivetti, M. (2010). Exploring engagement in the university context: The role of justice and social identification. *Procedia - Social and Behavioral Sciences*, 2(2), 2248-2252.
- Berti, C., Molinari, L., & Speltini, G. (2010). Classroom justice and psychological engagement: students' and teachers' representations. *Social Psychology Education*, 13, 541-556.
- Blader, S.L., & Tyler, T.R. (2009). Testing and extending the group engagement model: Linkages between social identity, procedural justice, economic outcomes, and extra-role behavior. *Journal of Applied Psychology*, 94(2), 445-464.
- Bryk, A. S., & Schneider, B. (1996). *Social trust: A moral resource of school improvement*. Chicago. University of Chicago, Center for School Improvement.
- Chory-Assad, R.M. (2002). Classroom justice: Perceptions of fairness as a predictor of student motivation, learning, and aggression. *Communication Quarterly*, 50, 58-77.
- Chory, R.M. (2007). Enhancing student perceptions of fairness: The relationship between instructor credibility and classroom justice. *Communication Education*, 56, 89-105.
- Chory-Assad, R.M., & Paulsel, M.L. (2004a). Anti-social classroom communication: Instructor influence and inter-actional justice as predictors of student aggression. *Communication Quarterly*, 52, 98-114.
- Chory-Assad, R.M., & Paulsel, M.L. (2004b). Classroom justice: Student aggression and resistance as reactions to perceived unfairness. *Communication Education*, 53, 253-273.
- Coleman, J. S. (1990). *Foundations of social theory*. Cambridge, MA: Belknap Press of Harvard University Press.
- Colquitt, J.A., Scott, B.A., & LePine, J.A. (2007). Trust, trustworthiness, and trust propensity: A meta-analytic test of their unique relationships with risk-taking and job performance. *Journal of Applied Psychology*, 92(4), 909-927.
- Connell, J. P., Spencer, M. B., & Aber, J. L. (1994). Educational risk and resilience in African American Youth: Context, self, and action outcomes in school. *Child Development*, 65, 493-506.

- Connell, J. P., & Wellborn, J. G. (1991). *Competence, autonomy, and relatedness: A motivational analysis of self-system processes*. In R. Gunnar & L. A. Sroufe (Eds.), Minnesota symposia on child psychology (23, pp. 43-77). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Croninger, R.G., & Lee, V.E. (2001). Social capital and dropping out of school: benefits to at-risk students of teachers' support and guidance. *Teacher College Record*, 103, 548-581.
- Cropanzano, R. & Greenberg, J. (1997). Progress in organizational justice: Tunneling through the maze. In C.L. Cooper & I.T. Robertson (Eds.), *International review of industrial and organizational psychology*, (Vol. 12; pp. 317-372). London: John Wiley.
- De Cremer, D., & Stouten, J. (2003). When do people find cooperation most justified? The effect of trust and self-other merging in social dilemmas. *Social Justice Research*, 16(1), 41-52.
- De Cremer, D., & Tyler, T.R. (2005). Managing group behavior: the interplay between procedural justice, sense of self, and cooperation. In M.P. Zanna (Ed.). *Advances in experimental social psychology*, (37, pp. 151-218). New York: Academic Press.
- De Cremer, D., & Tyler, T.R. (2007). The effect of trust in authority and procedural fairness on cooperation. *Journal of Applied Psychology*, 92(3), 639-649.
- Eccles, J. (1983). Expectancies, values, and academic behaviors. In J. Spence (Ed.). *Achievement and achievement motivation*. San Francisco: Freeman.
- Emler, N., & Reicher, S. (1995). *Adolescence and Delinquency*, Oxford, Blackwell.
- Finn, J.D. (1989). Withdrawing from school. *Review of Educational Research*, 59, 117-142.
- Finn, J.D., & Rock, D.A. (1997). Academic success among students at-risk of school failure. *Journal of Applied Psychology*, 82, 221-234.
- Folger, R., & Cropanzano, R. (1988). *Organizational justice and human resource management*. Beverly Hills, CA: Sage.
- Fredericks, J.A., Blumenfeld, P.C., & Paris, A.H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74, 59-109.
- Fukuyama, F. (1995). *Trust: The social virtues and the creation of prosperity*. New York: Simon & Schuster.
- Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, 95, 148-162.
- Goddard, R. D., Tschanne-Moran, M., & Hoy, W. K. (in press). The relationship of trust to student achievement in urban elementary schools: A multi-level analysis. *Elementary School Journal*.
- Gouveia-Pereira, M., Vala, G., Palmonari, A., & Rubini, M. (2003). School experience, relational justice and legitimization of institutional. *European Journal of Psychology of Education*, 18, 309-325.
- Greenberg, J., & Cropanzano, R. (2001). *Advances in Organizational Justice*, Standford, California, Standford University Press.
- Haslam, A.S., Van Knippengberg, D., Platow, M. J., & Ellemers, N. (2001). *Social identity at work. Developing theory for organizational practice*, New York and Hove: Psychology Press.
- Hoffman, J., Sabo, D., Bliss, J., & Hoy, W. K. (1994). Building a culture of trust. *Journal of School Leadership*, 4, 484-501.
- Hoy, W. K., & Tschanne-Moran, M. (1999). Five faces of trust: An empirical confirmation in urban elementary schools. *Journal of School Leadership*, 9, 184-208.

- Karweit, N. L. (1989). Time and learning: a review. In R.E. Slavin (Ed.), *School and classroom organization*, (pp. 69-95), Hillsdale, NJ: Erlbaum.
- Kramer, M., & Tyler, T.R. (1996). *Trust in organizations: Frontiers of theory and research*. Thousand Oaks, CA: Sage Publications.
- Krapp, A., Hidi, S., & Renninger, K. A. (1992). Interest, learning, and development. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 3-25). Hillsdale, NJ: Erlbaum.
- Leary, T. (1957). *Interpersonal diagnosis of personality*. New York: Ronald Press.
- Leventhal, G.S. (1980). What should be done with equity theory?. In K.G. Gergen, M.S. Greenberg & R.H. Willis (Eds.). *Social exchange: Advances in theory and research*, (pp. 167-218), New York: Plenum Press.
- Lewicki, R.J., & Bunker, B.B. (1995). Trust in relationships: A model of development and decline. In B.B. Bunker, & J.Z. Rubin (Eds.), *Conflict, cooperation and justice*, (pp. 133-173), San Francisco: Jossey-Bass.
- Lind, E.A. (2001). Fairness heuristic theory: Justice judgments as pivotal cognitions in organizational relations. In J. Greenberg, & R. Cropanzano, (Eds.). *Advances in Organizational Justice*, (pp. 56-88), Standford, California, Standford University Press.
- Lind, E.A. & Tyler, T.R. (1988). *The Social Psychology of Procedural Justice*. New York, Plenum Press.
- Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle and high school years. *American Educational Research Journal*, 37(1), 153-184.
- Mayer, R. C., & Davis, J. H. (1999). The effect of the performance appraisal system on trust for management: A field quasi-experiment. *Journal of Applied Psychology*, 84, 123-136.
- Newmann, F. (1981). Reducing student alienation in high schools: Implications of theory. *Harvard Educational Review*, 51, 546-564.
- Newmann, F. M. (1986). Priorities for the future: Towards a common agenda. *Social Education*, 50, 240-250.
- Newmann, F. M. (1992). *Student engagement and achievement in American secondary schools*. Teachers College Press, New York.
- Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of Educational Research*, 70, 323-367.
- Peterson, P., Swing, S., Stark, K., & Wass, G. (1984). Students' cognitions and time on task during mathematics instruction. *American Educational Research Journal*, 21, 487-515.
- Pruitt, D.G., & Kimmel, M (1977). Twenty years of experimental gaming: Critique, synthesis, and suggestions for the future. *Annual Review of Psychology*, 28, 363-392.
- Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion*, 28, 147-169.
- Rousseau, D. M., Sitkin, S. B., Ronald, S. B., & Camerer, C. (1998). Not so different after all: a cross-discipline view of trust. *Academy of Management Review*, 23(3), 393-404.
- Sabbagh, C., Resh, N., Mor, M., & Vanhuysse, P. (2006). Spheres of Justice within schools: reflections and evidence on the distribution of educational goods. *Social Psychology of Education*, 9, 97-118.
- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology*, 85, 571-581.

- Smith, H.J., Olson, G., Agronick, G., & Tyler, T.R. (2009). Everyday interactions with university authorities: Authority treatment quality, outcome favorability and first year students' university adjustment. *Group Processes & Intergroup Relations*, 12(2), 209-226.
- Smith, H.J., Tyler, T.R., Huo, Y.J., Ortiz, D.J., & Lind, E.A. (1998). The self-relevant implications of the group-value model: Group membership, self-worth, and procedural justice. *Journal of Experimental Social Psychology*, 34, 470-493.
- Thibaut, J., & Walker, L. (1975). *Procedural justice*. Hillsdale, NJ: Erlbaum.
- Thijs, J., & Verkuyten, M. (2009). Students' anticipated situational engagement: The roles of teacher behavior, personal engagement, and gender. *The Journal of Genetic Psychology*, 170(3), 268-286.
- Thorkildsen, T.A. (1989). Justice in the classroom: The student's view. *Child Development*, 60, 323-334.
- Tschannen-Moran, M., & Goddard, R. (2001, April). Collective efficacy and trust: A multi-level analysis. *Paper presented at the annual meeting of the American Educational Research Association*, Seattle, WA.
- Tschannen-Moran, M., & Hoy, W. K. (2000). A multi-disciplinary analysis of the nature, meaning, and measurement of trust. *Review of Educational Research*, 70(4), 547-593.
- Tschannen-Moran, M (2009). Fostering teacher professionalism in schools: The role of leadership orientation and trust. *Educational Administration Quarterly*, 45(2), 217-247.
- Tyler, T.R., & Degoy, P. (1995). Collective restraint in social dilemmas: Procedural justice and social identification effects on support for authorities. *Journal of Personality and Social Psychology*, 69, 482-497.
- Tyler, T. R., & Degoe, P. (1996). Trust in organizational authorities: The influence of motive attributions on willingness to accept decisions. In R. Kramer & T. Tyler (Eds.), *Trust in organizations* (pp. 331-356). Thousand Oaks, CA: Sage.
- Tyler, T.R., & Blader, S.L. (2000). *Cooperation in groups. Procedural Justice, social identity, and behavioral engagement*, New York University, Essays in Social Psychology.
- Tyler, T.R., & Blader, S.L. (2003). The group engagement model: Procedural justice, social identity, and cooperative behavior. *Personality and Social Psychology Review*, 7, 349-361.
- Tyler, T.R., Boeckmann, R., Smith, H.J., & Huo, Y.J. (1997). *Social justice in a diverse society*. Denver, CO : Westview.
- Tyler, T.R., & Lind, E.A. (1992). A relational model of authority in groups. *Advances in Experimental Social Psychology*, 25, 115-191.
- Yamamoto, K., Thomas, E.C., & Karns, E.A. (1969). School-related attitudes in middle-school-age students. *American Educational Research Journal*, 6, 191-206.
- Zyngier, D. (2008). (Re) Conceptualizing student engagement doing education not doing time. *Teaching and Teacher Education: an International Journal of Research and Studies*, 24, 1765-1776.
- Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, 21, 3-17.



## ***Chapter 4***

# **TEACHER-CHILD INTERACTION TRAINING: DESCRIPTION, HISTORICAL UNDERPINNINGS AND CASE EXAMPLE**

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## **ABSTRACT**

Behavior that disrupts the learning of the student or surrounding students (e.g., arguing, being out-of-seat, not following directions) is a prominent concern of teachers (Axup & Gersh, 2008; Ennis, 1996), and 50-68% of teachers believe they spend too much time managing problematic classroom behavior (Beaman, Wheldall, & Kemp, 2007). Disruptive behavior is stable without treatment (Campbell, 1995; McNeil, Capage, Bahl, & Blanc, 1999), and young children who display disruptive behavior may develop delinquent and antisocial behavior as adolescents or adults (Farrington, 1995; Loeber, Burke, Lahey, Winters, & Zera, 2000). Such students score lower on standardized tests than their compliant peers (Finn, Pannozzo, & Voelkl, 1995). In addition to the disruptive behavior of a child impacting his or her own academic achievement, a student's disruptive behavior adversely affects the whole class by requiring the teacher's attention resulting in decreased instructional time (Carr, Taylor, & Robinson, 1991). Additionally, teachers report that they feel overwhelmed and unprepared to handle the behavior problems that they face in the classroom (Kurtz, Fernandez, Miller, Madigan, Firpo, Dimotta, et al., 2010). Teachers report that disruptive behavior increases their job-related stress and believe that effective behavior management would decrease their stress levels (Axup & Gersh).

Teacher-Child Interaction Training (TCIT) is an emerging program to help teachers of young children effectively manage the behavior in their classrooms. Proponents of TCIT have adapted Parent-Child Interaction Therapy (PCIT), an evidence-based treatment program for parents of children ages three- through six-years with disruptive behavior (Eyberg, Nelson, & Boggs, 2008; Hood & Eyberg, 2003; Nixon, 2001), for use with teachers. PCIT, and subsequently TCIT, is based on the two-phase model of parent training initiated by Constance Hanf in Oregon (Costello, Chengappa, Stokes, Tempel, &

McNeil, in press; Hanf, 1969). Specifically, child-focused play skills that foster a warm, nurturing environment in the classroom are combined with consistent consequences to handle misbehavior. TCIT is being implemented primarily in preschools and kindergartens.

Given that TCIT is a relatively new program, research groups differ in the approaches they have used to adapt the characteristics of PCIT to a classroom setting. For example, some train teachers in the classroom with students present, others train during workshops or in-service days, and others during the school day but outside of the typical classroom. Additionally, TCIT has been implemented as both a targeted intervention to improve the behavior of an identified child who causes significant disruption in the classroom and as a universal teacher training program to improve behavior management skills across the board for use with all students. One of the main challenges of adaptation is that PCIT focuses on the interactions of one parent with one child while teachers are responsible for many children at once and have as many as 30 children in one classroom. The differences in implementation of TCIT will follow.

## GOALS AND SKILLS OF TCIT

### Child-Directed Interaction

Following the Hanf model and reflecting PCIT, the skills of TCIT are taught in two phases. The goal of the first phase, called Child-Directed Interaction (CDI), is to create a warm classroom environment in which the students enjoy spending time. Characteristics of such a classroom might be students feeling comfortable approaching the teacher to ask questions, as well as frequent shared laughter and smiles between the teacher and students. The focus of this phase is building a strong positive relationship between the teacher and students. Such a relationship is a critical but often ignored characteristic of effective behavior management (Budd, Watkin, Legato, & Feuer, 2010). Consistent with PCIT, this positive relationship and corresponding classroom environment is established with the use of five skills, referred to as the PRIDE skills, which are praise, reflection, imitation, description, and enthusiasm/enjoyment.

Praise is a statement containing a positive evaluation about a child (Eyberg, Nelson, Duke, & Boggs, 2005). One type of praise is unlabeled praise which is a general positive statement (Eyberg, et al., 2005), such as “good job,” “terrific work,” or “way to go.” This type of praise makes the child feel good, but TCIT encourages teachers to use labeled praise. Labeled praise is a positive evaluation about a specific action or product of a child, such as “good job standing in line quietly while we wait for the doors to open,” “terrific work making your letter A,” and “way to go for cleaning up so quickly after play time was over.” Labeled praise tells children exactly what they did to receive recognition, and it has been shown to increase the frequency of the behavior praised (Bernhardt & Forehand, 1975). Teachers are taught to target desirable, prosocial behaviors with labeled praise and to use labeled praise at the frequency of about two per minute during practice sessions.

Reflections are statements that repeat or paraphrase the appropriate vocalizations of the child without changing the meaning of the child’s statement (Eyberg, et al., 2005). Reflections affirm a child’s speech, provide attention for a child’s appropriate vocalizations, and provide an opportunity for the teacher to model correct pronunciation and grammar,

while also incorporating new vocabulary words (Eyberg, 1988; Tempel, Wagner, & McNeil, 2008). For example, a child may say, “Dee car go fast, vroom-vroom,” and the teacher may reflect, “The car’s engine goes vroom-vroom as it goes fast down the street.”

Imitation is a motor action that mimics the action of a child (Eyberg, et al., 2005). Similarly to how reflections repeat and provide attention for a child’s appropriate verbal behavior, imitations repeat and provide attention for a child’s appropriate nonverbal behavior. The goal of imitation is to have the teacher physically join the play with the child without directing the play.

Description is a verbal statement that provides a commentary on the child’s actions. Because the goal is to improve child behavior, TCIT emphasizes the use of behavioral descriptions in which the focus is on specific, ongoing or just completed, appropriate actions of the child (Eyberg, et al., 2005). In this way, behavioral descriptions become a method for providing differential reinforcement of appropriate behavior, as positive and neutral behaviors are being reinforced with verbal attention. Examples of behavioral descriptions are “You put the toy in the green bin,” “Everyone is waiting patiently for their turn,” and “John is sitting with his legs crossed and ready for the story to begin.” Behavior descriptions increase on-task behavior (Tempel, Wagner, & McNeil, 2010) and provide attention for appropriate behaviors.

Enthusiasm involves changing the voice pattern and pitch to express interest and enjoyment. Enthusiasm/enjoyment can be conveyed with an energetic tone of voice, a positive facial expression, or attentive body language (Filcheck, McNeil, & Herschell, 2001). The purpose of enthusiasm is to bring warmth and excitement to all of the other PRIDE skills. Enthusiasm may increase a child’s attention to the task as it makes the play more fun. In addition to using the PRIDE skills, parents in PCIT are taught to avoid using certain types of statements: negative talk, commands, and questions.

TCIT research groups have approached use of commands and questions in different ways. Negative talk is the only type of teacher statement that all research groups teach teachers to reduce to near zero. Negative talk is any statement about an aspect of a child that contains a negative evaluation or implies that the child engaged in an inappropriate behavior (Eyberg, et al., 2005). Statements that contain the words “no,” “don’t,” “stop,” “quit,” or “not” in reference to an action or characteristic of the child are considered negative talk. “Stop talking,” “that is not very nice,” and “please don’t move that,” are examples of negative talk. Sometimes teachers inadvertently use negative talk when they are trying to use a labeled praise, such as, “Thank you for not screaming inside.” Thus, teachers are given practice identifying the positive opposite of a misbehavior in order to quickly identify the praiseworthy behavior; in the case of the previous example, “thank you for using your inside voice” would be a labeled praise statement. Even though teachers reduce their use of negative talk, they continue to set limits in the classroom by praising the positive opposite of a problem behavior, using positively stated commands that are incompatible with the problem behavior, and redirecting negative attention-seeking behavior with neutral or positive behavior and praising the positive alternative behavior once the child has ceased the problem behavior.

While it is beneficial to bring questions and commands to near zero in a parent-child interaction to allow maximum relationship-building, it is not optimal in a classroom setting to eliminate all questions and commands. Various implementers of TCIT have different approaches to questions and commands. Commonly, teachers are encouraged to reduce “rapid-fire” questions to which children do not have adequate time to think and formulate a response (Tiano, 2010). Teachers are taught to wait at least 5-seconds between questions to

allow time for response formulation during structured learning with the entire class (Tiano). Commands are not necessarily addressed in the CDI component of TCIT (Budd, et al., 2010). However, some TCIT researchers suggest that it can be beneficial to have teachers practice reducing commands to zero during one-on-one analog situations. This allows them to practice their PRIDE skills and using redirection and praising the opposite behavior to handle minor misbehaviors; thereby realizing that commands are not always necessary for behavior management (Tiano).

Lastly, as part of CDI, teachers are given practice combining ignoring and the PRIDE skills to manage minor misbehavior (i.e., misbehavior that does not harm the student, another person, or property). The PRIDE skills are used to provide attention to appropriate, prosocial behavior such as paying attention, raising one's hand, sitting quietly, etc. At the same time, inappropriate minor misbehavior, such as interrupting or arguing, is ignored. One benefit of the classroom setting is that appropriately behaving peers may model desirable classroom behavior. Teachers may use the PRIDE skills to identify appropriate behaviors of other children in the classroom. The emphasis on providing labeled praise for the positive opposite of misbehavior continues throughout TCIT.

## **Teacher-Directed Interaction (TDI)**

The second phase of TCIT is called Teacher-Directed Interaction (TDI), which is similar to the Parent-Directed Interaction (PDI) of PCIT. The goal of TDI is to create a structured classroom environment that facilitates learning by effectively reducing the frequency of noncompliance and aggression (i.e., hitting, kicking, biting). First, teachers are taught to give commands which are directly-stated (e.g., clear that the student should complete the action), specific, positively-stated, respectful, and singular (i.e., requesting one action at a time). For example, the ineffective command of "Let's all put away our pencils, books, and line up," would be re-stated to the more effective command of "Please put away your pencils," followed by two additional commands addressing books and lining up. Teachers are taught to wait 5 seconds following a command to give a child time to begin to comply with the instruction. Teachers provide attention with a labeled praise for the appropriate behavior of compliance (e.g., "Good job of following directions.")

If a child fails to comply or initiate compliance behavior (e.g., moving towards door to line up) within 5 seconds, the teacher provides a warning statement. Compliance with the warning statement results in a labeled praise. In contrast, failure to comply with the warning statement within 5 seconds results in a consequence in which the child remains in a defined location and the teacher removes attention from the child for a limited period of time. Such areas must have clearly defined boundaries to easily identify when a child is within the area or when the child has left, and the areas can be known as a time-out chair, a calm-down area, a thinking zone, a quiet chair, or "sit-and-watch." Some schools or teachers do not approve of time-out as a disciplinary practice. In fact, many implementers of TCIT do not use the word "time-out" at all (Budd, et al., 2010; Tiano, 2010). Instead, words are used with which the school, parents, and teachers are comfortable. For example, "Time-out chair" may be renamed as a "Thinking Chair" (Tiano, 2010), or the teacher may have the child "Sit and Watch" the classroom activities but not participate for a period of time (Budd, et al., 2010). Thus, teachers may be able to develop a procedure functionally similar to time-out in which a

time-limited removal of access to privileges (i.e., activities and attention) occurs as a consequence to defiance, aggression, and/or breaking a classroom rule.

The duration of attention removal is designed to be developmentally appropriate for each child and is typically established as 3 minutes plus 5 seconds of quiet; however, a shorter period may be used with younger children or children with developmental delays. If the child leaves the designated area without teacher consent, then a back-up procedure is implemented to teach the child to stay in the area. Once the “time-out” has finished and the child is quiet, the teacher tells the child that he or she may leave the area and the child is directed to comply with the original command. Requiring compliance with the original command prevents removal of attention from inadvertently allowing the child to escape a demand or a request (Everett, Olmi, Edwards, Tingstrom, Sterling-Turner, & Christ, 2007). Additionally, immediately following compliance with the original command, teachers provide a simple, “follow-up” command to have the child over-practice compliance. When children have learned to remain in the designated area as a consequence for noncompliance, time-limited removal of attention in a specified location is implemented as a consequence for aggression. Generally, this procedure is used for only two behaviors in the classroom: blatant defiance to a teacher’s warning and hurting another person. Occasionally, another rule may have to be implemented for a particular child, such as no profanity or no breaking objects, but most classrooms can be maintained by reserving this consequence for only (a) defiance to adult commands and (b) aggression.

It is important that this procedure is implemented in accordance with the regulations and values of the school’s administration and the classroom’s teacher. Thus, the location for removal of attention and the back-up procedures are individualized to each teacher and school. It may be more acceptable to use TDI only with children whose noncompliance and/or aggression causes a chronic problem in the classroom and has not responded to other disciplinary procedures. With such students, written parental permission in the form of a behavior plan, a classroom safety plan, or an Individualized Education Plan (IEP) for the use of “time-out” with a particular student may make the procedure more acceptable (Tiano, 2010). The teacher and TCIT trainer work together to determine the best area with clearly defined boundaries for removal of attention and the back-up procedure in the context of each individual classroom. Some teachers are comfortable with a chair or table positioned away from the group; others may prefer that children sit in a specified area of the classroom, such as a carpet square.

Back-up procedures may involve sending the student to another classroom, to stand in the hallway, or to an administrator’s office. The important feature of the back-up procedure is that it must be less rewarding to the child than the first location. For example, if a student is sent to the principal’s office for refusing to sit in the “calm down” chair, it is important that the principal not engage in friendly conversations, reprimands, or other interactions with the child. The back-up procedure is implemented to teach the child to accept the first consequence. When used appropriately, use of the back-up procedure will reduce as children learn to remain in the “calm down” chair. Appropriate use of the back-up procedure should not result in large amounts of time spent away from instruction or out of the classroom. For children with difficult classroom behavior, negative attention often is reinforcing. For this reason, it is important that staff remain neutral in demeanor when sending the child to the designated area and when implementing the back-up procedure.

## Teaching the Goals and Skills of TCIT

The first and most important step in TCIT is to build rapport with the teacher because teachers are unlikely to implement procedures that they do not accept. Budd and colleagues (2010) reported that some teachers are skeptical and wary of “outsiders” who are not from their school being able to help them, which highlights challenges that must be overcome. School-based intervention research suggests facilitating working partnerships, evaluating prior intervention attempts, and using staff’s past experiences to inform interventions (e.g., McIntosh et al., 2000; Rork & McNeil, 2008; Tiano & McNeil, 2006). Additionally, Tempel and McNeil (2010) found that teachers were more accepting of TCIT trainers who emphasized their past experience in classrooms rather than the research basis of the program.

Evaluating behavioral strategies that are in place in classrooms prior to introducing TCIT allows for an assessment of the presenting problems and environmental contingencies maintaining difficult behavior as well as allowing for rapport building with the teaching staff. During the initial meeting with staff, information should be gathered regarding discipline and limit-setting in the classroom. It is important to know and follow facility regulations regarding discipline strategies. Teaching staff often report use of calm down areas, quiet areas, time outs, or “sit and watch” as a consequence for disruptive classroom behavior (Tempel & McNeil, 2010). Regardless of the name used to describe discipline strategies, the actual application of each strategy often varies across classrooms and among staff members. Ideally, all members of the teaching staff will be involved in TCIT. Inclusion of the entire staff should provide the greatest chance for consistency among teaching staff members. Additionally, the role that individuals serve on the teaching staff may be related to their use of behavior management techniques (Tempel & McNeil, 2010). Some TCIT implementers devote a 1-2 hour orientation session to developing rapport with teachers (Campbell, Martin, West, Hubel, Flood, & Hansen, 2010), while others are less structured with the time they devote to this aspect. No matter how much time is formally dedicated to rapport-building, TCIT will likely not be successful without sufficient engagement and partnership with the teachers and administrators.

Each phase of treatment begins with a didactic explanation of the goals and skills. Given time limitations and administrative support, 1-2 hour group sessions may be devoted to each didactic (Campbell, et al., 2010) during a teacher in-service day, or goals and skills can be explained during unstructured classroom time with the teacher pulled to a quiet corner of the classroom from which he or she can still monitor the students while the co-teacher supervises the class.

In PCIT, parents practice and are coached in skills specific to each phase until they achieve predetermined “mastery criteria” at which point they progress to the next phase if they are in CDI or complete treatment if they are in PDI. Parents have attained the CDI mastery criteria when they are able to provide 10 labeled praises, 10 reflections, 10 behavioral descriptions, and three or fewer combined negative talk, questions, and commands during a 5-minute observation. Mastery of PDI is when at least 75% of all commands are “effective,” the child complies with at least 75% of effective commands, and parents follow-through with contingent consequences for at least 75% of commands during a 5-minute observation. Thus, PCIT is considered a “data-driven” approach because parents progress based on their demonstration of skill use.

Implementers of TCIT differ in their criteria for progressing to TDI or completion of the training program. Tiano (2010) keeps the mastery criteria the same for TCIT as in PCIT. Kurtz and colleagues (2010) consider “mastery” to be when a teacher provides 30 combined labeled praises, reflections, and/or behavioral descriptions in a natural classroom setting, and at least 20 of these statements are specific to a pre-determined target behavior, such as paying attention. Budd and colleagues (2010) do not set mastery criteria and instead use a “time-limited” approach in which teachers remain in each phase of training for a predetermined number of sessions. Campbell and colleagues (2010) use a mix of data-driven and time-limited approaches in that teachers aim for a predetermined goal but receive a maximum of 14 total sessions. In the latter model, teachers’ skill use is coded while the teacher and one to three student(s) are pulled out of the classroom to a more controlled setting, such as a designated carpet area in an unoccupied room.

After the didactic introduction to each phase and its skills, the teachers are provided instruction and feedback on their skills in the form of coaching until they reach the predetermined mastery criteria or the set number of sessions. In PCIT, the therapist coaches the parent in the clinic from behind a one-way mirror and provides instruction and feedback to the parent via a “bug-in-the-ear” device. Such a controlled environment is rarely possible in a school setting. Implementers of TCIT have confronted this challenge in different manners. Most implementers of TCIT shadow teachers and provide in-vivo feedback during regular class time (e.g., Budd, et al., 2010; Kurtz, et al., 2010; Tiano, 2010). In contrast, Campbell and colleagues (2010) pull the teacher out of the classroom and coach the teacher in skill use with one to three children at a time. The number of children increases as the teacher’s skill level increases.

## REVIEW OF RESEARCH LITERATURE AND DEVELOPMENT OF TCIT

Given its efficacy in reducing disruptive and noncompliant behavior in young children in the clinic and at home (Eyberg, et al., 2008), research on Parent-Child Interaction Therapy (PCIT) has moved toward studying treatment effects on child behavior in multiple settings. As behavior problems in young children often present at school, studying the generalizability of the effects of PCIT in this setting is particularly salient. Research has progressed from examining the generalizability of PCIT to the school setting, to adapting PCIT as a specific teacher training program and implementing it in preschool and elementary school classrooms with TCIT.

McNeil and colleagues (1991) conducted an early study examining the generalizability of PCIT treatment effects from the home to the school setting. The authors acknowledged that children in PCIT often demonstrated a behavioral contrast effect (i.e., a resurgence of disruptive behavior problems at school following a decrease at home) after completion of treatment (McNeil, et al.). To address this effect, the authors implemented a controlled trial studying the effects of PCIT on disruptive and noncompliant behavior in children across the home and school settings. Children with disruptive behavior disorders whose parents received PCIT not only showed improved behavior at home but decreased noncompliance and disruptive behavior at school (McNeil, et al.). Additionally, maternal and teacher reports were strongly correlated, indicating agreement across both settings. It was proposed that the

emphasis on training general skills (e.g., compliance to all parental requests) and teaching compliance so that it becomes a habit, as compared to focusing on specific behavior problems (e.g., only focusing on child participating in bedtime routine), may have led to generalizability of the treatment program (McNeil et al.).

Progressing from the study by McNeil and colleagues (1991), emphasis was placed on training teachers directly in PCIT skills. In a study conducted by Filcheck and colleagues (2004), a preschool teacher was trained in a whole-class token economy (the Level System; see Ficheck et al., 2004) and TCIT utilizing a single-subject treatment comparison design. During training in TCIT, the teacher was trained in both the Child-Directed Interaction (CDI) and Parent-Directed Interaction (PDI) phases. In CDI, the teacher was taught to engage in at least 15 praises, and 25-30 behavioral descriptions and reflections. Coaching began with one child and the number of children progressively increased until the teacher interacted with three children at one time. In PDI, the teacher was trained to implement the standard time-out procedure, and was subsequently coached in this procedure in the classroom. During the implementation of TCIT, the teacher was observed and provided with immediate feedback during the first two days. Child disruptive behavior decreased when the Level System was implemented and further decreased during the implementation of TCIT. Additionally, teacher criticism decreased, and praise increased.

Tiano and McNeil (2006) trained Head Start teachers were trained in a group setting. The CDI and PDI phases were taught during two 2-hour workshops. Teachers received live, progressive coaching (e.g., coaching was conducted with one child and progressed to the entire classroom) and mastery criteria were consistent with standard PCIT (Tiano & McNeil). Additionally, teachers were coached in the use of specific group behavior modification skills, including an ignoring signal, the use of “When-Then” statements (e.g., “When everyone pushes in their chair, then we will have snack time”), and differential reinforcement of appropriate behavior (Tiano & McNeil). The time-out chair was renamed as the “Thinking Chair,” (Tiano & McNeil). The back-up procedure involved placing an additional “Thinking Chair” in the hallway (Tiano & McNeil). Teachers in the TCIT group maintained higher positivity in the classroom as compared to teachers in the control group by using more positive behavior management strategies (e.g., praise) and a decreasing need for the use of time-out (Tiano & McNeil). In these studies, it was demonstrated that training teachers was effective in increasing and maintaining positive teacher behavior and appropriate child behavior.

Several other research teams also have adapted PCIT as a training program for teachers. McIntosh and colleagues (2000) utilized Teacher-Child Interaction Therapy in a case study with a 2-year old child with severe disruptive behavior problems. Treatment was divided into the standard CDI phase and a “Teacher Directed Interaction” (TDI) phase. CDI consisted of training the teacher in “DRIP” skills (e.g., descriptions, reflections, imitation, praise), and the teacher was taught effective commands and the time-out sequence in TDI. As with other studies of PCIT and TCIT, the Dyadic Parent-Child Interaction Coding System (DPICS; Eyberg & Robinson, 1983) was utilized as the behavioral coding system, but in this study it was renamed the “Dyadic Teacher-Child Interaction Coding System” (DTICS) to acknowledge teacher use of skills (McIntosh et al., 2000). Consistent with PCIT, the teacher was encouraged to engage in the five minutes of “special play time” required of parents in traditional PCIT in which the teacher played with the referred child individually and used a high frequency of “DRIP” skills. The teacher was able to maintain a high level of “DRIP”

skills during the CDI and TDI phases, and when the TDI phase was implemented the teacher's use of commands decreased and the child's disruptive and noncompliant behavior decreased (McIntosh et al., 2000).

Recently, Lyon and colleagues (2009) and Gershenson and colleagues (2010) trained teachers in an ethnically diverse, low-income preschool classroom in Teacher-Child Interaction Training (TCIT). Gershenson (2010) described the development and implementation of the training program, while the Lyon study provided more detailed teacher and child outcomes. Teachers were shadowed and coached by research assistants, and children were given a modified time-out procedure. In TDI, children were instructed to be seated in a "Sit and Watch" chair, and no back-up procedure was used (Gershenson et al.). Additionally, increased emphasis was placed on working collaboratively with teachers with the use of team-building exercises, increasing teacher motivation, and focusing on the diversity in the classroom (Gershenson et al.). Although teachers trained in TCIT showed moderate changes in skill use (e.g., slight to moderate increase in praise across classrooms; slight decrease in critical statements), they reported a high level of satisfaction with the training (Lyon et al., 2009). Also, the authors demonstrated efficacy of treatment effects in a predominantly low-income, urban population.

Multiple research groups (e.g., Budd, et al., 2010; Campbell, et al., 2010; Kurtz, et al., 2010; Tempel & McNeil, 2010) are currently examining the implementation of TCIT in preschool and early elementary school classrooms. Within these studies, implementation issues (e.g., teacher collaboration, acceptability of TCIT procedures, logistical concerns, practicality of training teachers) and treatment outcome effects (e.g., teacher use of skills, changes in child disruptive and noncompliant behaviors) are being examined (Campbell, et al., 2010; Budd, et al., 2010; Kurtz et al., 2010; Tempel & McNeil, 2010). Additionally, Campbell and colleagues (2010) have developed a TCIT manual (Campbell, Martin, Hubel, Asawa, Flood, & Hansen, 2010) and are testing the effectiveness of TCIT based on this manual.

## CASE ILLUSTRATION OF TCIT

### Presenting Problems

The Kindergarten class taught by Mrs. Wilson at Lake View School was referred by the school counselor for Teacher-Child Interaction Training. Mrs. Wilson reported that she and the assistant teacher, Mrs. Patrick, were having particular difficulties managing defiant and noncompliant behaviors of two children, Luke and Jerry, which affected the behavior of her whole class.

Luke was a 5-year-old child with developmental delays and limited speech. As part of his Individualized Education Plan (IEP), Luke received services at school from a speech-language pathologist and physical therapist. Luke frequently displayed "aggression" such as hitting, kicking, biting, and hair pulling towards Mrs. Wilson, Mrs. Patrick, and the other children in his class. He refused teacher requests and hit the teachers if they insisted that he follow instructions. For instance, when Mrs. Patrick told him to wear his coat before going

outside, he refused by saying “no” and “I don’t want my coat.” When Mrs. Patrick persisted with him and held his coat out for him to wear, he hit her arm. Mrs. Patrick responded by taking him to a corner of the room called the “Calming Corner” and saying, “You have not been very good today.” However, he persisted to throw books off the book rack in the Calming Corner, and then ran from the corner to join his classmates on the playground. When she noticed Luke leaving the Calming Corner she let him continue to the playground because her attention was directed towards another child needing assistance. Luke also got into physical fights with other children and pushed or kicked them if they did not give him what he wanted. He used rough play with other children and turned toys into guns and cars that rammed into and destroyed other toys. He often broke toys and other materials in the class and sometimes knocked other children down because of his rough play.

Jerry was a 5-year-old in the class who frequently interrupted his teachers and talked excessively to other children. He continually asked the staff for help with toys and frequently asked them questions while they were leading group activities or conducting circle time. He often ran around the children or roamed the classroom during circle time. His teacher often told him to “quit talking” or to “stop interrupting” others. When the teacher got frustrated with his talking to other children she said, “Jerry, do your work” and “I mean it.” He was frequently off-task and distracted other children from doing activities by making funny faces or by clowning around. He often pretended that he did not hear Mrs. Wilson or Mrs. Patrick when they gave him instructions; and he continued to talk to other children during circle time, nap time, and meals.

Mrs. Martin reported that she and Mrs. Patrick were “overwhelmed” with the disruptive classroom behaviors of Luke and Jerry. They felt that they were giving most of their time and attention to these children while the other children were being ignored. The staff reported that each of the boys did well if given individual attention but that this was not possible because they also had to take care of the other children. Mrs. Patrick reported that they had tried rewards, praise, and spending more time with each child, yet nothing seemed to change the disruptive behaviors.

## Pre-Training Assessment of Skills

Structured one-on-one observations of child-led and teacher-led play were conducted to examine the skills displayed by each staff member prior to receiving TCIT. Mrs. Wilson and Mrs. Patrick were asked to complete the structured observation with the child that they felt had the most difficult behavior. During free-play time, Mrs. Wilson and Mrs. Patrick took turns interacting with Luke in a corner of the classroom. During the first child-led play session, Mrs. Wilson used 3 unlabeled praises, 0 labeled praises, 0 behavior descriptions, 0 reflections, 16 questions, 7 commands, and 4 criticisms. Mrs. Patrick had 5 unlabeled praise, 0 labeled praise, 0 behavior descriptions, 0 reflections, 10 questions, 12 commands, and 8 criticisms. During teacher-led play, Mrs. Wilson provided 0 direct commands and 16 indirect commands such as “Would you please sit down” and “I want you to listen.” She provided no effective consequences for either compliance or noncompliance to commands (i.e., praise for compliance and physical guidance for noncompliance). Mrs. Patrick used 7 direct commands, 12 indirect commands, and had no effective consequences for noncompliance with commands.

## **CDI**

The CDI didactic was conducted one hour before school with Mrs. Wilson and Mrs. Patrick. At the end of the session the TCIT trainer modeled CDI skills and had the staff role play the skills with the help of toys. The staff was assigned homework to practice the CDI skills for 5 minutes every day, and directed to initially practice the skills with one child at a time. In the CDI coaching session with Mrs. Wilson and Luke, she described his rough play while he banged the toys on the table. Mrs. Wilson was coached to turn around and ignore Luke's undesirable behaviors and attend only to positive behaviors. Luke became louder in his play and started throwing the toys. She gave him the command, "Stop it, Luke," but was instructed by the TCIT trainer to ignore and redirect his behavior with enthusiastic play, as his rambunctious behavior was not dangerous or destructive in that moment. Eventually, Luke calmed down and went back to the table to play with Mrs. Wilson. Mrs. Wilson was instructed to immediately give him labeled praises for "coming back to the table," for "playing so quietly," and for "being gentle with the toys," because these were behaviors that she wanted Luke to increase.

During her CDI coaching session with Jerry, Mrs. Patrick had difficulties decreasing her use of questions. She was also instructed to change questions, such as "Are you building a tower?" into statements, such as "You are building a tower." Behaviors that were inconsistent with Jerry's problem behaviors were praised whenever they occurred. These included sharing toys, asking nicely, "using nice hands," and "keeping hands to yourself."

Both teaching staff members reported that they found themselves using these skills throughout the day and in interactions with other children in their classroom. Once the staff met mastery of the CDI skills with one child, they were instructed to begin practicing their skills during interactions with several children and to selectively use the CDI skills for desirable behaviors. Both Mrs. Wilson and Mrs. Patrick achieved mastery of CDI on the fourth session. Therefore, in a 5-minute period, they were able to give 10 labeled praises, 10 reflections, and 10 behavior descriptions while having fewer than 3 questions, criticisms, or commands.

## **Preparation for TDI**

Given that Luke's behavior was the most problematic, the teachers would learn and master TDI skills with Luke first and then apply their skills with Jerry. As the teaching staff approached mastery of the CDI skills, the TCIT trainer and teaching staff requested a meeting with Luke's mother and his Individualized Education Plan (IEP) team. The TCIT trainer discussed the need for a safety plan that could be consistently implemented for Luke's disruptive classroom behaviors as well as for the other children in the classroom with identified behavioral concerns. The trainer specified that TCIT aligned with the Positive Behavior Supports program that was currently underway as a school wide, universal system for behavior management at Lake View. Specifically, the trainer discussed CDI as similar to the universal program providing positive supports to all children in the classroom and TDI as a specialized intervention developed for children displaying unsafe or aggressive behavior in the classroom, such as not listening to staff, hitting, climbing on book cases, or running from the classroom. The TCIT trainer addressed particular questions related to the TDI phase of

treatment. Following the meeting, the trainer provided each professional with a clearly written behavioral safety plan to enhance consistency and communication between professionals.

An in-class “listening square” was selected as a safe, consistent, and predictable consequence for inappropriate classroom behavior. A back-up procedure was not implemented, because the Lake View school system prohibited any removal of a child from a classroom due to misbehavior. Instead staff returned the child to the listening square for leaving during a “listening sequence.” Due to Luke’s aggressive behaviors, the teaching staff and Luke’s mother agreed that Luke’s teachers would first practice TDI during one-on-one interactions with him. A square marker was placed on the floor similar to the circle spot that children in the Kindergarten class were expected to sit on during daily circle time. The area around the listening square was cleared of all unnecessary furniture, toys, and wall decorations to prevent the possibility of Luke tearing materials from the wall as he often did after being told he could not do something.

## TDI

During the first TDI teaching session, the TCIT trainer met with Mrs. Wilson and Mrs. Patrick before school for one hour. During this time the trainer taught the staff the specific TDI skills and modeled, role-played, and provided feedback related to the staff’s use of these skills during role-play situations. The TCIT trainer taught the staff how to provide effective commands and the appropriate response for child compliant or noncompliant behaviors following an effective command. The TCIT trainer discussed with the staff the importance of consistency among staff members as well as the predictability of consequences to reduce problem behaviors.

Mrs. Wilson voiced the relief she felt for finally having a safe way to support children in her classroom. She pointed out that for years she had felt that it was necessary to “teach” kids how to follow classroom rules by pulling children aside and talking to them about classroom expectations and rule-breaking immediately following misbehavior. She described her “Aha!” moment as she realized that for some attention-seeking children this may actually have served as a reward. Mrs. Patrick agreed that she was motivated to make necessary changes to improve class behavior but was hesitant to believe that changes could be made.

During the role-plays the staff practiced providing positively-stated, direct commands and enjoyed taking turns demonstrating disruptive child behavior. Mrs. Wilson volunteered to first role-play the teacher. She provided a command, “Would you please hand me the red truck?” and quickly corrected herself by saying, “I mean, please hand me the red truck.” She laughed at how logical effective commands seemed yet how easy it was to fall into her habit of indirectly “asking” the child to listen. Mrs. Patrick quickly caught on to the command sequence. Following Mrs. Wilson’s noncompliance after Mrs. Patrick provided a direct command and warning statement, she guided Mrs. Wilson to the listening square. She moved through the listening sequence with little assistance and ended the sequence with an enthusiastic labeled praise for compliance with a second equivalent command, saying “Great job putting the truck in the garage so quickly!”

The children arrived in the classroom shortly after the completion of the role-plays, and the TCIT trainer stayed in the classroom to work directly with the staff during the first TDI coaching day. The TCIT trainer coached Mrs. Wilson as she introduced the “listening

practice” and the staff took turns working one-on-one with Luke during free-play times throughout the day to be observed and coached as they practiced listening skills. A clipboard was hung by the listening square and used by staff to document and monitor each command sequence. Additionally, the clipboard assisted in removing the attention directed towards Luke while he was at the listening square. The staff identified the problem behavior as well as antecedents (i.e., what happened before) and consequences (i.e., what happened after) to assist with monitoring and evaluating difficult classroom behaviors, the frequency of use of the listening square, and potential environmental factors that may have been maintaining behaviors.

As the teaching staff mastered their TDI skills with Luke, the staff used Mr. Bear to individually introduce Jerry to “listening practice,” the command sequence, and the listening square. Although the staff’s use of effective commands during listening practice had increased, the TCIT trainer worked with the staff to move towards providing effective commands that targeted the specific disruptive behaviors of each child during class activities throughout the day (e.g., “Please put the car back on the shelf” rather than “Don’t play with the car. You are not allowed to play right now.”) The staff felt confident with the use of effective commands after a few weeks of practice; in addition, the coding of staff behavior during teacher-led play indicated that Mrs. Wilson and Mrs. Patrick were able to provide four effective commands with 100% effective follow-through to both compliance and noncompliance during one-on-one interactions with Luke and Jerry. Following the mastery of the TDI skills with one child at a time, the staff worked to incorporate the TDI skills in interactions where two or more children were present. Additionally, the TCIT trainer continued to coach Mrs. Wilson and Mrs. Patrick on their use of alternative behavior management strategies such as selectively attending and redirecting other children in the classroom during misbehavior.

The Sutter-Eyberg Student Behavior Inventory-Revised (SESBI-R; Eyberg & Pincus, 1999) was completed by staff for each child during each classroom visit throughout the course of TCIT. TDI mastery criteria were as follows: (a) child behavior within normal limits on the SESBI-R, (b) the teaching staff felt confident in managing classroom behavior, and (c) the teachers were able to consistently provide at least 4 effective commands with at least 75% effective follow through during teacher-directed interactions involving several children. Once the staff successfully completed TDI, the TCIT trainer worked with the teachers to schedule a follow-up classroom visit to monitor their maintenance of TCIT skills after treatment completion and to provide the teaching staff with any needed support.

## CONCLUSION

TCIT is an emerging training program to help teachers reduce noncompliant, aggressive, and other dangerous behaviors that disrupt classroom activities and contribute to teacher stress. TCIT borrows the two-phase treatment model of PCIT in which the first phase focuses on promoting positive relationships and providing differential reinforcement of appropriate behavior and the second focuses on consistent consequences for compliance, defiance, and aggression. Additionally, TCIT trainers provide in-vivo instruction and feedback to teachers on their use of behavior management skills to reach specified goals of skill use. As TCIT has

been implemented in more classrooms, slight variations in delivery have emerged due to challenges unique to working in the classroom with multiple children and in school settings with philosophies that differ about the inclusion of a “time-out” component. Research studies are currently being conducted to answer questions regarding the effectiveness of TCIT in decreasing disruptive behavior in the classroom, acceptability of program procedures, and practicality of implementation. However, TCIT shows promise in providing teachers with the behavior management skills to enhance the learning environment for their students. It is possible that TCIT may remediate the disruptive behavior of young children, and, thus prevent the academic and social problems associated with challenging behavior in later elementary and secondary schools as well as the related stress experienced by teachers.

## REFERENCES

- Axup, T., & Gersch, I. (2008). The impact of challenging student behaviour upon teachers' lives in secondary school: Teachers' perceptions. *British Journal of Special Education*, 35, 144-151.
- Beaman, R., Wheldall, K., & Kemp, C. (2007). Recent research on troublesome classroom behaviour: A review. *Australasian Journal of Special Education*, 31, 45-60.
- Bernhardt, A. J., & Forehand, R. (1975). The effects of labeled and unlabeled praise upon lower and middle class children. *Journal of Experimental Child Psychology*, 19, 536-543.
- Budd, K., Watkin, S. C., Legato, L., & Feuer, R. M. (2010, November). Development and pilot dissemination of teacher-child interaction training as a universal prevention model. In C. Campbell & D. J. Hansen (Chairs), *An innovative application of evidence-based practices to unite cognitive-behavioral therapists and teachers: Teacher-child interaction training*. Symposium conducted at the meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.
- Campbell, C., Martin, E. K., Hubel, G. S., Asawa, L. E., Flood, M. F., & Hansen, D. J. (2010). *University of Nebraska – Teacher-Child Interaction Training (UNL – TCIT): Therapist Manual*. Lincoln, NE: University of Nebraska-Lincoln Department of Psychology.
- Campbell, C., Martin, E. K., West, T., Hubel, G. S., Flood, M. F., & Hansen, D. J. (2010, November). Applying evidence-based practices to improve social and behavioral competence in preschoolers: Evaluating the effectiveness of teacher-child interaction training in head start settings. In C. Campbell & D. J. Hansen (Chairs), *An innovative application of evidence-based practices to unite cognitive-behavioral therapists and teachers: Teacher-child interaction training*. Symposium conducted at the meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.
- Campbell, S. B. (1995). Behavior problems in preschool children: A review of recent research. *Journal of Child Psychology and Psychiatry*, 36, 113–149.
- Carr, E. G., Taylor, J.C., & Robinson, S. (1991). The effects of severe behavior problems in children on the teaching behavior of adults. *Journal of Applied Behavior Analysis*, 24, 523-535.
- Costello, A. H., Chengappa, K., Stokes, J. O., Tempel, A. B., & McNeil, C. B. (in press). Parent-child interaction therapy for oppositional children: Integration of child-directed

- play therapy and behavior management training for parents. In A. A. Drewes, S. Bratton, & C. E. Schaefer (Eds.), *Parent- Child Interaction Therapy for Oppositional Behavior in Children: Integration of Child- Directed Play Therapy and Behavior Management Training for Parents*. Hoboken, NJ: Wiley.
- Ennis, C. D. (1996). When avoiding confrontation leads to avoiding conflict:Disruptive students' impact on curriculum. *Journal of Curriculum and Supervision, 11*, 145-162.
- Everett, G. E., Olmi, D. J., Edwards, R. P., Tingstrom, D. H., Sterling-Turner, H. E., & Christ, T. J. (2007). An empirical investigation of time-out with and without escape extinction to treat escape-maintained noncompliance. *Behavior Modification, 31*, 412-434.
- Eyberg, S. M. (1988). Parent-child interaction therapy: Integration of traditional and behavioral concerns. *Child & Family Behavior Therapy, 10*, 33-46.
- Eyberg, S. M., Nelson, M. M., & Boggs, S. R. (2008). Evidence-based psychosocial treatments for children and adolescents with disruptive behavior. *Journal of Clinical Child and Adolescent Psychology, 37*, 215-237. DOI: 10.1080/15374410701820117
- Eyberg, S. M., Nelson, M. M., Duke, M., & Boggs, S. R. (2005). Manual for the dyadic parent-child interaction coding system (3rd ed.). Retrieved October, 4, 2009 from www.pcit.org.
- Eyberg, S. & Pincus, D. (1999). Eyberg Child Behavior Inventory & Sutter-Eyberg Student Behavior Inventory-Revised: Professional Manual. Odessa, FL: Psychological Assessment Resources.
- Eyberg, S. M., & Robinson, E. A. (1983). *Dyadic parent-child interaction coding system: A manual*. San Rafael, CA: Social and Behavioral Science Documents.
- Farrington, D. P. (1995). The development of offending and antisocial behavior from childhood: Key findings from the Cambridge study in delinquent development. *Journal of Child Psychology and Psychiatry, 36*, 929-964.
- Filcheck, H. A., McNeil, C. B., & Herschell, A. D. (2001). Types of verbal feedback that affect compliance and general behavior in disruptive and typical children. *Child Study Journal, 31*, 225-247.
- Filcheck, H. A., McNeil, C. B., Greco, L. A., & Bernard, R. S. (2004). Using a whole-class token economy and coaching of teacher skills in a preschool classroom to manage disruptive behavior. *Psychology in the Schools, 41*, 351-361.
- Finn, J. D., Pannozzo, G. M., & Voelkl, K. E. (1995). Disruptive and inattentive-withdrawn behavior and achievement among fourth graders. *The Elementary School Journal, 95*, 421-434.
- Gershenson, R. A., Lyon, A. R., & Budd, K. S. (2010). Promoting positive interactions in the classroom:Adapting parent-child interaction therapy as a universal prevention program. *Education and Treatment of Children, 33*, 261-287.
- Hanf, C. (1969). *A two-stage program for modifying maternal controlling during mother-child (M-C) interaction*. Paper presented at the meeting of the Western Psychological Association, Vancouver.
- Hood, K. K., & Eyberg, S. M. (2003). Outcomes of parent-child interaction therapy: Mothers' reports of maintenance to six-years after treatment. *Journal of Clinical Child and Adolescent Psychology, 32*, 419-429.
- Kurtz, S. M., Fernandez, M. A., Miller,, S., Madigan, R. J, Firpo, Y., DiMotta, R., Owens, M., & Golub, S. (2010, November). Extant issues in the implementation of teacher-child

- interaction training by other disciplines in other settings. In C. Campbell & D. J. Hansen (Chairs), *An innovative application of evidence-based practices to unite cognitive-behavioral therapists and teachers: Teacher-child interaction training*. Symposium conducted at the meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.
- Loeber, R., Burke, J. D., Lahey, B. B., Winters, A., & Zera, M. (2000). Oppositional defiant and conduct disorder: A review of the past 10 years, part I. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 1468-1484.
- Lyon, A. R., Gershenson, R. A., Farahman, F. K., Thaxter, P. J., Behlig, S., & Budd, K. S. (2009). Effectiveness of teacher-child interaction training (TCIT) in a preschool setting. *Behavior Modification*, 33, 855-884.
- McIntosh, D. E., Rizza, M. G., & Bliss, L. (2000). Implementing empirically supported interventions: Teacher-child interaction therapy. *Psychology in the Schools*, 37, 453-462.
- McNeil, C. B., Capage, L. C., Bahl, A., & Blanc, H. (1999). Importance of early intervention for disruptive behavior problems: Comparison of treatment and wait-list control group. *Early Education and Development*, 10, 445-454.
- McNeil, C. B., Eyberg, S. M., Eisenstadt, T. H., Newcomb, K., & Funderburk, B. (1991). Parent-child interaction therapy with behavior problem children: Generalization of treatment effects to the school setting. *Journal of Clinical Child Psychology*, 20, 140-151.
- Nixon, R. D. V. (2001). Changes in hyperactivity and temperament in behaviourally disturbed preschoolers after parent-child interaction therapy (PCIT). *Behaviour Change*, 18, 168-176.
- Rork, K. E., & McNeil, C. B. (2008). A behavioral model of school consultation. *Behavior Therapist*, 31, 69-73.
- Tempel, A., & McNeil, C. B. (2010, November). The implementation of teacher-child interaction training in a rural head start setting. In C. Campbell & D. J. Hansen (Chairs), *An innovative application of evidence-based practices to unite cognitive-behavioral therapists and teachers: Teacher-child interaction training*. Symposium conducted at the meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.
- Tempel, A. B., Wagner, S. W., & McNeil, C. B. (2008). Parent-Child Interaction Therapy and Language Facilitation: The Role of Parent-Training on Language Development. *Journal of Speech-Language Pathology and Applied Behavior Analysis*, 3, 78-94.
- Tempel, A. B., Wagner, S., McNeil, C. B. (2010). *Parent-child interaction therapy: The effects of parental attention components on children's verbalizations and attending-to-task behaviors*. Manuscript submitted for publication.
- Tiano, J. D. (2010). Teacher-child interaction therapy for preschool classrooms. In C. B. McNeil & T. Hembree-Kigin (Eds.): *Parent-Child Interaction Therapy* (2nd ed. pp. 385-391). New York: Springer.
- Tiano, J. D., & McNeil, C. B. (2006). Training Head Start teachers in behavior management using parent-child interaction therapy: A preliminary investigation. *Journal of Early and Intensive Behavior Intervention*, 3, 220-233.

## ***Chapter 5***

# **URBAN CLASSROOM PEDAGOGY: THE ROLE OF SCHOOL-WIDE TEACHER-DIRECTED CONSULTATION**

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## **ABSTRACT**

Teachers establish beliefs and skills during the first few years on the job. Even the most dedicated teachers in urban school face daily challenges in the classroom that can be defeating. Teaching requires much more than dedication. Many teachers in urban schools select the job because of availability, not first choice. Many teachers lack the contextual or personal experience to understand the culture of urban schools. The high turn-over rate of teachers in urban schools is one consequence of the under-preparedness and limited supports available to novice teachers in urban settings. Yet, this consequence continues to be a foundational problem within the school. If schools have only novice teachers, there by availability and not by choice, who are learning how to teach, how can the school meet the goals and objectives of improving student learning outcomes and meeting adequate levels of academic and social proficiency? It is a self-perpetuating cycle that perplexes and frustrates urban school administrators.

In this study, the administrative staff of an urban elementary school with a student population at a 99% poverty level set about to cultivate a new culture within the school. Their ambition was to build a climate of support for teachers by starting with the goal of improving teacher effectiveness in the classroom. In order to improve their instructional skill set, urban teachers volunteered to participate in a 2-year teacher-directed consultation designed to improve instructional efficacy in the urban classroom. The study began with novice teachers (less than 3 years urban teaching experience) completing a teacher survey which assessed their beliefs about urban students' abilities to learn. Following the survey, teachers were observed monthly throughout the school year using an Urban Classroom Checklist (UCC). The UCC, an ecological assessment, evaluated classroom environment, instruction, research-based practices, and feedback. After each observation, the authors consulted with teachers to provide (a) specific instructional feedback on their teacher behaviors during instructional time, (b) instructional

recommendations, and (c) a written formative summary, from the UCC. Specific and individualized targeted pedagogical skills such as teacher transition time, teacher proximity, a ratio of positive/negative comments, and student opportunities to response were measured and discussed with the novice teachers. The strategy of (a) regular, ongoing, monthly observations and (b) ongoing consultation, and (c) performance feedback and dialog, suggests that heightening teachers' self-awareness of their performance was an effective method for making measurable gains in teaching practices.

## **INTRODUCTION**

Parker Palmer (1998) states good teaching is the intentional act of creating an educational environment that helps students learn. Unfortunately, many poor-urban schools abandon sound pedagogical practices and professional development in favor of what Martin Haberman, in 1991, called a pedagogy of poverty. Researchers in urban schools and classrooms have noted that in spite of multiple forms of sound, evidenced-based teaching practices available (e.g. direct instruction, cooperative learning, differentiated instruction, applied behavior analysis, scientific inquiry); there is an accepted basic form of teaching in urban schools (Belfiore, Auld, & Lee, 2005; Carey, 2004; Haberman, 1991). Nygreen (2006) noted that decades of sound educational research has done little to disrupt familiar schooling patterns of school failure. Through a series of classroom observations, Haberman (1991) documented a number of education practices that taken separately, and used occasionally may have some fundamental educational effect (see Table 1).

Haberman (1991) does not suggest that these basic educational practices exhibited by urban teachers, and "constitute the core functions of urban teaching" (p. 291) are unnecessary or obsolete. Only when these practices are chosen and performed in the classroom at the systematic exclusion of other, evidenced-based, best teaching practices do teachers begin to approach and embrace this pedagogy of poverty.

**Table 1. Basic Educational Practices That Constitute the Core Function of Urban Teaching (adapted from Haberman, 1991)**

|                                      |
|--------------------------------------|
| Ask Questions in Classroom           |
| Give Directions to Students          |
| Develop and Deliver Assignments      |
| Monitor Independent Seatwork         |
| Review Student Assignments           |
| Give Information to Students         |
| Give and Review Tests and Quizzes    |
| Assign, Collect, and Review Homework |
| Settle Classroom Disputes            |
| Punish Student Noncompliance         |
| Give Student Grades                  |
| Mark Student Written Assignments     |

At the core of this curricular deconstruction is the widespread teacher belief, that students enrolled in poor-urban schools cannot be successful (Carey, 2004; Hilliard, 2003; Nygreen, 2006; Rist, 1972; Terrill & Mark, 2000; Warren, 2002) and/or this lack of student success is not the fault of the instructional environment (McLaren, 2003; Thompson, Warren, & Carter, 2004). Lack of parental support, lack of parent education, lack of technology, lack of school/community funding, and/or economic struggles at home are just a few of the held beliefs as to why students underachieve. Often times these untrue and unfounded, yet pervasive beliefs by teachers are based on a teachers' lack of contextual and personal experiences to understand the culture of the urban school and community (Thompson, et al., 2004). It is these beliefs that drive the behavior of teachers to create what Belfiore et. al., (2005) and others (Carey, 2004; Haberman, 1991) identify as watered-down pedagogical practices and curriculums where students can do nothing more than underachieve. For example, following a series of teacher interviews in urban schools, Warren (2002) reported that low teacher expectations, and lack of accountability often resulted in lowering teaching standards, less teacher effort, and a watered-down academic curriculum for underachieving students. This was especially true in poor-urban schools (Warren, 2002).

The result of repeated exposure to poor educational practices and a watered-down curriculum, is student under-performance as evidenced by a lack of academic and social competency. If, for example, teachers believe students in their classroom cannot achieve, then teacher expectations are lowered and curriculum is watered-down to meet the "teacher-perceived" low academic level of students. Students repeated exposure to a less-than challenging academic curriculum results in real student underachievement, which in turn reinforces (a) teacher belief that some students require less academic challenge, and (b) teacher behavior to maintain instructional delivery at the water-down, less rigorous level. This final outcome, a self-fulfilling prophecy is described by Belfiore et al. (2005) and Carey (2004), but originally identified by Rist in 1970 as "the self-fulfilling prophecy in ghetto education" (p.411). Additionally, Lane (2008) stresses that such repeated exposure to poor pedagogical practices and academic failure results in student expecting to fail before ever trying.

In contrast to this rather nihilist, "banking" approach to educational, Freire (1998) and others (Conroy, Sutherland, Snyder, & Marsh, 2008; hooks, 2003; Kunjufu, 1985; McLaren, 2003) insist on a pedagogy that establishes dialog as the foundation. Freire (1998) suggests that a dialogic pedagogy occurs when two learners occupy a connected, but somewhat different space in an ongoing educational interaction. In such a dialogical pedagogy, teachers are providing instruction to, and learning from, their students. Such an ongoing reciprocal interaction between student and teacher establishes a dynamic classroom environment that includes effective class-wide pedagogical practices (Conroy et. al., 2008). Conroy, et al. (2008) continues by suggesting such a classroom is more likely to (a) have positive teacher-student interactions, (b) promote student engagement, and (c) minimize problem classroom behaviors.

## EVIDENCED-BASED PEDAGOGICAL PRACTICES IN THE CLASSROOM

While non-urban and non-poor schools continue to take for granted rich, meaningful academic curricular opportunities (Cuban, 2004), poor-urban schools continue providing increased paper and pencil practice in test-specific content (e.g. reading and mathematics). Poor teaching practices, requiring only the basic levels of knowledge comprehension by students, undercut any real teaching and learning accountability efforts (Hilliard, 2003), and urban schools employing such poor teaching practices should be called to question (Belfiore, et al., 2005).

Conversely, in describing a pedagogy of risk-taking, Belfiore et al., (2005) demonstrated that student academic achievement was a result of such evidenced-based, pedagogical practices as increasing active student participation, placing students in small ability-level group, and implementing differentiated instruction. Belfiore et. al., (2005) showed that using curriculum-based assessment data to guide teachers in (a) determining student ability-grouping and (b) differentiate academic instruction resulted in increased early literacy skills, as measured by the Woodcock Reading Mastery Test –Revised/NU (Woodcock, 1998), for students enrolled in two, K-8 urban schools. The use of curriculum-based assessment data as a foundation to differentiated academic instruction is the only choice for teachers who will not accept a classroom where more and more students are becoming less and less successful (George, 2005).

In general, instructional environments, including urban classrooms, where such evidenced-based practices as teacher-centered classroom practices and positive behavior supports have been incorporated, teachers have been successful, and students have increased learning (e.g. Alvarado-Gomez & Belfiore, 2000; Auld, Hayes, & Belfiore, 2009; Belfiore, Lee, Spicer, & Dexter , 2008; Campbell-Whatley & Comer, 2000; Hutchinson & Belfiore, 1998; McCurdy, Kunsch, and Reibstein, 2007; Shippen, Houchins, Steveton, & Sartor, 2005; Trussell, 2008).

### Teacher-Centered Classroom Practices

In an analysis of elementary school teachers, Thompson, Ransdell, & Rousseau (2005) found that effective teachers whose students scored high on achievement tests in urban school settings actively engaged their students in learning in a teacher-centered classroom. Educational practices often associated with the teacher-centered classroom include components of direct instruction and academic engagement, including (a) small group instruction, (b) multiple opportunities for student responding to academic-specific content, (c) immediate and instructional teacher feedback, (d) increased student time on meaningful academic tasks, (e) explicit teacher directions and prompts, (f) teacher modeling of correct academics, (g) positive consequences following student response, (h) instructional pacing, (i) wait time, (j) teacher proximity (Auld, et al., 2009; Belfiore & Agramonte, 2002; Engelmann, Becker, Carnine, & Gersten, 1988; Hoadley, 2003; Thompson et al., 2005).

If students learn by doing, and learn more by doing more, it makes educational sense that if classroom teachers increase the number of opportunities for students to “do” academics then more student learning will occur. At the heart of the teacher-centered classroom is the

goal of systematically increasing the opportunities students have to academically respond in the classroom. Greenwood, Delquadri, and Hall (1984), define student opportunity to respond as an interaction between teachers instructional prompts, materials, and/or questions, and the success of those strategies to establish and increase student responding. Greenwood et al., (1984) also stress the importance of active, not passive, student responding. Examples of active student responding may include (a) student academic writing as prompted by a guided notes format, graphic organizers, or web maps (b) student academic talk such as answering academic-specific questions or engaging in class-wide, small group, or peer mentoring discussion or debate, (c) student academic choral responding, where whole class or small groups verbally respond to academic-specific questions, and (d) student presentation of response cards (e.g., pre-printed true-false/yes no cards, individual sized dry erase boards) in response to teacher-delivered questions (Alvarado-Gomez & Belfiore, 2000; Blackwell & McLaughlin, 2005; Conroy et al., 2008; Greenwood et al., 1984; Nies & Belfiore, 2006). Conversely, passive student responding includes (a) students looking at a teacher lecture, (b) students watching a video or power point presentation, and/or (c) students waiting for teacher assistance during in-seat assignments.

Increasing student opportunities to respond in the teacher-centered classroom becomes much more of a learning situation when teacher corrective feedback follows. Teacher feedback takes the form of corrective feedback when a student actively responds in error to the academic cue. For example, if the academic cue is "What is the state capital of Pennsylvania?" and the student response is "Bethlehem" then teacher corrective feedback may be "No, the state capital of Pennsylvania is Harrisburg." Additionally, teachers might ask the student or class (i.e., choral responding) to repeat the correct answer, once the teacher provided the correct answer. Corrective feedback may be provided by the classroom teacher, or embedded in a lesson where response cards (in the form of individual dry erase boards) are used by the student. In a study by Nies and Belfiore (2006), students acquired and retained more spelling words when they were instructed to cover the correct word written on a dry erase board, write their answer, make a visual discrimination of accuracy between the pre-written correct word and their written word (i.e., self-evaluation), and if incorrect, correct the error immediately (i.e., self-correction).

## Positive Behavior Support

Teachers in urban settings must be more knowledgeable and better prepared in classroom management strategies that create a supportive academic environment than those teachers working in non-urban settings (McKinney, et al., 2005). One set of strategies that establish management and support in the classroom is positive behavior supports (PBS). Trussell (2008) suggests that the fundamental intent of PBS is to establish an instructional environment that (a) supports and teaches social and academic behaviors, while (b) preventing the occurrence of problem behaviors. PBS provides teachers specific techniques to assist students to learn the appropriate skills, rather than allowing teachers to continually react to the problem behaviors.

Unfortunately, many classroom teachers continue to respond after the problem behavior has occurred, utilizing consequential, correction strategies to manage their classroom rather than develop positive, pre-correction strategies. McCurdy, et al., (2007) identify such

“default” strategies as reactive and typically involve punishment, including verbal reprimands, time-out, response-cost, detention, in-school suspension, and expulsion. In addition to the limited learning effectiveness to the targeted student, these punitive practices may cause a ripple effect to the behaviors of other students in the classroom, and ultimately may result in diminishing the overall success of the classroom (Soodak, 2003).

The emphasis in PBS is on teaching the student to use more appropriate strategies to handle his or her classroom behaviors, rather than teachers responding with the more traditional method of reacting to inappropriate behaviors by applying punishment (Auld, Belfiore, & Scheeler, 2007; McKinney, et al., 2005). The result is an improved learning environment for all students. Within a model of PBS teachers are directed to establish class-wide or individualized interventions that increase effective instruction and teach and/or maintain positive behaviors while incorporating social skills training in a culturally responsive pedagogy (McKinney et al., 2005). Auld et al., (2007) suggests the intention of PBS is for teachers to instruct students to use appropriate skills to achieve the same outcome as the inappropriate skills they have been using. For example, if students are continually engaging in talking out behavior (inappropriate skill), then the teacher might develop a systematic program to teach and reinforce hand raising (appropriate skills). In such a situation the teacher would ignore student talking out behavior while differentially reinforcing an alternative behavior (DRA), hand raising. Talking out and hand raising may be functional equivalent (i.e., to access teacher attention), but hand raising is certainly a more appropriate classroom skill to gain teacher attention.

Although sound pedagogical practices, as defined as evidenced-based or research-based, exist, translating that research into everyday classroom applications appears to be lacking (Goldenbrg, Kunz, Hamburger, & Stevenson, 2003). Reinke, Lewis-Palmer, and Merrell (2008) add that even when evidenced-based/research-based strategies are translated into classroom practices, class-wide implementation of those strategies is difficult. Additionally, this inability to translate and implement evidenced-based strategies into classroom practices that are both academically rigorous and culturally responsive contributes to the high attrition rates among teachers in urban schools (McKinney et. al., 2005).

## **TEACHER RETENTION AND PROFESSIONAL DEVELOPMENT**

Ingersoll (2004) reported that annual public teacher turnover in urban, high-poverty school was at 22.0%, whereas low-poverty teacher turnover was at 12.8% annually, and the overall annual all public teacher turnover was at 15.1%. Additionally, low-income and high-minority schools are consistently staffed by the highest number of under-prepared teachers (National Commission on Teaching and America's Future, 2002). For example, in California, schools with 76-100% of their students eligible for free or reduced-priced lunches had a teaching staff where 22% were without full credentials, whereas schools with 0-25% of their students eligible for free or reduced-priced lunches had a teaching staff where only 7% were without full credentials (National Commission on Teaching and America's Future, 2002). Additionally, in California, schools with a minority student population of 91-100% had a teaching staff where 26% were without full credentials, whereas schools with a minority

student population of 0-30% had a teaching staff where only 5% were without full credentials.

Professionals in the field of education have been repeatedly suggested that more needs to be done to increase and retain the numbers of accomplished teachers in urban settings (Abbate-Vaughn, Frechon, & Wright, 2010; National Commission on Teaching and America's Future, 2002). Ingersoll (2004) and others (McKinney et al., 2005) indicates that qualified urban teachers are scarce, and poor teacher retention exacerbates the problem. Quality teaching is grounded in preparation, initially at the pre-service level, but continuing, and on-going, at the in-service level (Auld, et al., 2010; Carey, 2004). Ultimately, the Ingersoll (2004) report concludes by suggesting the recruitment of more teachers will not solve staffing inadequacies, rather it is an issue of retention.

It is difficult to retain teachers in urban schools when they are under-prepared and under-certified to provide the quality education expected (Carey, 2004; National Commission on Teaching and America's Future, 2002). Hurwitz and Hurwitz (2005) stress that even with the best pre-service education carried out in institutions of higher education by schools of education, most novice teachers enter their first classroom under-prepared for the academic and social demands of helping children learn. The solution often recommended and carried out by a majority of K-12 schools is the pre-school year in-service where the teaching and school administrative staff gather for several days engaging in school policy and professional development. Additionally, several additional days are set aside throughout the school year for additional policy and practice discussions. Carey (2004) suggests that too often such K-12 in-services are "temporary and scattershot." (p. 22). Other criticism of the traditional approach to school in-services include (a) the use of in-services as add-ons, not truly integrated into the structure of the schools practice or school policy, (b) the focus on individual students as targets for intervention, not class-wide ecologies, (c) the lack of follow-up to monitor if best-practices introduced to teachers early in the school year are part of the classroom pedagogy throughout the year, (d) the under-utilization of corrective feedback on teacher instructional performance, and (e) a lack of on-going professional development throughout the school year (Carey, 2004; Hurwitz & Hurwitz, 2005; Kennedy & Shiel, 2010; Mautone, Luiselli, & Handler, 2006; Reinke et al., 2008).

Conversely, Kennedy and Shiel (2010) describe a collaborative teacher in-service program that (a) links school-wide practices with individual teacher preparation, (b) differentiates instruction to students needs, and (c) links classroom-based assessment with instruction through a sustained, intensive on-site professional development. Additionally, Hurwitz and Hurwitz (2005) recommend that any professional development in-service should be integrated into the current pedagogical practices of the school, should include both novice and experienced teachers, and should include release time and stipends for those teachers serving a mentorship role.

Both Mautone et al., (2006) and Reinke et al., (2008) suggest that a vital component of any effective professional in-service must include on-going teacher directed consultation. Fundamental to any consultation is the frequent use of performance feedback. Prescriptive, individualized, performance feedback provided routinely during on-going consultation encourages dialog among teachers and consults, as well as provides a blue print from which to build better pedagogical classroom skills.

The purpose of this project was to examine the impact of (a) direct classroom observations, (b) on-going/year-long consultation, and (c) individualized performance

feedback within a close time frame to our direct classroom observations on the pedagogical classroom practices of novice teachers in an urban school.

## METHODOLOGY

### Participants and Setting

Participants in this study included teachers with less than 3 years of urban teaching experience plus one teacher with extensive experience who voluntarily chose to participate with the intention of receiving performance feedback that would help them to improve their teaching effectiveness. The first year of the study began with a cohort of nine teachers. The year ended with seven of the nine teachers remaining in the cohort. The second year began with a cohort of ten different teachers volunteering to participate, with nine of the ten completing the year.

The study took place in an urban K-8 school for students from homes identified in the 99% poverty level. Nearly every classroom had several students identified as English language learners, and the school had high levels of transiency among the student population. The school building was nearly 70 years old, and in need of significant structural repairs. Class size ranged from 22 - 28 students, with one self-contained teacher. Rarely were teachers provided any classroom aides to assist in the classroom.

The initial invitation to participate was presented to the entire teaching staff at the first professional development in-service training for the teachers in August. A brief overview of the use of positive behavior supports and successful classroom management strategies was presented by the two authors, along with an invitation to participate in this unique professional development opportunity.

At the outset of the planning for the year-long consultation, the authors met with the school's administrative team (co-principals) to discuss observation schedules, implementation plans, survey instruments, and classroom observation tools. Following the meeting, the co-principals decided they would incorporate our models of evidence-based practice into their annual teacher evaluations.

One further interesting dimension of this consultation was the level of support provided by the co-principals. The administration approached the authors seeking a unique plan for professional development wherein novice teachers who expressed an interest in improving their performance could participate in cohesive, on-going professional development throughout the school year. Their long-term plan was to imbed professional development practices into day-to-day teaching best practices, replacing the typical one-size-fits-all professional development model common within most school district, which often has no measurable impact from the dollars and time invested.

Both the authors and co-principals were in agreement that we would not share any specific observational data or details with the administrators, so as to preserve the level of trust the authors had attained with the classroom teachers.

**Table 2. Teacher Belief-Instructional Behavior Survey  
(Developed by Belfiore & Auld 2006)**

Please check the response indicating the extent to which you believe each of the following statements are relevant as teachers in your school.

SD-Strongly Disagree D-Disagree U-Uncertain A-Agree SA-Strongly Agree

|  | SD | D | U | A | SA |
|--|----|---|---|---|----|
| 1. Children are eager to learn new things  |    |   |   |   |    |
| 2. Children are naturally curious  |    |   |   |   |    |
| 3. Children achieve as a direct result of teacher expectations   |    |   |   |   |    |
| 4. Once a student begins to experience success, they continue to strive for success                              |    |   |   |   |    |
| 5. A teacher is very influential in cultivating a student's confidence level                                     |    |   |   |   |    |
| 6. The classroom environment needs to be controlled to make success possible for some students                   |    |   |   |   |    |
| 7. Teachers should strive to help each child reach his/her fullest potential                                     |    |   |   |   |    |
| 8. The educational background of the parent greatly influences how successful a student will be in the classroom |    |   |   |   |    |
| 9. It is the teacher's responsibility to nurture a culture of respect in the classroom                           |    |   |   |   |    |
| 10. One of the teachers' many jobs is to be responsive to students' parents                                      |    |   |   |   |    |
| 11. Students from single parent homes struggle in school   |    |   |   |   |    |
| 12. Teachers should allow students to have opinions in the classroom, even if they differ from the teachers      |    |   |   |   |    |
| 13. Student's work is a demonstration of student's competency, and as such should be valued                      |    |   |   |   |    |
| 14. Competition between students in the classroom can be very damaging to students                               |    |   |   |   |    |
| 15. Students who excel at non-academic skills should be recognized for their accomplishments                     |    |   |   |   |    |
| 16. Sometimes a teacher must put a student's needs over personal preference of staff                             |    |   |   |   |    |
| 17. All people deserve respect, and in such teachers must model this in the classroom                            |    |   |   |   |    |
| 18. Students from economically poor environments can demonstrate excellence and high level learning              |    |   |   |   |    |
| 19. All human beings are learning organisms  |    |   |   |   |    |
| 20. Healthy school environments can help students to overcome limitations from their home environment            |    |   |   |   |    |
| 21. Success in school builds a sense of efficacy in students   |    |   |   |   |    |

Instructor \_\_\_\_\_ Curriculum Area \_\_\_\_\_ Date \_\_\_\_\_  
 Observation Time \_\_\_\_\_ Number of Observations this Month \_\_\_\_\_

### **Environment**

|   | Yes | No | Additional Comments |
|---|-----|----|---------------------|
| At least 90% of the students are engaged (asking questions, raising hands, on-task) |     |    |                     |
| Room noise level is conducive to learning   |     |    |                     |
| Best student works displayed  |     |    |                     |
| Daily and or weekly schedule displayed  |     |    |                     |
| Classroom rules are displayed   |     |    |                     |
| Group/individual contingency plans are designed and displayed                       |     |    |                     |
| Students are asking questions related to topic                                      |     |    |                     |
| Teacher displays good proximity   |     |    |                     |

### **Instructional Practices**

|   | Yes | No | Additional Comments |
|---|-----|----|---------------------|
| Directions are given in clear and precise manner                            |     |    |                     |
| The teacher knows the subject material                                      |     |    |                     |
| Multiple methods of instruction are used (lecture, discussion, small group) |     |    |                     |
| Teacher allows 5-10s after asking academic question before moving on        |     |    |                     |
| Pre-correction or preview strategies are observed                           |     |    |                     |
| Pacing of lesson is appropriate for students' skill level                   |     |    |                     |
| Smooth transitions, including precise closure, & directions for new lesson  |     |    |                     |

### **Research-Based Practices**

|   | Yes | No | Additional Comments |
|---|-----|----|---------------------|
| The lesson utilizes Professional Development strategies |     |    |                     |

\_\_\_\_%    \_\_\_\_%

### **Student–Teacher Interactions (use seating chart)**

|                                       | Frequency | Additional Comments |
|---------------------------------------|-----------|---------------------|
| Teacher assistance given (A)          |           |                     |
| Teacher-initiated questions asked (T) |           |                     |

### **Feedback**

|  | + | - | Additional Comments |
|--|---|---|---------------------|
| General classroom feedback<br>(e.g. "the class is working hard today," "everyone get quiet") |   |   |                     |
| Individual feedback (e.g. "John, I like the way you are working," "John, stop that")         |   |   |                     |

Graduate Special Education, Mercyhurst College (2006)

Figure 1. Urban Classroom Checklist: Developed by Belfiore and Auld (2006).

## Data Collection

### ***Teacher Beliefs***

The Teacher Belief–Instructional Behavior Survey (TB-IBS) (Table 2), used to measure urban teachers' beliefs undergirding daily classroom practices, was issued to teachers at the introductory meeting, before the first in-classroom observation sessions were held. Pre (September) and post (May) TB-IBS data were collected. The study took place across two years at the same school. However, each subset of data (pre and post survey) were self-contained, different teachers participated each of the two years (i.e., Year 1-Teacher Cohort 1; Year 2-Teacher Cohort 2). One of the first year participants was asked to continue on for a second year.

### ***Classroom Direct-Observations***

Monthly in-class 20-minute direct observations were scheduled in participating teachers' classrooms on Tuesdays using the author-created Urban Classroom Checklist (UCC) (see Figure 1). This observation tool, which was a type of ecological assessment, was divided into five sections measuring (a) classroom environment, (b) instructional practices, (c) teacher's use of research-based practices (d) teacher-student interactions, and (e) teacher feedback. Methods of classroom instruction varied during each observation. A follow-up consultation was held within two days of observations each month.

## Procedures

### ***School-Wide In-Service***

The two authors were asked by the co-principals to present an overview of the proposed school-wide consultation to the entire faculty, staff, and administration of the school during the school's professional development prior to the start of the academic school year. The brief presentation included three general areas for discussion (a) ground rules/non-negotiables (e.g., there is no teaching without learning, learning occurs when good teachers talk to each other about good teaching, we are responsible for the successes and failures of all our school children, the gap is one of potential-all children have potential, and good teaching is the most creative way to manage and engage a class), (b) assessing where to begin (e.g., curriculum match-not mismatch-the role of curriculum-based assessment, do we know who we teach?), and (c) try prevention, not reaction (e.g., reprimands may be rewards, positive parent communication, catch children being good, class-wide: tokens/raffles/red-yellow-green, consider non-contingent reinforcement, first hour needs, and peers are powerful). The purpose of the brief 30-minute in-service to the school was to introduce pedagogical expectations and recruit volunteers.

### ***Classroom Direct Observations***

Classroom teachers identified their preferences for the observation times, and as a result they were aware that the observation was scheduled. All teachers were asked to provide a seating chart of students for use by the authors in the data collection process during the 20-minute observation. The classroom seating charts allowed the authors to monitor the (a)

frequency of students' opportunities to respond (teacher questions and teacher assistance given), and (b) distribution of teacher questions and assistance across the classroom. Data were gathered using the UCC on conditions of the classroom environment and instructional practices, such as teacher's posting of classroom rules and consequences, teacher's display of student work, student behavior charts, instructional pacing, and teacher proximity (See Figure 1). In addition to student-teacher interaction data gathered from the seating charts, classroom observations included (a) percentage of yes/no items from the UCC, and (b) teacher feedback defined as positive and negative comments from the teacher. Observations involved the authors entering the classroom during instructional times. During these observations, interactions between the researcher and the teacher were kept to a minimum so as not to disrupt the flow of teaching.

### ***On-Going Consultation***

Following each session, the two authors tabulated data from the UCC, identifying common patterns and concerns among the classroom. The authors prepared prescriptive individualized performance feedback reports for each teacher. In addition, the authors prepared a brief (10-15 minute) professional development workshop discussion to take to the teachers. The on-going consultations and performance feedback built the connection among identified pedagogical issues, classroom data gathered, data-based instructional decision making, and planning for more effective classroom practices. Consultations held with the teachers were useful to provide positive supports, feedback, and practical answers to the teachers in a responsive, timely manner. Overall, sample topics discussed during consultation addressed classroom management strategies which are typically the most challenging dimension of teaching for any beginning teacher, but conditions in urban setting often exacerbate novice teachers' abilities to effectively manage student behaviors. Specifically the range of topics focused on increasing opportunities to respond, pacing, transitions, strategies for responding to student behaviors, and increasing academic engagement.

During on-going consultation, each teacher was given a written (1-2 page) summary of the previous classroom observations, and specific tips and suggestions for improvements. Consultations were held in the school's library, immediately after the school day ended, and lasted typically 30 minutes. Additionally, teachers were given a short research-based article to read on the topic of discussion for that month. Table 3 provides a list of topics and articles provided. Among the objectives for this project, the administrative staff had expressed an interest in building a professional community among the teaching staff, one in which teachers would have common positive experiences and a willingness to discuss classroom practices openly in positive, effect terms. The regular monthly meetings were intentionally designed to facilitate such conversations and dialogs, and hopefully inspire common bonds that would be repeated throughout the school.

## **RESULTS AND DISCUSSION**

The purpose of this project was to improve teacher efficacy by providing (a) direct classroom observations, (b) on-going consultation, and (c) performance feedback within a close time frame to our direct observations. The results of this two-year school-wide teacher-

directed consultation are discussed in three dimensions. First, a pre and post assessment tool, the Teacher Belief–Instructional Behavior Survey (TB-IBS) was administered to participating cohorts of teachers from Year 1 and Year 2. The TB-IBS gathered data addressing teacher beliefs and perceptions of their preparedness and teacher efficacy. Second, we evaluated the data from the Urban Classroom Checklist (UCC) of evidenced-based practices from individual teacher's classroom observation sessions and aggregated for the purpose of drawing generalizable conclusions. Lastly, we discuss the results of several individual teachers' cases from the consultation.

## **TEACHER BELIEF–INSTRUCTIONAL BEHAVIOR SURVEY**

Several experts in urban education have suggested that the teacher's beliefs often sell the students short of successful academic performance (e.g., Rist, 1970; Thompson et al., 2004; Warren, 2002). The surprising results of the TB-IBS indicated that among the novice teachers surveyed, most believed that student success was attainable within their classroom. Most teachers answered the survey questions with equally strong indications (pre- and post-survey results) that the teacher was responsible to demonstrate respect, cultivate habits for success in the students and establish a healthy classroom environment for learning. These teachers did not cite the typical excuses of poor parenting, economic limitations or poor school resources as causation for the poor student academic performance (e.g., Questions 8 and 11). In contrast, these teachers answered the survey indicating that the individual teacher's expectations of student behaviors were directly responsible for the students' performance (e.g., Questions 3 and 5). The response to these questions was consistent from pre- and post-survey results.

Overall, there was little measurable change between the pre-professional development program and the post-professional development survey results. This trend held fast within the Year 1 Cohort as well as within the Year 2 cohort of teachers. If the teachers believe the students could perform successfully, then the problems might potentially lie within the teacher's ability to manage day-to-day classroom challenges. This became the starting point for our year-long school-wide consultation.

## **Urban Classroom Checklist (UCC)**

Overall impact of teaching effectiveness was measured by the percent correct on the UCC used to measure various aspects of the classroom learning environment. The classroom teacher and the two authors entered into an unwritten contractual arrangement wherein the teacher opened the classroom for observation and professional performance feedback. All participants held current teaching certificates, which included training in classroom management. From the first observation, specific feedback was provided to each individual teacher to enhance teaching efficacy as well as management practices, as reflected in the increases in percent correct on the UCC and increase in teacher use of positive comments toward student behaviors. There was a measurable improvement across all teachers.

**Table 3. Mercyhurst College Graduate Education Program: School-Wide Consultation Professional Development Overview**

|               | Month     | Professional Development   | Teachers Attending | Resources Provided   |
|---------------|-----------|--|--------------------|--|
| <b>Year 1</b> |           |  |                    |  |
|               | August    | Classroom management strategies and positive behavior supports                     | School-wide        | Mercyhurst College Classroom Management Guidebook. Developed by Belfiore & Auld.   |
|               | October   | Whole group management   | 10                 | Friend, M., & Pope, J., (2005). Creating schools in which all students can succeed. <i>Kappa Delta Pi Record</i> , 41, 56-61.  |
|               | November  | Academic engagement and positive communications                                    | 10                 | George, P.S., (2006). A rationale for differentiating instruction in the regulate classroom. <i>Theory into Practice</i> , 44, 185-193.  |
|               | January   | Pacing of lessons and transitions  | 9                  | Hoadley, U., (2003). Time to Learn: pacing and the external framing of teachers' work. <i>Journal of Education for Teaching</i> , 29, 265-274.   |
|               | February  | Giving precise directions  | 9                  | Catt, S., Miller, D., & Schallenkamp, K., (2007). You are the key: Communicate for learning effectiveness. <i>Education</i> , 127, 369-377.  |
|               | April     | Motivation, feedback and student attention   | 8                  | McKinney, S., Campbell-Whately, & Kea, C., (2005). Managing student behavior in urban classrooms: The role of teacher ABC assessments. <i>The Clearing House</i> , 79, 16- 20.   |
|               | May       | Aligning appropriate engaging activities to students' present level of performance | 8                  | Henjum, A., (2001). Let's select "self-actualizing teachers. <i>Education</i> , 104, 51- 55.   |
| <b>Year 2</b> |           |  |                    |  |
|               | September | Classroom management strategies and positive behavior supports                     | 10                 | Catt, S., Miller, D., & Schallenkamp, K. (2007). You are the key: Communicate for learning effectiveness. <i>Education</i> , 127 369-377.<br>Mohr, K., & Mohr, E. (2007). Extending English-language learners' classroom interactions using the response protocol. <i>The Reading Teacher</i> , 60, 440-450. |

**Table 3. Continued**

|  |          |  |    |  |
|--|----------|--|----|--|
|  | October  | Effective communication, think a-louds, inclusion, and English language learners                                 | 10 | Smith, L., (2006). Think-aloud mysteries: Using structured, sentence-by-sentence text passages to teach comprehension strategies, <i>The Reading Teacher</i> 59, 764-772.  |
|  | November | Responding to student behaviors and creating positive learning environments                                      | 10 | Rhode, G., Jenson, W., & Reavis, H.K. (1993). <i>The tough kid book: Practical classroom management strategies</i> . Longmont, CO: Sopris West.  |
|  | January  | Giving precise directions  | 8  | Simpllico, J., (2008). Miscommunication in the classroom: what teachers say and what students really hear. Retrieved from: <a href="http://findarticles.com/p/articles/mi_qa3673/is_200204/ai_n90346448">http://findarticles.com/p/articles/mi_qa3673/is_200204/ai_n90346448</a> . |
|  | February | Using your voice as an effective management tool   | 8  |  |
|  | March    | Strategic planning for high levels of student engagement during small group and independent instructional times. | 8  | Merritt, M., and Humphrey, F. (2001). Teacher, talk and task: Communicative demands during individualized instruction time. <i>TIP</i> , VIII (4), 298-303.  |
|  | April    | Maximizing new opportunities for learning late in the school year  | 8  | Blackwell, A., & McLaughlin, FT., (2005). Using guided notes, choral responding and response cards to increase student performance <i>The International Journal of Special Education</i> , 20, 1-5.  |
|  | May      | Keeping above the fray in your classroom   | 8  | Michie, G., (2002). Teaching in the undertow. <i>Rethinking Schools, The New Teacher Book</i> . Retrieved from: <a href="http://www.rethinkingschools.org/static/publication/newteacher/NTUndertow.pdf">www.rethinkingschools.org/static/publication/newteacher/NTUndertow.pdf</a> |

## Overall Teaching Effectiveness

During the first session, Year 1 Cohort teachers demonstrated a mean of 51% overall teacher effectiveness (range of 29% – 84%) which was determined by the percent of “yes”

answers on the UCC. (See Figure 1 for details.) Final session of Year 1 Cohort results indicate 86% mean teacher effectiveness (range of 67% - 100%). Year 2 Cohort participants' teaching effectiveness measured during first session was 66% (range of 37-87%); final session mean was 87% (range of 70% - 94%).

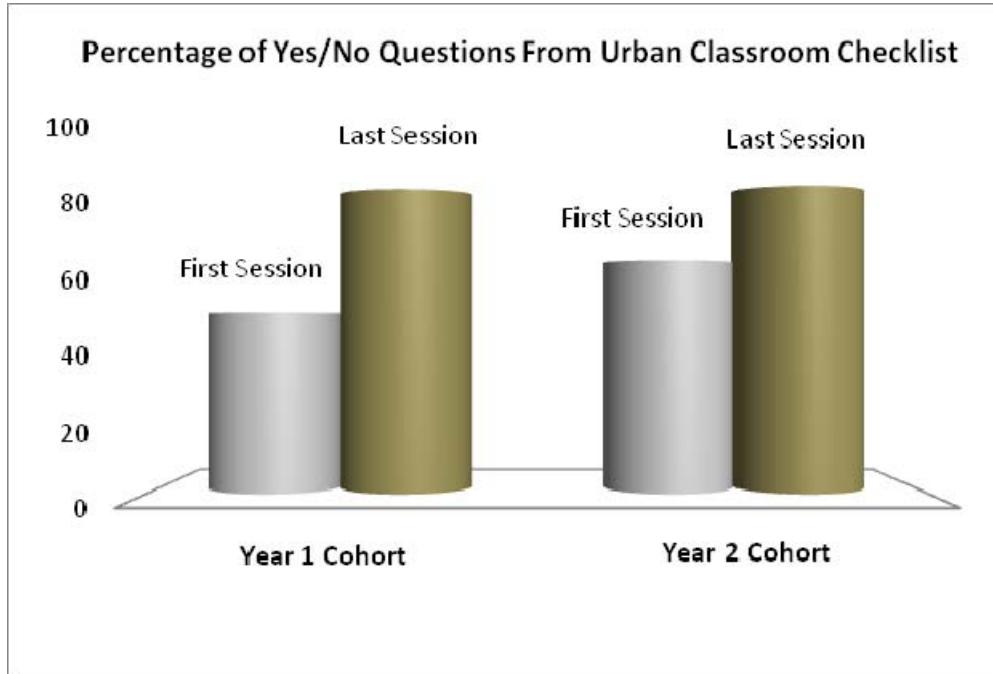


Figure 2. Results from the Urban Classroom Checklist (UCC): Percentage of Yes/No Questions as Observed Evidence-Based Practices for Year 1 and Year 2 Classroom Teacher Cohorts from First Session (September) and Last Session (May).

### Use of Positive or Negative Comments

Several specific teacher behaviors were also measured during the monthly classroom observations. The authors requested a seating chart be available for every observation. This chart was used to track teacher – student interactions and the nature of those interactions (whether comments were positive or negative toward the student). Year 1 Cohort for the first observation session (September), mean teacher use of positive comments was 7.0, (range of 1.0 - 25.0). The final two sessions (April and May), mean teacher use of positive comments was 8.3 and 6.0, respectively, (range of 2.0 - 14.0). Year 2 Cohort for the first observation session, mean teacher use of positive comments addressing student behaviors was 6.0, (range of 1.0 - 15.0). The final two sessions, mean teacher use of positive comments was 22.0 and 21.0, respectively, (range of 5.0 - 41.0).

In addition, teacher's use of negative comments was also recorded during monthly classroom observations. Year 1 Cohort for the first observation session (September), mean teacher use of negative comments was 5.0, (range of 0-15.0). The final two sessions (April and May), mean teacher use of negative comments was 1.5 and < 1.0, respectively, (range of

0 - 5.0). Year 2 Cohort for the first observation session, mean teacher use of negative comments was 6.0, (range of 0 - 15.0). The final two sessions, mean teacher use of positive comments was 1.3 and 1.4, respectively, (range of 0 - 4.0). Use of negative comments during the final two sessions demonstrates the consistent application by teachers of the evidenced-based practices discussed during monthly consultations.

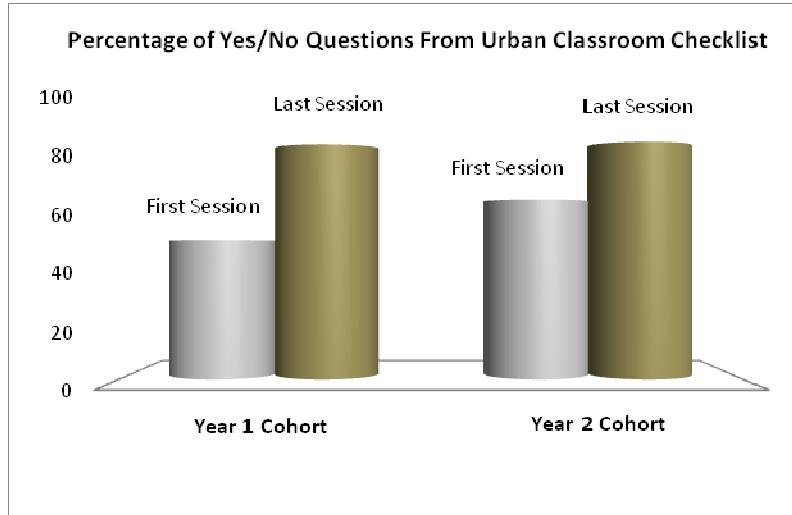


Figure 3. Results from the Urban Classroom Checklist: Mean Frequency of Negative Comments from Classroom Teacher Cohorts from First Session (September) and Last Two Sessions (April and May).

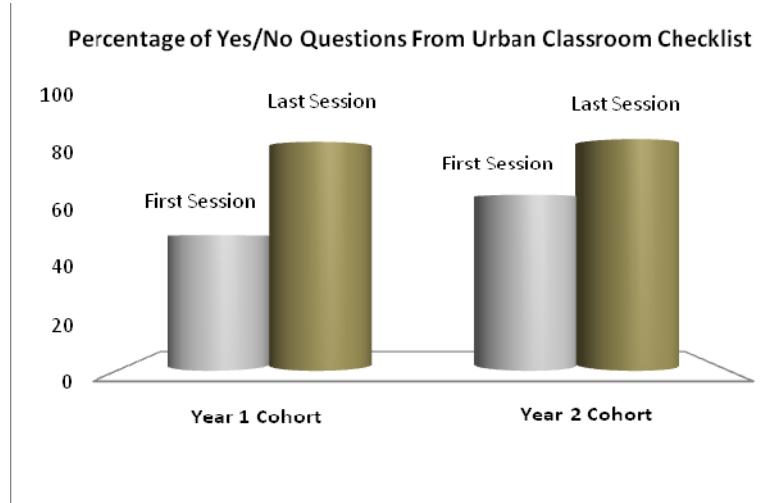


Figure 4. Results from the Urban Classroom Checklist: Mean Frequency of Positive Comments from Classroom Teacher Cohorts from First Session (September) and Last Two Sessions (April and May).

## Individual Teacher Performance

Many of the participating teachers began the on-going professional development process with considerable personal strengths, and (according to the Belief – Instruction Survey results) very strong positive beliefs about the impact good teaching has upon students. Although the teachers met the criteria we set of less than 3 years teaching experience in an urban setting, both their responses to the Belief- Instruction Survey as well as their performance on the UCC were positive indicators of their teaching effectiveness. There were others who demonstrated significant gains through the observations. One common shift in teacher efficacy was the overall reduction of the teacher's use of negative comments toward students.

## Individual Case Studies

While every teacher in the study possessed considerable strengths and showed measurable improvement, for the purpose of illustrating some of the specific improvements, two teachers professional developmental gains are noteworthy enough to discuss. Dorothy Joseph was a third year teacher, new to the grade she was teaching, and new to this building. Mrs. Joseph possessed many strengths; she was astute in responding to student needs, planned excellent highly engaging lessons, used effective strategies to manage the large group of students she had in her intermediate grade level. Her classroom had several non-English speaking students in the room. Mrs. Joseph gave serious thought and preparation to the floor plan and the visuals displayed on the walls. She worked to cultivate an environment that was warm and conducive to learning with minimal distractions. All of these conditions suggest signs for success. After the first observation, when feedback from the UCC data helped Mrs. Joseph realize that she only interacted with 5 of the 26 student in the class, she was very distraught. When she learned that 81% of her students were not actively engaged in the activity, she quickly responded by changing instructional strategies (e.g., increased the frequency of teacher-initiated questions) to engage more students. This is a typical example of how individualized performance feedback can help novice teachers make rapid improvements to their classroom.

A second illustration was found in Nellie Darling's classroom. Ms. Darling had taught before in a parochial setting, however, in this urban classroom she was challenged and often feeling under-prepared for the experiences she had with this population of primary-grade students. Her comments were often wrought with questions about why the students were not able to be successful. Ms. Darling frequently found that the strategies she had used in a previous setting were quickly rendered ineffective in this urban setting. One such habit was to tell the students what they were doing wrong, with the expectation that they would already know what the correct behavior was, and would then comply to her comments with the appropriate behaviors. It is easy to understand how such expectations could seem acceptable. However, in this urban setting, Ms. Darling found herself needing to develop a more effective, more specific skills set for communicating student expectations. After several consultation sessions, Ms. Darling began to shift her focus from attention toward the problem behavior to attending to the appropriate behaviors. This change was noted on the monthly written feedback reports. Additionally, she became aware of the need to state what it was that

she wanted the student to do (rather than state what not to do). This minor shift in the teacher's use of "air time" allowed the young students in this primary grade to hear what was expected, and to respond successfully to the teacher's directive. In essence, Mrs. Darling represents a classic case for preparing teachers in effective use of positive behavior supports, wherein teachers refrain from focusing upon (and punishing) inappropriate behaviors, and find constructive methods for teaching students strategies to learn to do the more appropriate, successful expected behaviors. Students in this urban environment come to school with sets of underdeveloped skills. When they are taught those alternative, more appropriate skills for classroom success, they begin to use them, generalize them, and their classroom performance, academically and socially, improves. As suggested by Soodak, (2003) the outcome in Mrs. Darling's case, was a change in the learning environment for all students. Teachers often find themselves focused upon the problem behaviors of one or two students, to the neglect of the other 20- 22 students who are mostly doing just what the teacher wants them to do, yet receiving virtually no teacher attention for it!

## CONCLUSION

Good teaching is difficult work in today's classroom environment. Good teaching for a master teacher in a supportive classroom environment is an arduous dynamic interpersonal experience. Good teaching for novice teachers in classroom environments in which both the teacher and the students may arrive with underdeveloped skill sets is a potentially powerful experience; powerfully dangerous, if not recognized and handled with exactitude and care. The results of our 2-year project suggest pedagogical expertise can be cultivated in even the most wanting of schools, when the conditions of teacher interest, specific performance feedback, and repeated measures align.

It is not enough to implore novice teachers to believe in high expectations and that all students are entitled to a quality education. Teachers must be provided pedagogical practices, backed by evidential effectiveness. Best practices coupled with beliefs of high expectation, re-constructs a classroom pedagogy where success in students and teachers can be witnessed.

## REFERENCES

- Abbate-Vaughn, J., Frechon, O., & Wright, B.L. (2010). Accomplished urban teaching. *Theory Into Practice, 49*, 185-192.
- Alvarado-Gomez, M., & Belfiore, P.J. (2000). Effects of error correction on Spanish spelling words for students whose primary language is Spanish. *Journal of Behavioral Education, 10*, 213-222.
- Auld, R.G., Belfiore, P.J.& Scheeler, M.C. (2010). Increasing Pre-service Teachers' Use of Differential Reinforcement: Effects of Performance Feedback on Consequences for Student Behaviors. *Journal of Behavioral Education, 19*, 169-183.
- Auld, R.G., Belfiore, P.J., & Scheeler, M.A. (2007). Preparing pre-service teachers to use positive behavior supports in general education classrooms. *Pennsylvania Teacher Educator, 6*, 50-57.

- Auld, R.G., Hayes, R., & Belfiore, P.J. (2009). Listening comprehension in urban high school students with learning disabilities: The role of listening while reading silently. *Journal of Evidenced-Based Practices for Schools, 10*, 124-142.
- Belfiore, P.J., & Agramonte, V. (2002). Using mnemonics to increase early literacy skills in at-risk, urban kindergarten students. *Journal of Behavioral Education, 11*, 181-190.
- Belfiore, P.J., Auld, R.G., & Lee, D.L. (2005). The disconnect of poor-urban education: Equal access and a pedagogy of risk taking. *Psychology in the Schools, 42*, 855-863.
- Belfiore, P.J., Lee, D.H. Spicer, E., & Dexter, D. (2008). Resiliency in the classroom: The role of behavioral momentum. In *School psychology: 21<sup>st</sup> century issues and challenges*. D.H. Molina (Ed.) (pp.213-233). Hauppauge, NY: Nova Science Publishers.
- Blackwell, A., & McLaughlin, FT., (2005). Using guided notes, choral responding and response cards to increase student performance. *The International Journal of Special Education, 20*, 1-5.
- Campbell-Whatley, G.D., & Comer, J. (2000). Self-concept and African-American student achievement: Related issues of ethics, power and privilege. *Teacher Education and Special Education, 23*, 19-31.
- Carey, K., (2004). The real value of teachers: Using new information about teacher effectiveness to closing the achievement gap. *Thinking K-16, 8*, 3-32.
- Conroy, M.A., Sutherland, K.S., Snyder, A.L., & Marsh, S. (2008). Classwide interventions: Effective instruction makes a difference. *Teaching Exceptional Children, 40*, 24-30.
- Cuban, L. (2004). Meeting challenges in urban schools. *Educational Leadership, 81*, 64-69.
- Engelmann, S., Becker, W.C., Carnine, D., Gersten, R. (1988). The direct instruction Follow Through model: Design and outcome. *Education and Treatment of Children, 11*, 303-317.
- Freire, P. (1998). *Pedagogy of freedom: Ethics, democracy, and civic courage*. NY: Rowman & Littlefield.
- George, P.S., (2005). A rationale for differentiating instruction in the regular classroom. *Theory Into Practice, 44*, 185-193.
- Greenwood, C.R., Delquadri, J.C., & Vance Hall, R. (1984). Opportunities to respond and student academic performance. In W.L. Hewrd, T.E. Heron, D.S. Hill, & J. Trap-Porter (Eds.), *Focus on behavior analysis in education* (pp58-88). Columbus, OH: Merrill.
- Goldenberg, I.I., Kunz, D., Hamburger, M., & Stevenson, J.M. (2003). Urban education: Connections between research, propaganda, and prevailing views of education. *Education, 123*, 628-634.
- Haberman, M. (1991). The pedagogy of poverty versus good teaching. *Phi Delta Kappan, 4*, 290-294.
- Hilliard, A. (2003). No mystery: Closing the achievement gap between Africans and excellence. In T. Perry, C. Steele, & A. Hilliard (eds.). *Young, gifted and black: Promoting high achievement among African-American students*, pp. 131-166. Boston: Beacon Press.
- Hoadley, U., (2003). Time to Learn: pacing and the external framing of teachers' work. *Journal of Education for Teaching, 29*, 265-274.
- hooks, b. (2003). *Teaching community: A pedagogy of hope*. NY: Routledge.
- Hurwitz, N., & Hurwitz, S. (2005). The challenge of teacher quality: High standards and expectations must apply to teachers as well as to students. *American School Board Journal, April*, 38-41.

- Hutchinson, J.M., & Belfiore, P.J. (1998). Adding a sequence of high-preference mathematic problems to increase low-preference mathematics problems performance. *Proven Practices, 1*, 12-16.
- Ingersoll, R.M. (2004). *Why do high-poverty schools have difficulty staffing their classrooms with qualified teachers?* Washington DC: Center for American Progress and Institute for America's Future.
- Kennedy, E., & Shiel, G. (2010). Raising literacy levels with collaborative on-site professional development in an urban disadvantaged school. *The Reading Teacher, 63*, 372-383.
- Kunjufu, K. (1984). *Developing positive self-images and discipline in black children.* Chicago: African American Images.
- Lane, G.M. (2008). Reflections on 30 years of teaching in East Harlem. Livermore CA: WingSpan Press.
- Mautone, J.A., Luiselli, J.K., & Handler, M.W., (2006). Improving implementation of classroom instruction through teacher-directed behavioral consultation: A single-case demonstration. *International Journal of Behavioral and Consultational Therapy, 2*, 432-438.
- McCurdy, B.L., Kunsch, C., & Reibstein, S. (2007). Secondary prevention in the urban school: Implementing the behavior education program. *Preventing School Failure, 51*, 12-19.
- McKinney, S.E., Campbell-Whately, G.D., & Kea, C.D. (2005). Managing student behavior in urban classrooms: The role of teacher ABC assessments. *The Clearing House, 79*, 16-20.
- McLaren, P. (2003). *Life in schools: An introduction to critical pedagogy in the foundations of education.* Boston: Allyn & Bacon.
- National Commission for Teaching and America's Future (2002). *Unraveling the "teacher shortage" problem: Teacher retention is the key.* Washington DC: U.S. Government Printing Office.
- Nies, K.A., & Belfiore, P.J. (2006). Enhancing spelling performance in students with learning disabilities. *Journal of Behavioral Education, 15*, 163-170.
- Nygreen, K. (2006). Reproducing or challenging power in the questions we ask and the methods we use: A framework for activist research in urban education. *The Urban Review, 38*, 1-26.
- Palmer, P. (1998). *The courage to teach: Exploring the inner landscape of a teacher's life.* San Francisco: Jossey-Bass.
- Perry, T. (2003). Up from the parched earth: Towards a theory of African-American achievement. In T. Perry, C. Steele, & A. Hilliard (eds.). *Young, gifted and black: Promoting high achievement among African-American students*, pp 1-10. Boston: Beacon Press.
- Rist, R.C. (1970). Student social class and teacher expectations: The self-fulfilling prophecy in ghetto education. *Harvard Educational Review, 40*, 411-451.
- Shippen, M.E., Houchins, D.E., Steventon, C., & Sartor, D. (2005). A comparison of two direct instruction reading programs for urban middle school students. *Remedial and Special Education, 26*, 175-182.
- Soodak, L. C. (2003). Classroom management in inclusive settings. *Theory into Practice, 42*, 327-333.

- Terrill, M., & Mark, D. (2000). Preservice teacher expectations for schools with children of color and second-language learners. *Journal of Teacher Education*, 57, 149-155.
- Thompson, G.L., Warren, S., & Carter, L. (2004). It's not my fault: Predicting high school teachers who blame parents and students for students' low achievement. *The High School Journal, Feb/March*, 5-14.
- Thompson, S., Ransdell, M., Rousseau, C. (2005). Effective teachers in urban school settings: Linking teacher disposition and student performance on standardized tests. *Journal of Authentic Learning*, 2, 22-36.
- Trussell, R.P. (2008). Classroom universals to prevent problem behavior. *Intervention in School and Clinic*, 43, 179-185.
- Warren, S.R. (2002). Stories from the classroom: How expectations and efficacy of diverse teachers affect the academic performance of children in poor urban schools. *Educational Horizons*, 80, 109-116.
- Woodcock, R. W. (1998). *Woodcock Reading Mastery Test -- Revised NU*. Circle Pines, MN: American Guidance Service.

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## ***Chapter 6***

# **THE RACIST TEACHER REVISITED: RACE AND SOCIAL SKILLS IN A NATIONALLY REPRESENTATIVE SAMPLE OF AMERICAN CHILDREN**

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## **ABSTRACT**

A long line of research finds consistently that African American students are significantly more likely than white students to be subjected to a range of negative school sanctions. Several researchers attribute this differential to racially biased appraisals of African American's behaviors by teachers and school administrators. Using data from the ECLS-K—the largest sample of kindergarten and first grade students ever created—we test whether there are statistically significant differences in social skills between whites and African Americans at the start of their educational careers. We then evaluate whether teacher characteristics, including their race, have any impact on their evaluations of student social skills. The findings provide no evidence suggesting that teachers are biased against black students. The data do reveal, however, that black students enter school with substantial social skills deficits.

## **INTRODUCTION**

One of the most pressing issues in contemporary educational research is the disproportionate disciplinary infractions that exist between black and white students (Garibaldi, 1992; Skiba and Leone, 2001; Skiba, Michael, Nardo, and Peterson, 2002; Townsend, 2000). A long line of research consistently finds that black students are significantly more likely to be subjected to a range of negative school sanctions (Garibaldi, 1992; Skiba, Simmons, Staudinger, Rausch, Dow, and Feggins, 2003) Virtually every punitive sanction that is at the disposal of teachers and school administrators is

disproportionately employed against black students. Black students, for example, are significantly more likely to be removed from the classroom, to be sent to the principal's office, and to be suspended or expelled (Skiba, Peterson, and Williams, 1997)—even in grades as early as kindergarten (Gilliam, 2005; McFadden and Marsh, 1992).

Despite a vast array of research investigating the causes of punishment disparities, the factors accounting for these differences remain unclear. Two prominent explanations have been advanced, however. On the one hand, some researchers argue that racial disparities in school punishment are the result of a “silent conspiracy” levied against minorities (Johnson, Boyden, and Pittz, 2001; Skiba and Leone, 2001; Skiba, Michael, Nardo, and Peterson, 2002; Skiba et al., 2003; Townsend, 2000). According to this argument, anti-minority values and sentiments flow through the educational system, resulting in a sublime form of institutional racism (Gordon, Piana, and Keleher, 2000). The disproportionate recognition and labeling of minority students’ behavior as deviant, and the subsequent sanctions that emerge out of these differential interpretations, are, according to this position, indisputable evidence of racism.

On the other hand, insight from various disciplines hints at the possibility that punishment disparities could actually reflect the differential rates of misbehavior observed between black and white students (Epstein, March, Conners, and Jackson, 1998; Thernstrom and Thernstrom, 1997). Although Skiba and his colleagues (2002:335) conclude that no “...previously published research studying differential discipline and rates of behavior by race has found any evidence that the higher rates of discipline received by African American students are due to more serious or more disruptive behavior,” a large pool of research examining antisocial behavior suggests otherwise (DeLisi and Regoli, 1999; Gottfredson and Hirschi, 1990; Sampson, Morenoff, and Raudenbush, 2005; Walsh, 2004; Wilson, 1987; Wilson and Herrnstein, 1985). Evidence garnered from a variety of sources, including self-report data, parental data, teacher data, and official crime data all point in the same direction—namely, that African Americans are disproportionately over-involved in disruptive and rule-violating behaviors. Moreover, these differences emerge very early in life; they are detectable as early as kindergarten (Gilliam, 2005; Krishnakumar and Black, 2002). From this viewpoint, African American and white youth differ in the prevalence and incidence in which they import behavioral problems into schools.

Suspensions, expulsions, and other sanctions are employed at the end of an intricate chain of events. In order for a suspension/expulsion to be enforced, someone, presumably a teacher, must first recognize the student’s misconduct and interpret such behavior as problematic. The teacher must evaluate the student’s action and determine whether it is serious enough to bring to the principal’s, or another school administrator’s, attention. Usually the decision of whether to suspend/expel a student rests in the hands of school administrators, not teachers. The process leading up to the decision to suspend or expel the student, however, begins with the teacher’s subjective evaluation of the student’s conduct. If, for whatever reason, the teacher fails to interpret the event as warranting punishment, or fails to inform administrators of the behavior, then the student’s action will remain unpunished. In this sense, teachers can be viewed as the “gatekeepers” of exclusionary disciplinary practices. Only when a teacher appraises the student’s behavior as troublesome, dangerous, or otherwise disruptive enough to warrant further disciplinary action by school administrators, will the student have the potential to receive a suspension or expulsion. Suspensions and expulsions thus hinge on teachers’ subjective appraisals of their students’ behaviors, social skills, and other observable classroom interactions.

Using the largest nationally representative sample of kindergarten and first grade students, we test two hypotheses. First, we ascertain whether there are statistically significant differences in social skills between whites and African Americans at the start of their educational careers. Secondly, we evaluate whether teacher characteristics, including their race, have any impact on their evaluations of student social skills. If proponents (e.g., Skiba et al., 2002; Skiba et al., 2003; Skiba and Leone, 2001) of the “teacher bias” argument are correct, and racism is deeply embedded in the educational system, then white teachers would rate the social skills of black and white students differentially. Together, these two hypotheses form the backbone of the present paper.

## LITERATURE REVIEW

### Differential Social Control by Race

In comparison to white students, African Americans fare much worse at school (Farkas, 2003; McWhorter, 2000; Thernstrom and Thernstrom, 2003). Black students are more likely to drop out of school, to earn lower grades, and to fail to obtain their high school degrees. On standardized tests, black students score significantly lower on assessments of mathematical and reading comprehension, and on knowledge of science (Farkas, 2003; Rathbun, West, and Hausken, 2004). These findings hold regardless of the sample employed, the grade level examined, or the location studied. Black-white differences, however, are not limited merely to academic achievements. Rather, black students also are disproportionately represented in exclusionary disciplinary practices (Skiba et al., 1997; Skiba et al., 2002; Townsend, 2000). These widespread and pervasive black-white disparities have led some to conclude that the behaviors of black students are detected, labeled, and processed differentially.

One line of inquiry has recently presented findings purportedly showing that racism is the sole cause of punishment disparities between black and white students (Skiba et al., 1997; Skiba et al., 2002; Skiba et al., 2003; Skiba and Leone, 2001). Using data collected from 11,001 sixth, seventh, and eighth, and ninth grade students enrolled in an urban school district, Skiba and his colleagues (2002) examined whether African Americans were disproportionately subjected to suspensions and expulsions. Their data revealed that although black students made up only fifty-six percent of the school enrollment, they accounted for over sixty-eight percent of all suspensions and over eighty percent of all expulsions. They (Skiba, Michael, Nardo, and Peterson, 2002:322) also noted that prior “investigations of behavior, race, and discipline have yet to provide evidence that African American students misbehave at a significantly higher rate than other students.” Based on the extant research and their own analyses, Skiba and his associates conclude that racism is a main factor in black-white differences in exclusionary disciplinary actions.

Skiba points out that suspensions and expulsions usually originate in the classroom, with a teacher subjectively appraising the behavior of black students as problematic and reacting to it differentially—perhaps by recommending that the student be removed from the class or even the school. “For a student to be referred to the central office by a teacher,” notes Skiba and his colleagues (2003:5), “there must be a judgment made by the teacher that a behavior is too severe to be handled at the classroom level.” According to Skiba and colleagues (Skiba et

al., 2002; Skiba et al., 2003), disciplinary actions emerge out of the way in which teachers evaluate and appraise the behaviors of their students. According to proponents of the racist conspiracy doctrine, white teachers are more likely to judge the actions of black students as threatening, troublesome, and dangerous. They argue that these appraisals, in all likelihood, translate into more suspensions and expulsions for African American students. It is important not to casually gloss over this point. Teacher perceptions and ratings of students set into motion a series of events that may ultimately lead to an expulsion or suspension. Only when a teacher interprets a student's action as troublesome, dangerous, or otherwise disruptive will the student possibly receive a disciplinary infraction. And, if teachers differentially assess black students' behaviors and social skills as more bothersome, then this could start to explain the black-white gap in disciplinary sanctions.

Recently, Downey and Pribesh (2004) provided a sophisticated analysis examining whether teacher evaluations of students' behavior are dependent upon the race of the teacher. To address this issue, Downey and Pribesh analyzed a sample of kindergartners from the Early Childhood Longitudinal Study—Kindergarten Class (ECLS-K) and a sample of eighth grade students from the National Education Longitudinal Study of 1988 (NELS). For the kindergarten sample, they examined whether teacher evaluations of externalizing problem behaviors and approaches to learning were influenced by the teacher's race once relevant school characteristics, teacher characteristics, and student characteristics were controlled. Analysis of the ECLS-K data revealed average levels of behavioral differences between white and black students varied by the race of the teacher. However, black teachers rated black students' behaviors more positively when compared with the ratings of white students' behaviors by white teachers. White teachers, on the other hand, rated black students as having more problem behaviors. Students, especially black students, benefited from having a same-race teacher.

Similar results were garnered using the older sample of students from the NELS. Using slightly different teacher ratings of student's effort and student's disruptiveness, Downey and Pribesh (2004) found that when they did not control for the race of the teacher, black students were rated as more disruptive and rated as exerting less effort than were white students. Additional analyses, however, revealed that once the race of the teacher making the evaluation was taken into account, black students were rated quite differently. Indeed, black students matched with black teachers were evaluated as demonstrating more effort than white students matched to white teachers. Results for the models predicting disruptiveness also were very telling. When students were matched with their same race teacher, the results suggested that white students and black students were rated equivalently on the disruptiveness scale.

Not all research, however, reveals that white teachers evaluate black students more negatively (Chang and Sue, 2003; Pigott and Cowen, 2000). For example, Farkas (1996) examined the relationship between the teachers' race and subjective evaluations of their students. Farkas employed a sample of 486 students and their teachers from the Dallas Independent School District (DISD). Using an analytical strategy closely akin to Downey and Pribesh's (2004), Farkas examined whether the race of the teacher was predictive of two dependent variables: teacher ratings of student disruptiveness and teacher ratings of student appearance and dress. Their analysis did not reveal that white teachers were biased against black students on either outcome measure. Contrary to the results garnered by Downey and Pribesh (2004), Farkas's examination of the DISD data demonstrated that "...African

American teachers consider African American students to be much more disruptive than do white teachers" (Farkas, 1996:102).

## Differential Behavior by Race

There are at least four reasons to believe that black students may arrive at school with more social deficiencies. First, many of the known risk factors for antisocial behavior are heavily saturated in poor, black, urban communities (Wilson, 1987). Black children, for example, are more likely than their white counterparts to grow up in poverty, to reside in violence-ridden areas, to have little or poor healthcare coverage, and to have received inadequate prenatal care (Brown and Bzostek, 2003; Currie, 2005; Echevarria and Frisbie, 2001; Wilson, 1987). African Americans are more likely to be born prematurely, to be born with a low or very low birth weight (Hessol, Fuentes-Afflick, and Bacchetti, 1998; Sastry and Hussey, 2003), and to be exposed to neurotoxins that interfere with healthy human development. The confluence of these factors place African American children in a disadvantaged position, both academically and behaviorally.

Second, black children also enter school less well-prepared than white children. Compared to white parents, black parents talk less to their children, read less to their children, and are less likely to expose their children to the necessary information needed for normal language acquisition and the opportunity to excel at school (Brooks-Gunn and Markman, 2005). The end result is that black students, even as early as kindergarten, may be more likely to engage in socially-taxing behaviors and to have comparatively limited social functioning.

Third, once children arrive at school, there is evidence that black students are less interested in learning and less concerned about earning high grades (but see Tyson, 2002). Steinberg (1996), for example, presents data revealing that African American students spend less time studying and more time watching television than white and Asian students. These findings should by no means be trivialized. As other researchers have noted, excelling at school, at least for some black students, may be interpreted as "acting white" (Fordham and Ogbu, 1986) and result in African American students being ostracized by their peers. Indeed, many black students struggle with the prospect of being labeled "too white" (Steinberg, 1996). To reinforce and preserve their identity, black students may publicly denounce the importance of school by being combative toward their teachers, by breaking school rules, and by intentionally taking a lackadaisical approach to academics.

Fourth, black-white differences in suspensions and expulsions mirror the racial disparities found for juvenile delinquency and for adult criminal behavior—hinting at the possibility that black-white differences in behavior extend outward over the life course. African Americans are disproportionately over involved in crime, delinquency, and antisocial behavior (DeLisi and Regoli, 1999; Hawkins, Laub, and Lauritsen, 1998). In the words of Wilson and Herrnstein (1985:461) "No matter how one adjusts for other demographic factors blacks tend to be overrepresented by a factor of four to one among persons arrested for violent crimes, and by a factor of nearly three to one among those arrested for property crimes."

The pattern of results garnered from self-report surveys also show racial disparities similar to those of official crime data except the differences are somewhat attenuated (Walsh, 2004). Keep in mind that African American youth tend to underreport their involvement in all forms of delinquency, particularly the most violent acts (Hindelang, Hirschi, and Weis, 1981).

Even so, self-report data consistently reveal black-white differences in delinquency. For example, evidence from the National Youth Survey (NYS)—one of the largest and most widely-used criminological data sets—reveals that African Americans are disproportionately over-involved in misbehavior (Elliott, 1994). Such results are not isolated. The Office of Juvenile Justice and Delinquency Prevention (OJJDP, 1999:5) conducted an independent analysis of the National Longitudinal Survey of Youth (NLSY) and found “self-reported delinquent and deviant behaviors of youth varied by race...” One noteworthy finding from the OJJDP’s examination of the NLSY was that 21 percent of all black males aged 12-16 years old indicated they committed assault in the previous year compared to 15 percent of white males (OJJDP, 1999). Self-report data also show that low SES young black males are significantly more likely to engage in violent acts (e.g., attacked somebody with the intent to inflict injury) than are young white males from low SES (Paschall, Flewelling, and Ennett, 1998). Of course the above sets of findings are by no means exhaustive but they do highlight the robustness of black-white differences in misbehavior.

## CURRENT FOCUS

Downey and Pribesh’s (2004) findings suggest that white teachers have a working bias against black students, at least when evaluating their behaviors and learning strategies. In the current paper we also use the ECLS-K and seek to build upon and to extend Downey and Pribesh’s (2004) previous work in three important ways. First, unlike Downey and Pribesh, we use information collected about the children in kindergarten and in first-grade. By capitalizing on the longitudinal design of the ECLS-K we are able to establish temporal ordering among the variables and determine if a bias exists in first grade teacher evaluations of students’ social skills. Second, and unlike previous work, we use a more global outcome measure that taps into general problems that the student exhibits within the classroom. Prior research tends to use disaggregated measures of social skills (e.g., externalizing problem behaviors and approaches to learning) that do not tap into the full range of behavioral problems that are evident in the most troublesome students (Campbell, 1995). Third, we use a slightly different analytic strategy to examine whether the teacher bias is sensitive to different methodological and statistical procedures. For example, Downey and Pribesh’s (2004; see also Farkas, 1996) analysis is based on a matching design wherein they examine a series of interactions based on the teacher’s and student’s race (e.g., black teacher-black student, white teacher-black student). In contrast, we use a more parsimonious model that uses a dichotomous measure of the teacher’s race (i.e., black teacher; white teacher). Each model is calculated for the full sample, a black sub-sample, and a white sub-sample.

## METHODS

### Sample

Data for this paper come from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K). The ECLS-K is a large, longitudinal nationally representative

sample of kindergarten children, their parents, their teachers, and their schools. The ECLS-K used a dual frame, multi-stage sampling design that included over 21,000 kindergartners in approximately 1,000 different schools. To date, information has been garnered about the same children, through extensive interviews with their parents, their teachers, and their school administrators. Four waves of data have been collected thus far. The first wave of data was collected in the fall of kindergarten (1998). The second wave of data was gathered in the spring of kindergarten near the end of the student's first year of formal education. Waves three and four of the ECLS-K were collected in the fall (1999) and spring of first grade (2000). However, in the fall of their first grade only a small sub-sample of students was assessed. We, therefore, use data only from the three waves for which the total sample was interviewed. After deletion of missing cases, our final analytical sample consisted of 6,969 students embedded in 1,114 schools.

## Measures

### *Dependent Variable*

*Social Skills.* The ECLS-K used an adapted version of the Social Skills Rating Scale (SSRS) developed by Gresham and Elliot (1990) to measure social skills in kindergarten and first-grade students. The SSRS includes a number of subscales that indexes a variety of social skills, including misbehavior. Although both parent and teacher SSRS reports are available, we focused on the teacher reports because of our research question (i.e., are teachers racially biased?). The wave 2 and wave 4 social skills scales are each comprised of the three following subscales: teacher reports of self-control, teacher reports of approaches to learning, and teacher reports of the student's externalizing problem behaviors (wave 2  $\alpha = .84$ ; wave 4  $\alpha = .84$ ). The self-control subscale was designed to measure the child's ability to control and regulate their own behavior. The approaches to learning subscale indexed how well the child concentrated and remained focused on difficult tasks. The externalizing problem behaviors subscale captured the frequency with which the child fights, argues, acts impulsively, and gets angry. Overall, then, this scale encapsulates not only behavioral problems but also more subtle social deficiencies that may lead to poor achievement and the inability to thrive in the classroom. Items for the social skills scale are scored 1=never, 2=sometimes, 3=often, and 4=very often. Previous investigations of the SSRS has found the scales and subscales to be reliable and valid (Benes, 1995; Gresham, 2001). Higher scores represent less social skills.

The social skills measure is a unique scale that allows us to examine a wide array of potential problems exhibited by kindergarten and first-grade students. At all ages, but particularly in very young children, social skills are important tools needed to form relationships, to deal with complex social interactions, and to abide by school rules. Children with deficient or limited social skills may consistently violate social expectations, which, in turn, heightens their risk of school failure and increases their odds of displaying observable maladaptive behavioral patterns at school. The sensitivity of this scale to detect minor differences gives teachers much discretion in how to deal with their students. And since most suspensions and expulsions flow directly from teacher-student encounters (Skiba et al., 2003), this scale is a useful way to gauge whether teachers, in the very beginning of the disciplinary process, appraise white students and black students differentially.

### ***Level-1 Predictors***

#### **Teacher Characteristics**

To determine if student evaluations are contingent upon certain characteristics of the teacher making the judgment, we employed three teacher measures. To assess whether white teachers are racially biased against black students, we included a dummy measure of the teacher's race (0=black; 1=white). In addition, our analyses also incorporate a measure of the teacher's highest education level and the number of years of teaching experience.

#### **Cognitive Complexity**

Intelligence has been found to be a strong predictor of behavioral problems (Hirschi and Hindelang, 1977; Wilson and Herrnstein, 1985). To take this finding into consideration, we utilized a cognitive complexity scale. A cognitive assessment battery was administered to the ECLS-K children in the spring of kindergarten. The assessment battery was comprised of three distinct parts: language and literacy, mathematical skills, and general knowledge. To create the cognitive complexity scale, these three scores were combined ( $\alpha = .84$ ).

#### **Control Variables**

Three control variables were also included in our analyses. Gender (1=female; 2=male) and race (0=black; 1=white) were coded as dummy variables. We also developed a neighborhood disadvantage scale to capture the extent of neighborhood problems faced by the ECLS-K children. Five items, reported by the parents during the wave 2 interview, were summed together to form the neighborhood disadvantage scale. Parents were asked how safe is it for your child to play outside, whether garbage and litter are visible on the street, whether there are problems with people selling and using drugs/alcohol in the neighborhood, whether there are problems with burglaries and robberies in the neighborhood, if there are problems with violent crime, and if there are vacant houses nearby. Higher scores indicate more problems in the neighborhood ( $\alpha = .76$ ).

### ***Level-2 Predictors***

#### **Percent Minority**

Students attending schools with high concentrations of minority students tend to score lower on standardized tests and, more generally, have lower educational achievements (Bankston and Caldas, 1996; Roscigno, 1998). To examine the potential effects of the percentage of minority students at a school on student misbehavior, we include a measure of percent minority attending the school. At wave 4, school administrators were asked to indicate the percentage of minorities currently enrolled at their school. However, to help ensure anonymity, the percentage of minorities at each scale was collapsed into five categories. The coding scheme was: 1=0 to less than 10 percent, 2=10 to less than 25 percent, 3=25 to less than 50 percent, 4=50 to less than 75, and 5=more than 75 percent.

#### **School Crime**

To determine the extent of crime within the school, teachers were asked (at wave 4) if children carried weapons to school, if there was widespread theft committed by students, and

if physical attacks and fights were a problem within the school. If the teacher responded “yes” then each component item was scored 1; if they responded “no” the item was coded 0. The additive scale, therefore, ranged between 0 and 3, with higher scores representing more school crime ( $\alpha = .52$ )

## Public School

To take into account potential differences between public and private schools, we included a dummy measure for the type of school the child was attending during the spring of their first grade. Private schools were assigned a score of 2 and public schools were coded as 1.

## Analytical Plan

The analysis proceeds in two stages. First, prior researchers have maintained that black students and white students do not differ in terms of their behaviors and observable social skills (Skiba et al., 2002). To test this hypothesis and examine whether African American and white students differ on the measures that will be included in the multivariate models, we conduct a series of *t*-tests. The estimates gleaned from the *t*-tests will provide us with initial information about whether black and white students differ significantly on a variety of characteristics, including the social skills scale.

The next step in the analysis is to determine whether teachers, particularly white teachers, are biased in their assessments of black students’ social skills. Since we are dealing with a data set that contains information at multiple levels of analysis (i.e., the child-level and the school-level), a number of the assumptions of ordinary least squares (OLS) regression are violated and we are forced to use a different statistical procedure. Fortunately, Hierarchical Linear Modeling (HLM) was developed to account for the clustering of students within schools, the loss of independence, and other problems that surface with non-randomly distributed observations (Bryk and Raudenbush, 1988; Bryk and Raudenbush, 1992). Moreover, by calculating multilevel models, we are able to partial out the effects of broader environmental- and school-level influences that may potentially influence the student’s development of and capacity to use social skills effectively. All of the parameter estimates are generated from the statistical software package HLM5.

HLM, and multilevel models in general, can be thought of as series of interlocking equations operating at two different levels: the individual- or student-level (Equation 1) and the aggregate- or school-level (Equation 2) (Bryk and Raudenbush, 1992). These two equations can easily be combined to construct the reduced form equation (Equation 3). In matrix notation, the multilevel equations can be expressed as:

$$(Equation 1) \quad y_j = X_j\beta_j + r_j$$

$$(Equation 2) \quad \beta_j = W_j\Gamma + u_j$$

$$(Equation 3) \quad y_j = X_jW_j\Gamma + X_ju_j + r_j$$

where  $y_j$  is the response vector for the social skills scale for group  $j$ ,  $X_j$  is the design matrix for the student-level predictors,  $W_j$  is the design matrix for the school-level predictors,  $\Gamma$  is the vector containing the fixed regression coefficients,  $u_j$  is the vector for the school-level error variances, and  $r_j$  is the vector of student-level residuals (Curran, 2003).

Before proceeding to the analysis, it is important to note that we divided our full sample into two different groups: a black subsample ( $n=1,036$ ) and a white subsample ( $n=5,933$ ). Each of our equations, therefore, was calculated on three different samples, the full sample, the black subsample, and the white subsample. We also note that we calculated two different equations for all three samples. The first equation, with the wave 4 social skills scale as the dependent variable, includes all of the student-level variables except the wave 2 social skills scale (prior levels of social skills) and includes all of the school/classroom predictors. The second equation is an exact duplicate of the first equation but now it includes the measure of deficient social skills measured one year earlier. Including this measure changes the outcome variable from deficient social skills to *change* in deficient social skills between wave 2 and wave 4. Essentially, the wave 2 social skills measure strips away any variation in the wave 4 scale that is accounted for by stability, leaving only variation that can be attributed to change. This process provides a very conservative estimate of the predictors in each model.

## RESULTS

We begin our analysis by calculating a series of *t*-tests. As revealed in Table 1, there are marked and statistically significant differences for all of the measures. Black students are more likely to have black teachers, to have teachers with lower levels of education, and to have teachers with less experience in the workforce. As can be seen in the middle section of the table, blacks also score substantially lower on cognitive assessments and tend to reside in more disadvantaged neighborhoods.

**Table 1. Mean Differences between Whites and Blacks on Selected ECLS-K Variables  
(*t*-Tests)**

| Variables                  | White Mean | Black Mean | T-Value |
|----------------------------|------------|------------|---------|
| Teacher Measures           |            |            |         |
| Race of Teacher            | .98        | .70        | 19.09*  |
| Highest Education Level    | 3.12       | 2.95       | 5.23*   |
| Years as a Teacher         | 15.03      | 12.91      | 6.14*   |
| Individual Measures        |            |            |         |
| Cognitive Complexity       | 161.80     | 141.18     | 26.26*  |
| Neighborhood Disadvantage  | 6.44       | 7.23       | 14.52*  |
| First-Grade Social Skills  | 5.25       | 6.02       | 12.37*  |
| Kindergarten Social Skills | 5.05       | 5.87       | 13.78*  |
| School Measures            |            |            |         |
| Percent Minority           | 1.78       | 4.04       | 58.32*  |
| School Crime               | .42        | .81        | 13.58*  |
| Public School              | 1.26       | 1.12       | 12.39*  |

\* Significant at the .05 level.

**Table 2. HLM Fixed Effects Models Predicting Deficient Social Skills for First Grade Students**

| Variables                  | Full Sample    | Black Sample   | White Sample   |                |                |                |
|----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <i>Teacher Measures</i>    |                |                |                |                |                |                |
| Race of Teacher            | .12<br>(.16)   | .02<br>(.15)   | .42<br>(.23)   | .28<br>(.20)   | -.01<br>(.19)  | -.10<br>(.18)  |
| Highest Education Level    | -.01<br>(.04)  | -.01<br>(.04)  | .03<br>(.12)   | .02<br>(.11)   | -.01<br>(.04)  | -.02<br>(.04)  |
| Years as a Teacher         | -.00<br>(.00)  | -.00<br>(.00)  | .01<br>(.01)   | .01<br>(.01)   | -.00<br>(.00)  | -.00<br>(.00)  |
| <i>Individual Measures</i> |                |                |                |                |                |                |
| Gender                     | -.71*<br>(.04) | -.32*<br>(.03) | -.62*<br>(.11) | -.22*<br>(.11) | -.73*<br>(.04) | -.34*<br>(.04) |
| Race                       | -.44*<br>(.11) | -.24*<br>(.09) |                |                |                |                |
| Cognitive Complexity       | -.03*<br>(.00) | -.01*<br>(.00) | -.03*<br>(.00) | -.01*<br>(.00) | -.03*<br>(.00) | -.01*<br>(.00) |
| Neighborhood Disadvantage  | .04<br>(.02)   | .02<br>(.01)   | -.03<br>(.04)  | -.03<br>(.03)  | .06*<br>(.02)  | .04*<br>(.02)  |
| Kindergarten Social Skills |                | .57*<br>(.01)  |                | .55*<br>(.04)  |                | .56*<br>(.01)  |
| <i>School Measures</i>     |                |                |                |                |                |                |
| Percent Minority           | .12*<br>(.02)  | .12*<br>(.02)  | .00<br>(.06)   | .01<br>(.06)   | -.01<br>(.03)  | -.00<br>(.03)  |
| School Crime               | .04<br>(.04)   | .04<br>(.04)   | -.12<br>(.08)  | -.13<br>(.08)  | .07<br>(.05)   | .07<br>(.05)   |
| Public School              | -.11<br>(.07)  | -.12<br>(.07)  | -.62*<br>(.21) | -.61*<br>(.21) | -.05<br>(.07)  | .06<br>(.08)   |

\* Significant at the .05 level.

Beta values reported (standard errors).

Most noteworthy for the current purposes, however, are the mean differences for the kindergarten and first-grade social skills scales. The *t*-values for these scales reveal that black students are more likely to be characterized as having less social skills than white students. African Americans score over thirteen standard deviations higher on the kindergarten (wave 2) social skills scale and over twelve standard deviations higher on the first-grade (wave 4)

social skills scale<sup>1</sup>, accordingly, these data suggest that African American children arrive at school with substantial deficits in social skills.

To explore more fully the possibility that white teachers have a working bias against minorities, we calculated three different HLM statistical models. Table 2 displays the results of these findings. The first equation in model 1, depicted on the left-hand side of the table, regresses the wave 4 social skills scale on the teacher measures, the individual measures, and the aggregate school measures. Of particular interest are the findings associated with the teacher characteristics, especially their race.

In the first equation none of the teacher characteristic variables reached conventional levels of statistical significance, suggesting that the race of the teacher is not a salient predictor of their students' social skills. Only four of the measures in the first equation exerted an independent and statistically significant effect on the outcome measure. Specifically, males, black students, and children attending schools with a high percentage of minority students score higher on the social skills scale. Likewise, students with low cognitive capabilities are more likely to be classified as having limited social skills.

The results for the second equation in model 1, which residualizes the deficient social skills scale, are similar to those garnered in the first equation. Again, none of the teacher measures are predictive of students' social skills. Of all the independent variables, only gender, race, cognitive complexity, prior misbehavior, and the percentage of minority students attending the school predict student social skills.

We next turn attention to the findings generated from the analysis of the sample of black children. The pattern of results is almost identical to those found with the full sample. For both equations, gender, cognitive complexity, and the measure of public school are significant, while the measure of prior social skills is also significant. None of the teacher measures maintain a significant relationship with the outcome measure for either of the models.

The last model, depicted on the right-hand side of the table, is estimated by using the white sample. Similar to the findings for the full and black samples, both gender and cognitive complexity are salient predictors of social skills for both equations. Unlike the two previous models, however, students residing in disadvantaged neighborhoods were significantly more likely to be characterized as having deficient social skills. The results for the teacher measures parallel those of the previous models; none of the teacher measures reached conventional levels of significance.<sup>2</sup>

To summarize the findings, we find no compelling evidence demonstrating that teacher characteristics, including their race, have any effect on their appraisals of student social skills.

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<sup>1</sup> To rule out the possibility that all teachers, regardless of their race, rated blacks as having more limited social skills than whites, we also used two social skills scales based only on parent responses to the SSRS. The parent scales were closely akin to the teacher scales. For both wave 2 and wave 4, four items were used: parent's assessments of their child's self-control, their child's approaches to learning, their child's activity level, and their child's social interactions with others. Using these scales, we calculated t-tests to ascertain if parental responses also revealed substantive differences between whites and blacks. Similar to the findings reported for the teacher scales, we found that blacks, in comparison to whites, scored almost nine standard deviations higher for the wave 2 social skills scale ( $t=8.80$ ,  $p<.001$ ), and over six standard deviations higher for the wave 4 scale ( $t=6.14$ ,  $p<.001$ ). Given that such significant differences exist even when parents are asked about their own children, it seems unlikely that our results can be attributed solely to racially biased teachers.

<sup>2</sup> It is important to point out that we also calculated all of the multilevel models using the parental scale of social skills (see endnote 1) in place of the teacher social skills measure. The pattern of results was virtually identical; none of the teacher characteristics, including their race, reached statistical significance (analyses not presented).

This finding holds across the full sample, the black subsample, or the white subsample. Noteworthy, however, are the results revealing that compared to white children, black first graders in the ECLS-K sample employ a restricted range of social skills while at school. We speak to these findings in the conclusion section.

## CONCLUSION

One of the more startling observations about the American educational system is that African American students are disciplined at rates that far-exceed those of white students. Two explanations have been advanced to account for this black-white disparity. First, some scholars have advocated the position that black students are disciplined disproportionately due, in large part, because teachers assess their behaviors differentially. According to this argument, teachers and school administrators, either consciously or unconsciously, evaluate black students as lacking social skills. The second explanation for the black-white gap is that black students have acquired fewer social skills and, therefore, are more likely to be disruptive.

Using the largest longitudinal sample of kindergarten and first grade students, we tested these two competing perspectives. We first addressed the question of whether black students engaged in more problematic behaviors than did white students. T-tests revealed substantial differences, wherein white students scored significantly higher on measured social skills than black students. We should also note that to collaborate this finding, we analyzed parental reports of child social skills. The results gleaned from the *t*-tests (using parental reports of child social skills) produced virtually identical results (analyses not presented; see endnote 1). In both instances, black children were characterized as having a limited set of social skills.

To test the possibility that white teachers are biased against black students, we examined whether the teacher's race had an appreciable effect on their evaluations of black and white students' social skills. In the multilevel tests, the ECLS-K data provided no evidence that white teachers differentially rate black students as demonstrating more deficient social skills. Indeed, the teacher characteristics did not have a measurable impact on the subjective appraisal of their students' social skills. The findings reinforce prior research showing that teachers provide accurate, reliable, and valid assessments of their students (Cairns and Cairns, 1994; Perry and Meisels, 1996).

The multilevel models also revealed that student race, even in multivariate equations, continued to be a significant predictor of limited social functioning. Stated differently, the race of the student predicted variation in social skills, net of teacher characteristics (Pigott and Cowen, 2000; Zimmerman, Khoury, Vega, Gil, and Warheit, 1995). This finding is noteworthy because it hints at the possibility that black students enter school with a restricted range of social skills. Although prior research has tended to explain black-white disparities in terms of a teacher bias against black students, the current results take a cautious first step towards debunking this hypothesis.

Although much of the extant research examining black-white differences in suspensions and expulsions appears to reveal that white teachers are biased against black students, most of this work employs descriptive statistics, leaving open the possibility that the findings are misspecified (Skiba et al., 1997; Skiba et al., 2002). This line of research, for example,

compares frequencies, proportions, percentages, and other univariate statistics to bolster a “racist conspiracy” argument (Harry and Anderson, 1994; Skiba et al., 1997; Skiba et al., 2002). There is good reason to believe, however, that racial differences in the subjective appraisals of students made by teachers may be explained away when controlling for additional covariates. Even if race is a significant predictor, it does not necessarily mean that racism is at the heart of the problem. Just because a demographic variable, such as race, is a predictor of a certain outcome it tells us very little about the underlying mechanisms accounting for the relationship. “These variables [e.g., race],” notes Walsh (2002:7) “are predictors, not explanations.” Explanations, not predictors, are needed to understand the dynamic processes that unfold and place African Americans at a high risk for school failure (Steinberg, 1996).

Research supporting the notion that teachers are prejudiced against black students is also reported in such a way as to show that findings are in line with, and supportive of, the extant literature. For instance, Skiba and Leone’s (2001:35) claim that “...there is no evidence whatsoever that African American or other students of color exhibit higher rates of misbehavior...” is quite the opposite conclusion established in criminology where great efforts have been taken to understand and explicate the causes of racial differences in adolescent delinquency and adult crime (e.g., Cernkovich, Giordano, and Rudolph, 2000; McNulty and Bellair, 2003; Paschall, Flewelling, and Ennett, 1998; Walsh, 2004). To pretend that black Americans and white Americans engage in crime equally is to turn a blind eye to a major social problem endemic to America—namely, that on any given day 1 out of 3 African American males in their twenties is under some type of surveillance by the criminal justice system (Bennett, DiJulio, and Walters, 1996; McWhorter, 2000).

The current findings do not dismiss that racism is still evident in contemporary America, but rather question whether racism is so pervasive that it can account for black-white differences in teacher evaluations of their students’ social skills. The findings are aligned closely with McWhorter’s (2000) recent analysis of African Americans. In his book, McWhorter challenges and questions conventional wisdom holding that African Americans limited academic achievement is the result of a deep-seated bias against minorities. He traces blacks’ school problems, what he calls the cult of anti-intellectualism, to the African American culture (see also Steinberg, 1996). McWhorter continues by arguing that African Americans have been socialized to accept little responsibility for school problems, and more importantly, to attribute these problems to racism. McWhorter argues that racism, including racially-biased teachers, is not able to account for black-white differences in school performance. The current findings bear this point out.

Still, we are left to reconcile why the current findings are somewhat contrary to the findings of Downey and Pribesh (2004) even though both studies use the ECLS-K. While not exhaustive, we offer two reasons. First, Downey and Pribesh used an imputation algorithm to replace missing values. This procedure increased their sample size and, in turn, their statistical power to detect significant coefficients. Second, Downey and Pribesh only used data collected from the first wave of the ECLS-K, which was collected in the fall of the student’s kindergarten year. Our sample, in contrast, employed a longitudinal design that used data collected during the spring of kindergarten and spring of first-grade. Their work, however, was based on data collected during the very first few months of school. These two key differences, coupled to those previously mentioned, may partially explain the discrepancy between our findings and those of Downey and Pribesh.

Although our findings fail to reveal that white teachers are biased against black students, we would be remiss if we did not touch upon the major limitation of our study—the inability to measure official disciplinary sanctions levied against the students. Unfortunately, the ECLS-K did not include any measures pertaining to disciplinary sanctions, such as suspensions and expulsions. Ideally we would have examined the interrelationships among the race of the teacher, the race of the student, the student's social skills, and the ultimate outcome of classroom disruptiveness. Even so, we were able to address some of the issues raised by prior research (e.g., black students do not misbehave more frequently than white students) and found no evidence supporting the claim that white teachers favor white students at the expense of black students. Future research may wish to build upon our study and examine whether black students are punished more severely once taking into account their individual characteristics, such as their social skills and behaviors. As for now, our findings draw attention to the danger in making sweeping generalizations about teachers without grounding such statements in empirical evidence.

## REFERENCES

- Bankston, Carl and Stephen J. Caldas. 1996. Majority African American schools and social injustice: The influence of de facto segregation on academic achievement. *Social Forces* 75:535-555.
- Benes, Kathryn M. 1995. Review of the social skills rating system. In Conoley and Impara (eds.), *Twelfth Mental Measurements Yearbook*. Lincoln, NE: Buros Institute of Mental Measurement, pp. 964-967.
- Bennett, William J., John J. Dilulio, Jr., and John P. Walters. 1996. *Body Count: Moral Poverty...And How to Win America's War against Crime and Drugs*. New York: Simon and Schuster.
- Brooks-Gunn, Jeanne and Lisa B. Markman. 2005. The contributions of parenting to ethnic and racial gaps in school readiness. *The Future of Children* 15:139-168.
- Brown, Brett V. and Sharon Bzostek. 2003. *Violence in the lives of children*. Cross Currents (Child Trends) August:1-13.
- Bryk, Anthony S. and Stephen W. Raudenbush. 1988. Toward a more appropriate conceptualization of research on school effects: A three-level hierarchical linear model. *American Journal of Education* 97:65-108.
- Bryk, Anthony S. and Stephen W. Raudenbush. 1992. Hierarchical Linear Models: *Applications and Data Analysis Methods*. Newbury Park, CA: Sage.
- Cairns, Robert D. and Beverley D. Cairns. 1994. *Lifelines and Risks: Pathways of Youth in Our Time*. Cambridge: Cambridge University Press.
- Campbell, Susan B. 1995. Behavioral problems in preschool children: A review of recent research. *Journal of Child Psychology and Psychiatry* 36:113-149.
- Cernkovich, Stephen A., Peggy C. Giordano, and Jennifer L. Rudolph. 2000. Race, crime, and the American Dream. *Journal of Research in Crime and Delinquency* 37:131-170.
- Chang, Doris F. and Stanley Sue. 2003. The effects of race and problem type on teachers' assessments of student behavior. *Journal of Consulting and Clinical Psychology* 71:235-242.

- Curran, Patrick J. 2003. Have multilevel models been structural equation models all along? *Multivariate Behavioral Research* 38:529-569.
- Currie, Janet. 2005. Health disparities and gaps in school readiness. *The Future of Children* 15:117-138.
- DeLisi, Matt and Bob Regoli. 1999. Race, conventional crime, and criminal justice: The declining significance of skin color. *Journal of Criminal Justice* 27:549-558.
- Downey, Douglas B. and Shana Pribesh. 2004. When race matters: Teachers' evaluations of students' classroom behavior. *Sociology of Education* 77:267-282.
- Echevarria, Samuel and W. Parker Frisbie. 2001. Race/ethnic-specific variation in adequacy of prenatal care utilization. *Social Forces* 80:633-655.
- Epstein, Jeffery N., John S. March, C. Keith Conners, and Don L. Jackson. 1998. Racial differences on the Conners teacher rating scale. *Journal of Abnormal Child psychology* 26:109-118.
- Farkas, George. 1996. *Human Capital or Cultural Capital? Ethnicity and Poverty Groups in an Urban School District*. New York: Aldine De Gruyter.
- Farkas, George. 2003. Racial disparities and discrimination in education: What do we know, how do we know it, and what do we need to know? *Teachers College Record* 105:1119-1146.
- Fordham, Signithia and John U. Ogbu. 1986. Black students' school success: Coping with the "burden of 'acting white.'" *The Urban Review* 18:176-206.
- Garibaldi, Antoine M. 1992. Educating and motivating African American males to succeed. *Journal of Negro Education* 61:4-11.
- Gilliam, Walter S. 2005. Prekindergartners left behind: Expulsion rates in state prekindergarten programs. *Foundation for Child Development Policy Brief Series*, No. 3 (May):1-7.
- Gordon, Rebecca, Libero Della Piana, and Terry Keleher. 2000. Facing the Consequences: An Examination of Racial Discrimination in U.S. Public Schools. Available online at: [http://www.arc.org/downloads/ARC\\_FTC.pdf](http://www.arc.org/downloads/ARC_FTC.pdf).
- Gottfredson, Michael and Travis Hirschi. 1990. *A General Theory of Crime*. Stanford, CA: Stanford University Press.
- Gresham, Frank M. and Stephen N. Elliott. 1990. *The Social Skills Rating System*. Circle Pines, MN: American Guidance Service.
- Harry, Beth and Mary G. Anderson. 1994. The disproportionate placement of African American males in special education programs: A critique of the process. *Journal of Negro Education* 63:602-619.
- Hessol, Nancy A., Elena Fuentes-Afflick, and Peter Baccchetti. 1998. Risk of low birth weight infants among black and white parents. *Obstetrics and Gynecology* 92:814-822.
- Hirschi, Travis and Michael J. Hindelang. 1977. Intelligence and delinquency: A revisionist review. *American Sociological Review* 42:571-587.
- Johnson, Tammy, Jennifer Emiko Boyden, and William J. Pittz (Eds.). 2001. Racial Profiling and Punishment in U.S. Public Schools: How Zero Tolerance Policies and High Stakes Testing Subvert Academic Excellence and Racial Equity. Available online at: [http://www.arc.org/erase/profiling\\_nr.html](http://www.arc.org/erase/profiling_nr.html)
- Krishnakumar, Ambika and Maureen M. Black. 2002. Longitudinal predictors of competence among African American children: The role of distal and proximal risk factors. *Applied Developmental Psychology* 23:237-266.

- McFadden, Anna C. and George E. Marsh. 1992. A study of race and gender bias in the punishment of school children. *Education and Treatment of Children* 15:140-146.
- McNulty, Thomas L. and Paul E. Bellair. 2003. Explaining racial and ethnic differences in serious adolescent violent behavior. *Criminology* 41:709-748.
- McWhorter, John H. 2000. *Losing the Race: Self-Sabotage in Black America*. New York: The Free Press.
- Paschall, Mallie J., Robert L. Flewelling, and Susan T. Ennett. 1998. Racial differences in violent behavior among young adults: Moderating and confounding effects. *Journal of Research in Crime and Delinquency* 35:148-165.
- Perry, Nancy E. and Samuel J. Meisels. 1996. *How Accurate are Teacher Judgments of Students' Academic Performance?* (NCES 96-08). U.S. Department of Education, National Center for Education Statistics. Washington DC: U.S. Government Printing Office.
- Pigott, Rowan L. and Emory L. Cowen. 2000. Teacher race, child race, racial congruence, and teacher ratings of children's school adjustment. *Journal of School Psychology* 38:177-196.
- Rathbun, Amy, Jerry West, and Elvira Germino Hausken. 2004. *From Kindergarten through Third Grade: Children's Beginning School Experiences* (NCES 2004-007). U.S. Department of Education, National Center for Education Statistics. Washington DC: U.S. Government Printing Office.
- Roscigno, Vincent J. 1998. Race and the reproduction of educational disadvantage. *Social Forces* 76:1033-1060.
- Sampson, Robert J., Jeffrey D. Morenoff, and Stephen Raudenbush. 2005. Social anatomy of racial and ethnic disparities in violence. *American Journal of Public Health* 95:224-232.
- Sastry, Narayan and Jon M. Hussey. 2003. An investigation of racial and ethnic disparities in birth weight in Chicago neighborhoods. *Demography* 40:701-725.
- Skiba, Russell J. and Peter E. Leone. 2001. Zero tolerance and school security measures: A failed experiment. In Johnson, Boyden, and Pittz (Eds.), *Racial Profiling and Punishment in U.S. Public Schools: How Zero Tolerance Policies and High Stakes Testing Subvert Academic Excellence and Racial Equity*. Available online at: [http://www.arc.org/erase/profiling\\_nr.html](http://www.arc.org/erase/profiling_nr.html)
- Skiba, Russell J., Robert S. Michael, Abra Carroll Nardo, and Reece L. Peterson. 2002. The color of discipline: Sources of racial and gender disproportionality in school punishment. *The Urban Review* 34:317-342.
- Skiba, Russell J., Reece L. Peterson, and Tara Williams. 1997. Office referrals and suspension: Disciplinary intervention in middle schools. *Education and Treatment of Children* 20:295-315.
- Skiba, Russell J., Ada Simmons, Lori Staudinger, Marcus Rausch, Gayle Dow, and Renae Feggins. 2003. *Consistent removal: Contributions of school discipline to the school-prison pipeline*. Cambridge, MA: Harvard Civil Rights Project.
- Steinberg, Laurence. 1996. *Beyond the Classroom: Why School Reform has Failed and What Parents Need to Do*. New York: Simon and Schuster.
- Thernstrom, Abigail and Stephan Thernstrom. 2003. *No Excuses: Closing the Racial Gap in Learning*. New York: Simon and Schuster.

- Thernstrom, Stephan and Abigail Thernstrom. 1997. *America in Black and White: One Nation, Indivisible*. New York: Simon and Schuster.
- Townsend, Brenda L. 2000. The disproportionate discipline of African American learners: Reducing school suspensions and expulsions. *Exceptional Children* 66:381-391.
- Tyson, Karolyn. 2002. Weighing in: Elementary-age students and the debate on attitudes toward school among black students. *Social Forces* 80:1157-1189.
- Walsh, Anthony. 2002. *Biosocial Criminology: Introduction and Integration*. Cincinnati: Anderson.
- Walsh, Anthony. 2004. *Race and Crime: A Biosocial Analysis*. New York: Nova.
- Wilson, William Julius. 1987. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press.
- Wilson, James Q. and Richard J. Herrnstein. 1985. *Crime and Human Nature: The Definitive Study of the Causes of Crime*. New York: The Free Press.
- Zimmerman, Rick S., Elizabeth L. Khoury, William A. Vega, Andres G. Gil, and George J. Warheit. 1995. Teacher and parent perceptions of behavior problems among a sample of African American, Hispanic, and Non-Hispanic students. *American Journal of Community Psychology* 23:181-197.

## ***Chapter 7***

# **CLASSROOM ACOUSTICS: MEASUREMENTS, SIMULATIONS AND APPLICATIONS**

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## **ABSTRACT**

In every society – past, present and probably also future –, knowledge was, is, and will undoubtedly continue to be transmitted through the process of speaking and listening, i.e., a person transmitting knowledge orally to others who receive it. Notwithstanding current requirements for a variety of knowledge transmission techniques involving multimedia technologies, nothing can replace the teacher-student relationship that is basically involved in classrooms. It is therefore crucial for classrooms to provide optimal conditions for the development of activities inherent to education, which include the quality of classroom acoustics.

The quality of transmitted and perceived verbal information is linked intrinsically to the acoustic performance of the room, which in turn involves the observance of several speech quality descriptors – Reverberation Time, Speech Transmission Index, Definition and Centre Time. This chapter on Classroom Acoustics describes the techniques required for *in situ* measurements of these parameters, which are crucial for verbal communication. These parameters, which are based on national and international technical standards, seek to establish reference values in order to achieve good acoustics in classrooms. Another tool presented is computational simulation, which enables acoustic solutions for classrooms to be tested while still in the design phase, as well as interventions in existing buildings.

As a necessary part of the search for optimal classroom acoustics, real cases are presented whose objects of study are university classrooms.

## 1. INTRODUCTION

The classroom is the environment people experience throughout the years from primary school to university. Any nation that aspires to compete in the economic and scientific fields of today's globalized world includes the education of its citizens in its plans. Therefore, the classroom environment should favor the crucial practice of teaching and learning.

Education is as essential in today's societies as it was in the past. The most formal education takes place in classrooms, where learning involves intensive verbal communication between teachers and students (Lubman and Sutherland, 2001). However diverse the techniques for knowledge transmission aided by multimedia resources, which have become increasingly common, nothing replaces the teacher-student relationship which is basically developed in the classroom. It is therefore crucial for classrooms to provide the conditions required for the satisfactory development of teaching and learning activities, especially teacher-student communication. It is in this context that the importance of classroom acoustics stands out.

High levels of noise in the classroom cause students to become prematurely tired, consuming their cognitive abilities, which could be better employed in paying attention to and understanding the content of the classes (Hagen et al., 2002). Classrooms with good acoustics aid learning, making it more efficient and pleasurable (Lubman and Sutherland, 2001). Maxwell and Evans (2000) showed that the exposure of preschool children to noise is linked to difficulties in learning to read and write. Classrooms designed for acoustic quality lead to better student performance.

The quality of the information transmitted by the teacher and perceived by the student is intrinsically linked to the acoustic performance of the classroom. Speech consists of a succession of sounds varying rapidly in intensity and frequency (French and Steinberg, 1947). Knudsen (1929) claim that noise interferes in auditory speech, producing the so-called masking effect, which is dependent on the noise intensity compared to speech intensity. The reverberation and the distance between speaker and listener also interfere in communication (Steinberg, 1929). The transmission path between the speaker and the listener is described by the distribution of the speech signal in the room, and affects the deterioration of the speech signal (ISO 9921-2003).

Acoustic descriptors that characterize the quality of spoken communication, such as Reverberation Time, Centre Time, Definition, and Speech Transmission Index, can be predicted from the first stages of development of the architectural design and measured in existing buildings. It is essential that the results obtained from both acoustic predictions and *in situ* measurements be compatible with reference criteria available in national and international technical standards in order to ensure the quality of these rooms. This requires the constant improvement of technical standards that establish criteria aimed at achieving good acoustic performance in school buildings.

## 2. ACOUSTIC DESCRIPTORS FOR CLASSROOMS – MEASUREMENTS AND SIMULATIONS

Oral communication requires, above all, that classrooms have an acoustic field that favors speech intelligibility. From the first stages of planning of buildings, the achievement of this acoustic field should be ensured.

Makrinenco (1994) argues that speech intelligibility is determined by acoustic characteristics such as the level of the speech signal, the level of background noise, the reverberation time and the pattern of sound reflections. The parameters strictly related to speech intelligibility in rooms include Reverberation Time (RT), Definition ( $D_{50}$ ), and the Speech Transmission Index (STI).

### 2.1. Reverberation Time

The concept of reverberation time introduced by Sabine is defined as the time, in seconds, required for the sound pressure level in a room to decay by 60 dB starting from the interruption of a continuous sound. Reverberation time is one of the most important parameters to describe the acoustic quality of rooms.

In live results and in results where conditions of sound diffusion prevail, the RT can be estimated based on Sabine's theory. Sabine's formula, which is the most traditional one for calculating reverberation time, is given below:

$$RT = \frac{0.163 \cdot V}{A + 4mV} \quad (1)$$

where:

$V$  is the volume of the room in [ $\text{m}^3$ ],

$A$  is the equivalent sound absorption area  $A = \sum_{i=1}^n \alpha_i \cdot S_i$ , where  $S$  is the area of each

material, and  $\alpha_i$  is the absorption coefficient of the materials of the room's surfaces,

$4mV$  corresponds to sound absorption by air, expressed in [ $\text{m}^2$ ], and

$m$  is the energy attenuation coefficient for air, expressed in [ $10^{-3} \text{ m}^{-1}$ ].

Carl Eyring proposed a modification of Sabine's formula. This modification would be suitable for results with high absorption, “dead” results, with  $\bar{\alpha}$  higher than 0.5 seconds. Eyring claims that Sabine's formula is not valid for results with considerable absorption and that it should be used for “live” rooms. Eyring's formula is based on free propagation between reflections characterized by a diffuse sound field (Eyring, 1930). Eyring's formula is as follows:

$$RT = \frac{0.163.V}{S.\ln(1 - \bar{\alpha})} \quad (2)$$

where:

$RT$  is the reverberation time in [s],

$V$  is the room's volume in [ $\text{m}^3$ ],

$S$  is the total area of the room's surfaces in [ $\text{m}^2$ ],

$\ln$  is the Neperian logarithm,

$\bar{\alpha}$  is the mean absorption coefficient of all the materials:  $\bar{\alpha} = \frac{1}{S} \sum_i S_i \cdot \alpha_i$ , where  $S_i$  is

the area of each surface that makes up the room, and  $\alpha_i$  is the sound absorption coefficient of those materials.

According to Fasold and Veres (2003), the condition for the application of Sabine's equation is that the room's mean sound absorption coefficient is up to  $\bar{\alpha}_{room} = 0.3$  (live rooms). On the other hand, Eyring's equation is used for results where  $\bar{\alpha}_{room}$  is greater than 0.3 (dead rooms), i.e., with high absorption.

Analogously to the concept developed by Eyring, starting from Sabine, Millington and Sette (Millington, 1932; Sette, 1933) developed another formula for calculating the reverberation time. Unlike Eyring's formula, that of Millington-Sette considers sound absorption coefficients separately from the elements that constitute the environment, as shown below:

$$RT = \frac{0.163.V}{\sum_{i=1}^n [S_i \cdot \ln(1 - \alpha_i)]} \quad (3)$$

where:

$RT$  is the reverberation time in [s],

$V$  is the room's volume in [ $\text{m}^3$ ],

$S_i$  is the area of each surface that makes up the room, in [ $\text{m}^2$ ],

$\ln$  is the Neperian logarithm, and

$\alpha_i$  is the absorption coefficient of the materials of the room's surfaces.

Arau-Puchades (1988) proposed a formula for calculating the reverberation time of results with asymmetric distribution of sound absorption. The Arau-Puchades formula assumes that reverberation decay is a hyperbolic process. This decay is the superposition of three contributions: initial decay, first and second linear portion of the decay, and third linear portion of the decay (Neubauer and Kostek, 2001). For rectangular results, Arau-Puchades define an absorption coefficient based on Eyring's model for each surface parallel to the three

axes of  $x$ ,  $y$  and  $z$  spatial coordinates (Ducourneau and Planeau 2003). Arau-Puchades's formula for calculating the RT is as follows:

$$RT = \left[ \frac{0.163V}{-S.\ln(1-\alpha_x) + 4mV} \right]^{\frac{S_x}{S}} \cdot \left[ \frac{0.163V}{-S.\ln(1-\alpha_y) + 4mV} \right]^{\frac{S_y}{S}} \cdot \left[ \frac{0.163V}{-S.\ln(1-\alpha_z) + 4mV} \right]^{\frac{S_z}{S}} \quad (4)$$

where:

The first portion corresponds to the absorption of the materials located parallel to the  $x$  axis, the second parallel to the  $y$  axis, and the third parallel to the  $z$  axis,

$4mV$  corresponds to sound absorption by air, expressed in  $[m^2]$ ,

$m$  is the energy attenuation coefficient of air, expressed in  $[10^{-3} m^{-1}]$ ,

$V$  is the volume in  $[m^3]$ ,

$\ln$  is the neperian logarithm,

$\alpha_x$  is the arithmetic mean of the absorption coefficients of the surfaces of the floor ( $S_{x1}$

$$\text{and ceiling } (S_{x2}), \alpha_x = \left( \frac{\alpha_{x1}S_{x1} + \alpha_{x2}S_{x2}}{S_x} \right),$$

$\alpha_y$  and  $\alpha_z$  are the arithmetic means of the absorption coefficients of the surfaces of the side, front and back walls, respectively,

$S$  is the sum of the areas of all the materials, and

$S_x$ ,  $S_y$  and  $S_z$  are the sums of the areas of the materials that are parallel to the  $x$ ,  $y$  and  $z$  axes, respectively.

The energy attenuation coefficient  $m$  for air is presented in Table 1 as a function of temperature and relative humidity.

**Table 1. Energy attenuation coefficient  $m$   $[10^{-3} m^{-1}]$  for air in octave band frequencies as a function of temperature  $[^\circ C]$  and relative humidity [%]**

|                 |    | Atmospheric Air               |                             |       |       |       |      |      |      | Frequency [Hz] |       |       |       |      |      |      |      |
|-----------------|----|-------------------------------|-----------------------------|-------|-------|-------|------|------|------|----------------|-------|-------|-------|------|------|------|------|
|                 |    | Temperature<br>[ $^\circ C$ ] | Relative<br>humidity<br>[%] | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz           | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz |
| <b>Source 1</b> | 10 | 50                            | 0.1                         | 0.2   | 0.5   | 1.0   | 2.8  | 9.8  | 33.6 |                |       |       |       |      |      |      |      |
|                 | 20 | 50                            | 0.1                         | 0.3   | 0.7   | 1.2   | 2.3  | 6.5  | 22.4 |                |       |       |       |      |      |      |      |
|                 | 30 | 50                            | 0.1                         | 0.2   | 0.8   | 1.7   | 3.0  | 5.8  | 16.4 |                |       |       |       |      |      |      |      |
| <b>Source 2</b> | 10 | 50                            | -                           | -     | 0.41  | 1.01  | 2.77 | 8.93 | 17.8 |                |       |       |       |      |      |      |      |
|                 | 20 | 50                            | -                           | -     | 0.39  | 0.96  | 2.34 | 6.17 | 11.9 |                |       |       |       |      |      |      |      |
|                 | 30 | 50                            | -                           | -     | 0.38  | 0.94  | 2.26 | 5.76 | 9.88 |                |       |       |       |      |      |      |      |
| <b>Source 3</b> | 10 | 30 - 50                       | 0.1                         | 0.2   | 0.5   | 1.1   | 2.7  | 9.4  | 29.0 |                |       |       |       |      |      |      |      |
|                 | 20 | 30 - 50                       | 0.1                         | 0.3   | 0.6   | 1.0   | 1.9  | 5.8  | 20.3 |                |       |       |       |      |      |      |      |

Source: (1): Beranek-Vér (1992); Source (2): Barron (2003); Source (3): Hohmann, Setzer and Wehling (2004).

The data listed in Table 1 were extracted from the following sources: 1) Beranek and Vér (1992), according to data provided by the standard ANSI S1.26:1978: “Method for the calculation of the Absorption of Sound by the Atmosphere”; 2) Barron (2003) and 3) Hohmann, Setzer and Wehling (2004), according to data given in the standard DIN EN 12354-6 (2000): “Bauakustik – Berechnung der akustischen Eigenschaften von Gebäuden aus den Bauteileigenschaften – Teil 6: Schallabsorption von Räumen”).

The factor  $4mV$ , which corresponds to sound absorption by air, is usually neglected in the calculation of the reverberation time for small rooms. However, for large volumes and especially for high frequencies, the absorption by air has a relevant effect and should therefore not be neglected in calculations.

Table 2, adapted from Fasold and Veres (2003), shows the influence of sound absorption by air for different volumes as a function of frequency.

**Table 2. Sound absorption by air as a function of volume and frequency**

| Frequency [Hz]  | 125 | 250   | 500  | 1000 | 2000 | 4000 | 8000  |
|---|-----|-------|------|------|------|------|-------|
| Energy Attenuation Coefficient<br>$m$ [ $10^{-3}$ m $^{-1}$ ] | -   | 0.075 | 0.25 | 0.75 | 2.5  | 7.5  | 25    |
| (Temperature 20°C and relative air humidity 50%)*             |     |       |      |      |      |      |       |
| Sound absorption by air $4mV$ [m $^2$ ]                       |     |       |      |      |      |      |       |
| V = 100 m $^3$<br>(i.e.: a small classroom)                   | -   | 0.03  | 0.1  | 0.3  | 1    | 3    | 10    |
| V = 1000 m $^3$<br>(i.e.: a conference room)                  | -   | 0.3   | 1    | 3    | 10   | 30   | 100   |
| V = 10000 m $^3$<br>(i.e.: a concert hall)                    | -   | 3     | 10   | 30   | 100  | 300  | 1000  |
| V = 100000 m $^3$<br>(i.e.: a large factory pavilion)         | -   | 30    | 100  | 300  | 1000 | 3000 | 10000 |

\* Source: Fasold and Veres (2003).

According to the ISO 3382-1 (ISO, 2009) and ISO 3382-2 standards (ISO, 2008), the reverberation time, RT, can be measured by the interrupted noise method and by the integrated impulse response method.

Measuring the reverberation time, RT, by the interrupted noise method consists of exciting the room with a pseudo-random pink noise and calculating the RT from the room's response to this excitation. A common setup to measure the RT by this method comprises: 1) an omnidirectional sound source, 2) a sound power amplifier, 3) a noise generator, 4) omnidirectional microphones, and 5) a sound decay recorder and analyzer.

Reverberation time measured by the integrated impulse response method is similar to the previous method. The difference lies in the way this signal is processed. This mode of measuring is less influenced by background noise than the interrupted noise method (Bistafa and Bradley, 2000; Fasold and Veres, 2003). In addition, measurements of the impulse response allow for the analysis of other important parameters for the characterization of speech intelligibility, such as Centre Time, T<sub>s</sub>, Definition, D<sub>50</sub>, and Speech Transmission Index, STI.

The following equipment is normally utilized to measure the impulse response of rooms: 1) an omnidirectional source, 2) a sound amplifier, 3) an audio interface, 4) a sound signal generator, 5) omnidirectional microphones, and 6) a sound recorder and analyzer, which processes the sound signal and converts it into an impulse.

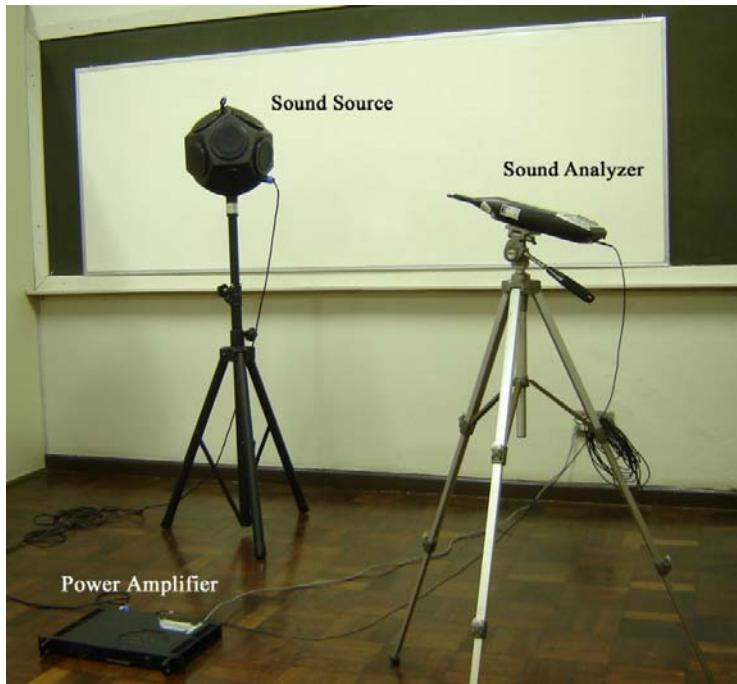


Figure 1. Devices required for measuring the RT by the interrupted noise method.

Figure 2 shows the decay curves of the sound pressure level for different octave bands (MultiSpectrum) for the measured RT in a classroom with a volume of  $565 \text{ m}^3$ . Note the dependence of the reverberation time as a function of frequency.

In this chapter the both methods were used to assess the acoustic quality in classrooms. RT interrupted noise measurements were taken with Brüel and Kjaer equipment and software, comprising: 1) an omnidirectional source, 2) a sound power amplifier, 3) a BK 2260 sound analyzer, 4) BZ 7204 software which manages the analyzer to generate and record sound signals, and 5) Qualifier Type 7830 software, which calculates the RT from the collected data. The impulse response was measured with the following equipment: 1) an omnidirectional source, 2) a sound amplifier, 3) an audio interface, 4) a BK 2260 sound analyzer, 5) BK 4953 omnidirectional microphones, and 6) Dirac 3.1 software for Windows.

For the same room, Figure 3 presents the spatial average of reverberation time obtained from six source-microphone combinations, according to ISO 3382-2:2008.

As discussed earlier, reverberation time is the time, in seconds, required for the sound pressure level in a room to decay by 60 dB starting from the interruption of a continuous sound. Since a decay of 60 dB is often difficult to record because of the influence of ambient noise on the reverberating tail, the reverberation time is extrapolated from the first 20 dB of decay measured from the reduction of 5 dB below the initial sound pressure level down to 25 dB below that level.

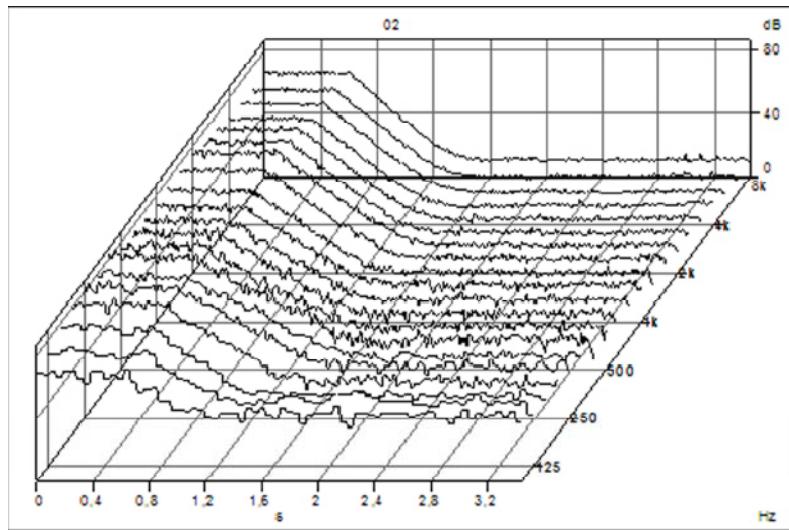


Figure 2. Multispectrum of the measured reverberation time.

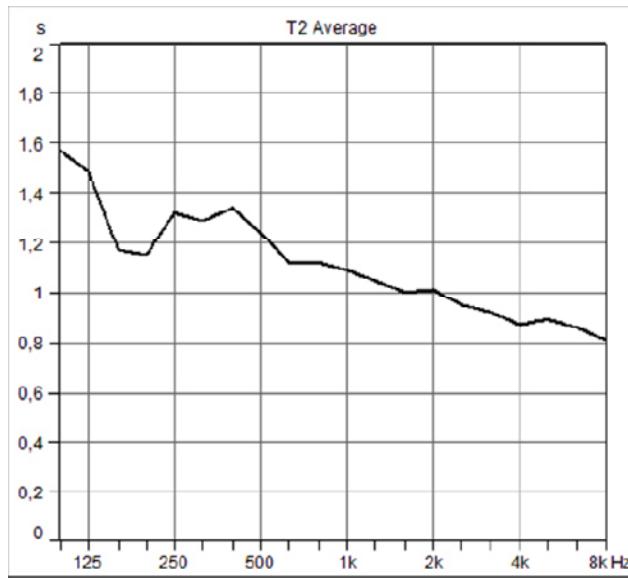


Figure 3. Spatial average of the reverberation time in a classroom.

This metric is represented by the letter T followed by the index corresponding to the measured interval,  $T_{20}$ .  $T_{30}$  is calculated likewise, by recording a longer interval (-5 dB to -35 dB), which is more commonly utilized (ISO 3382-2, 2008). Figure 4 presents the decay curves measured for the octave bands of 125, 250, 500, 1000, 2000 and 4000 Hz obtained from the measurements of  $T_{20}$  and  $T_{30}$  in a classroom with a volume of  $565 \text{ m}^3$ , using the interrupted noise method, according to the ISO 3382-2:2008.

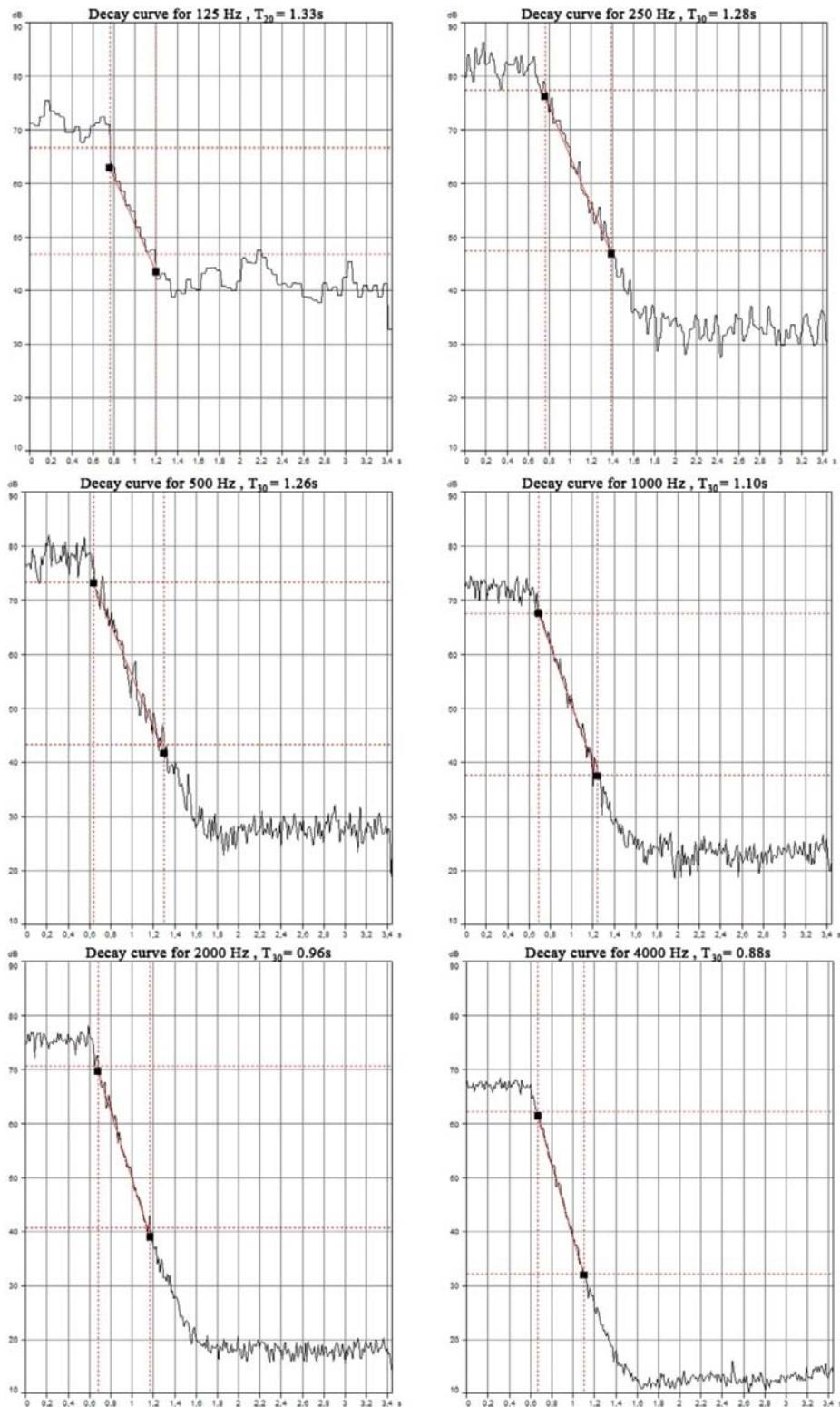


Figure 4. Decay curves  $T_{20}$  and  $T_{30}$  for the determination of the reverberation time.

As discussed earlier, the RT can be obtained by several calculation and measurement procedures. Figure 5 compares the values of RT obtained by: calculations with the formulas of Sabine, Eyring, Millington-Sette and Arau-Puchades, measurements by the interrupted noise method and by the integrated impulse response method. The results presented in this figure were obtained in a classroom of approximately 300 m<sup>3</sup>, with an average acoustic absorption coefficient of 0.15 at a frequency of 500 Hz.

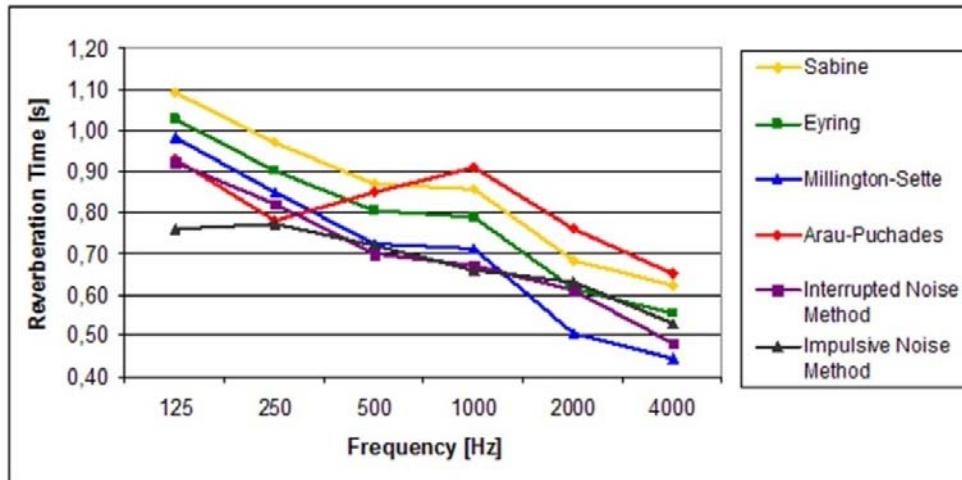


Figure 5. Reverberation time, RT, measured and calculated by different methods.

From Figure 5 it can be seen that the RT values obtained by the two measurement methods are very similar, and these results are corroborated by studies conducted by Astolfi et al. (2008) and by Passero and Zannin (2010). Moreover, Figure 5 demonstrates that the classical formulas comprise a reliable and low-cost frame of reference for predicting the RT in classrooms.

With regard to classrooms, various acoustic standards present reference values for the RT that should be observed in the design of the classroom. Germany, Japan, the United Kingdom, the United States of America, Portugal and France have specific technical standards for evaluating the RT of classrooms.

In Japan, RT values represent the average in 2-octave bands including 500 Hz and 1000 Hz, and RT is measured in the furnished and unoccupied classroom (Fukuchi and Ueno 2004). In the United Kingdom, the Building Bulletin 93 (BB93, 2003) indicates that RT is given in terms of the maximum mid-frequency reverberation time, T<sub>mf</sub>, the average RT in the 500 Hz, 1000 Hz and 2000 Hz octave bands, and RT should be measured in the unfurnished and unoccupied classroom.

In the USA, RT is given as the maximum RT for midband frequencies of 500 Hz, 1000 Hz and 2000 Hz, and RT is measured in the furnished and unoccupied classroom (ANSI S12.60, 2002). In Germany, the DIN 18041 (2004) standard establishes that RT values represent the average in 2-octave bands including 500 Hz and 1000 Hz, and RT is measured in the furnished and occupied classroom.

In France, RT is calculated as the arithmetic mean of the values measured for the frequencies of 500 Hz, 1000 Hz and 2000 Hz (WHO, 2001), and in Portugal, the RT

recommended for classrooms is established as a function of two frequency ranges: 1)  $125 \text{ Hz} \leq f \leq 250 \text{ Hz}$ , and 2)  $500 \text{ Hz} \leq f \leq 4000 \text{ Hz}$  (WHO, 2001).

The World Health Organization – WHO recommends the value of 0.6 s for the RT in classrooms (Shield and Dockrell, 2003). Table 3 shows the RT recommended in different countries as a function of the volume of the classroom.

**Table 3. Recommended Reverberation Time for Classrooms**

| Country                  | Reverberation Time, RT, in [s]   | Volume, V, in [ $\text{m}^3$ ] |
|--------------------------|--|--------------------------------|
| France                   | $0.4 < \text{RT} \leq 0.8$   | $V \leq 250$                   |
|                          | $0.6 < \text{RT} \leq 1.2$   | $V > 250$                      |
| Germany                  | $\text{RT} = 0.5$  | $V = 125$                      |
|                          | $\text{RT} = 0.6$  | $V = 250$                      |
|                          | $\text{RT} = 0.7$  | $V = 500$                      |
|                          | $\text{RT} = 0.8$  | $V = 750$                      |
| Japan                    | $\text{RT} = 0.6$  | $V \sim 200$                   |
|                          | $\text{RT} = 0.7$  | $V \sim 300$                   |
| Portugal                 | $\text{RT} \leq 1.0$ - for $125 \text{ Hz} \leq f \leq 250 \text{ Hz}$           | -                              |
|                          | $0.6 \leq \text{RT} \leq 0.8$ - for $500 \text{ Hz} \leq f \leq 4000 \text{ Hz}$ | -                              |
| United States of America | $\text{RT} = 0.6$  | $V \leq 283$                   |
|                          | $\text{RT} = 0.7$  | $283 < V \leq 566$             |
| WHO                      | $\text{RT} = 0.6$  | -                              |

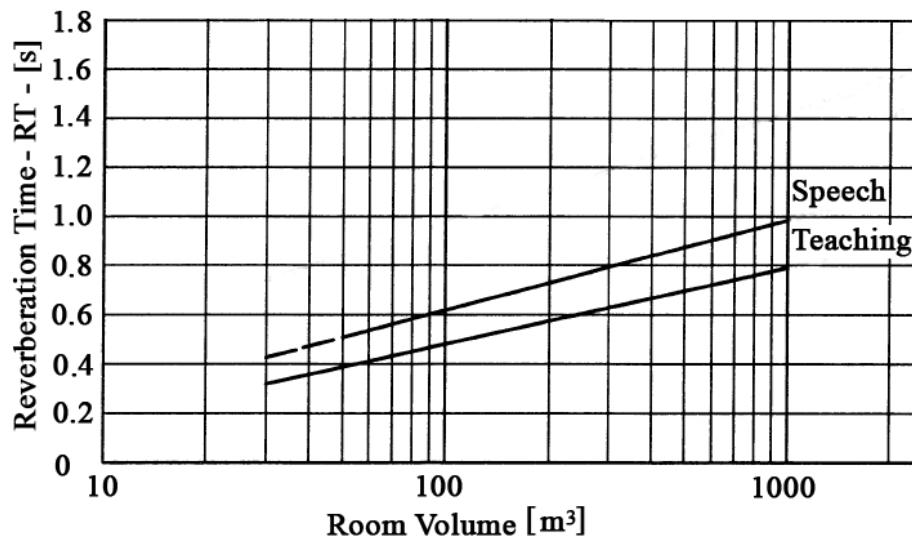


Figure 6. Reverberation time as a function of classroom volume (Adapted from DIN 18041:2004).

The German standard DIN 18041:2004 recommends that, in general, the RT of an unoccupied classroom should not be more than 0.2 s above the required value listed in Table 3. In addition, for people with impaired hearing, concentration or attention problems, and people who speak German as a foreign language, this standard recommends that the RT be about 20% lower than the values specified in Figure 6. This reduction in the value of the RT

should be observed for the octave bands of 250 Hz to 2000 Hz and for classrooms with a maximum volume of 250 m<sup>3</sup>.

## 2.2. Definition

According to Huber et al. (2002), the enormous number of results obtained by different researchers leaves no doubt that, in rooms destined for multiple uses, the reverberation time is the main objective parameter to be observed in the evaluation of their acoustic quality. On the other hand, the specific use of a room for music or speech requires that other acoustic parameters be taken into account.

In environments where speech intelligibility is the main objective to be achieved, the evaluation of RT should be complemented with an analysis of speech Definition D<sub>50</sub> over the areas of the audience or for a set of positions of these areas.

The parameter D<sub>50</sub> is defined as the ratio of sound energy, direct and reflected, which is contained in the first 50 ms of the decay curve and the total energy of the sound impulse. Definition is expressed in percentage [%]. Table 4 shows reference values for D<sub>50</sub>. This parameter is calculated by means of the following equation (Kuttruff, 2004; ISO 3382-1, 2009):

$$D_{50} = \frac{\int_0^{50ms} E(t)dt}{\int_0^{\infty} E(t)dt} \cdot 100 \quad (5)$$

where:

D<sub>50</sub> is the Definition in percentage [%];

$E(t)$  is the energy present in the impulse response that, in time  $t$ , reaches the receiving point.

**Table 4. Values of reference for Definition (D<sub>50</sub>)**

| Author/Standard   | D <sub>50</sub> Reference values for good intelligibility |
|-------------------|---|
| Fasold and Veres  | > 50%   |
| *DIN 18041:2004   | ≥ 50  |
| **ISO 3382-1:2009 | 30% to 70%  |

\* For a minimum syllabic intelligibility of 85%.

\*\* The range of recommended values refers to the mean values, in frequency, for a position in concert halls and multiple use rooms, not occupied, and with a volume of up to 25,000 m<sup>3</sup>. These values are obtained for the average between the frequencies of 500 and 1000 Hz.

## 2.3. Centre Time

Another parameter for the study of speech intelligibility is the Centre Time (T<sub>s</sub>). Centre Time can be described as the “center of gravity” of the sound energy decay curve. At this point there is a kind of compensation between the sound energy favorable to speech

intelligibility and the diffuse field of the room. Because this metric is not defined as a function of a given time interval, “the Centre Time avoids the discrete division of the impulse response into early and late periods” (ISO 3382-1, 2009). This characteristic of the  $T_s$  describes very closely the real behavior of sound at a given point in a room (Fasold and Veres, 2003). Table 5 lists the reference values for the Centre Time.

**Table 5. Reference values for  $T_s$**

| <b>Reference values for good speech intelligibility <math>T_s</math> [ms]</b> |                       |                            |
|---|-----------------------|----------------------------|
| Author/Standard   | *Multipurpose results | Speech performance results |
| Fasold and Veres (2003)   | 60-260                | -                          |
| ISO 3382-1:2009   | -                     | <80                        |

## 2.4. Speech Transmission Index

Among the acoustic parameters employed to characterize speech intelligibility, the Speech Transmission Index (STI) is the most efficient objective metric (Ronsse, 2006). The greater processing capacity of computers, the portability of measuring equipment, and the advent of high speed measurement techniques favor the use of this diagnostic technique.

Although the STI is similar to the articulation index (AI), another descriptor of intelligibility (ANSI S3.5, 1997), certain characteristics make it especially important. The STI considers the effects of reverberation, background noise and the contribution of the direction of the source for the determination of speech intelligibility. These elements, which are usually treated individually, are combined in a single index (Harris, 1998 and Kang 2002). The STI can be described as “a physical quantity representing the transmission quality of speech with respect to intelligibility” (IEC 60268-16 2003).

The IEC 60268-16:2003 standard establishes the measurement procedures and correlates the subjective impression of speech intelligibility to objective values of the measured STI. This correlation is presented in Figure 7.

To measure the STI requires that a test signal be transmitted from a sound source situated in the speaker’s position to a microphone located in the listener’s position. The important characteristics for the sound source are its physical size, direction, position and sound pressure level. Because the STI depends strongly on the directivity of the source, a mouth simulator with characteristics similar to those of a human mouth or head should be used as the sound source for greater precision. If a loudspeaker with characteristics different from those of a mouth simulator is used, the levels of reflections that will reach the receiver will be unreal (Müller 2007). Bozzoli et al. (2005) contend that the shape of the directivity balloon of the sound source is important to determine values that are correct and comparable to the STI.

Before beginning STI measurements, the sound level should be calibrated to 65 dB(A) and set at a distance of one meter from the source. In addition, the sound levels of the signal used at all the frequencies from 125 to 8000 Hz must be adjusted to ensure that the differences between them are lower than  $\pm 1$  dB.



Figure 7. Subjective correlation of the values of STI. Adapted from IEC 60268-16 2003.

The Speech Transmission Index is then calculated from the impulse response of this equalized signal. Figure 8 illustrates the impulse response of a classroom used to measure the STI.

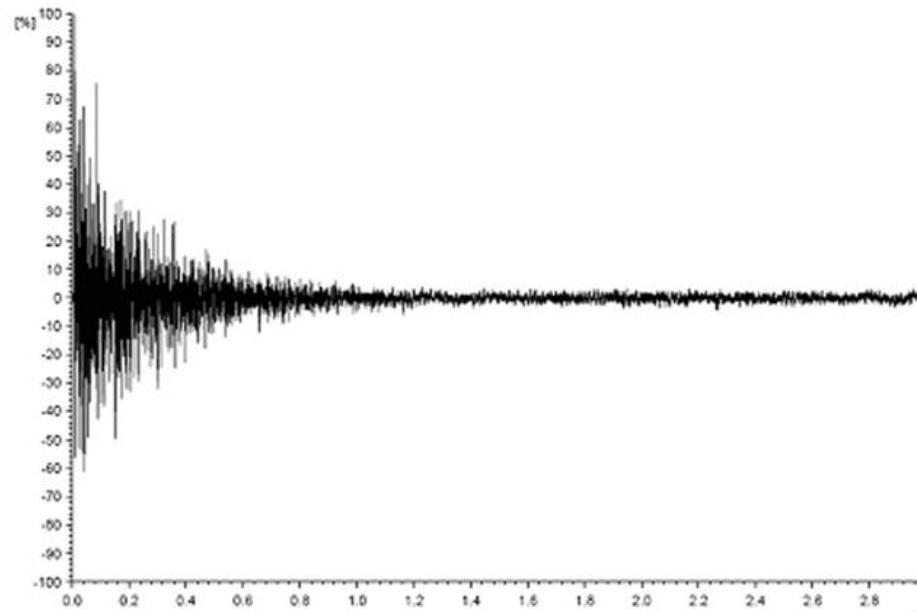


Figure 8. Impulse response of a classroom.

In addition to measuring the impulse response, the background noise (generated by the presence of people, ventilation systems and other equipment) in the room, measured or predicted, should be mixed with the recorded impulse response. This will align the signal-to-

noise ratio of the occupied room as closely as possible to the room's working condition and the STI calculation will provide more accurate results.

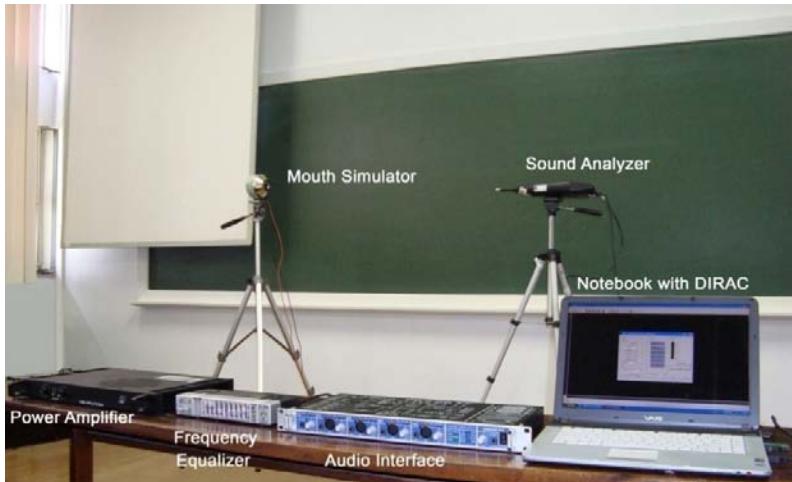


Figure 9. Devices required for measuring the STI.

Measuring the STI requires the following devices: 1) an audio interface, 2) a frequency equalizer (octave bands), 3) a power amplifier, 4) a sound source that simulates the characteristics of the human mouth (mouth simulator), 5) microphones to capture the sound signal, 6) a system to record the room's impulse response, 7) a sound level meter (to record background noise), and 8) a system to mix background noise and calculate the STI (usually a software program). Figure 9 depicts the devices employed to measure the STI.

Figure 10 shows the position of the source (mouth simulator) in the speaker's (teacher) position and the microphone that captures the response of the room in the listener's (student) position.

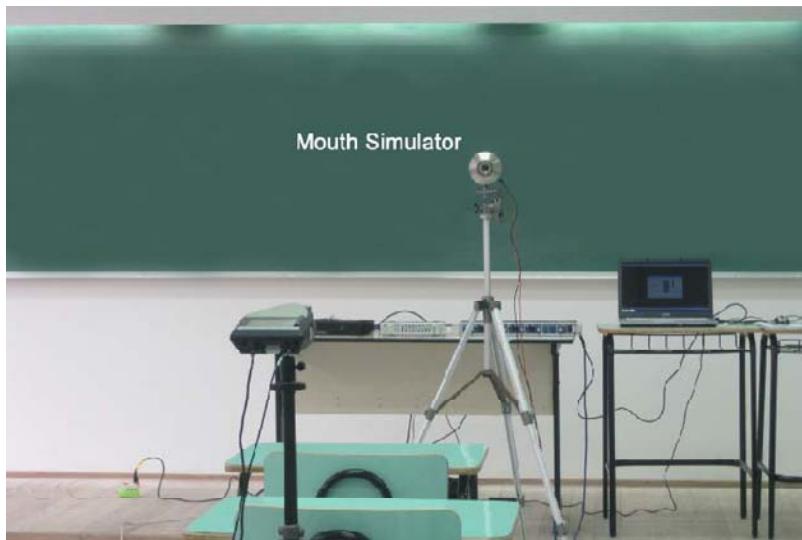


Figure 10. Mouth Simulator in the teacher's position to measure the STI in a classroom.

### 3. CASE STUDIES IN UNIVERSITY CLASSROOMS

This section presents several case studies carried out in classrooms at the Federal University of Paraná, Brazil.

Three classroom models are presented, which differ in terms of their volume, geometry and wall, floor and ceiling materials. The three models differ significantly with respect to their equivalent sound absorption.

Using the integrated impulse response method, measurements were taken in the three classrooms of the reverberation time (RT), Definition ( $D_{50}$ ) and Centre Time ( $T_s$ ) according to the ISO 3382-2:2008 and ISO 3382-1:2009 standards and of the Speech Transmission Index (STI) according to the IEC 60268-16:2003 standard – Objective rating of speech intelligibility by the speech transmission index.

The classroom depicted in Figure 11 (classroom A) is shaped like an auditorium and has a wood floor, mortared and painted brick walls with wood paneling up to 1.20 m from the floor, a lowered ceiling lined with Acoustic-Celotex Cane Tile (Knudsen and Harris, 1988), steel frame windows with ordinary glass panes, and a wood door.

The classrooms of this model were built in the 1960s, with a seating capacity of 50 students and a volume of 269.70 m<sup>3</sup>.



Figure 11. Classroom A – Interior View.

The classroom shown in Figure 12 (classroom B) has a parallel floor and ceiling, the floor is overlaid with vinyl tiles and the ceiling with mineral fiber. Its walls are of mortared and painted brick. The steel-framed windows have ordinary glass panes. The desks and chairs are made of tubular steel with plywood tops, seats and backrests covered with high-strength melamine laminate. This room has a volume of 263.41 m<sup>3</sup> and seating capacity of 60 students. The classrooms of this model were built in the 2000s.



Figure 12. Classroom B – Interior View.

The classroom presented in Figure 13 (classroom C) has a vinyl floor, a ceiling of precast reinforced concrete panels, mortared and painted brick walls, and steel-framed windows with ordinary glass panes. Like in classroom B, the desks and chairs are made of tubular steel with plywood tops, seats and backrests covered with high-strength melamine laminate. This room seats 45 students and has a volume of  $179.52 \text{ m}^3$ . This room was also built in the 2000s.



Figure 13. Classroom C – Interior View.

Table 6 presents an acoustic evaluation of rooms A, B and C for the parameters of RT, D<sub>50</sub> and T<sub>s</sub> obtained by the arithmetic mean of the frequencies of 500 Hz to 2000 Hz in octave bands. The STI parameter was measured for a source-receptor distance of 4 m and a background noise of 35 dB(A).

**Table 6. Acoustic performance of the three classrooms**

| <b>Classroom Type</b> | <b>Classroom Acoustic Descriptors</b> |         |         |      |
|-----------------------|---------------------------------------|---------|---------|------|
|                       | RT (s)                                | D50 (%) | Ts (ms) | STI  |
| A                     | 0.6                                   | 69      | 44.4    | 0.81 |
| B                     | 0.8                                   | 75      | 33.3    | 0.62 |
| C                     | 2.2                                   | 26      | 141.2   | 0.45 |

The standards listed in Table 3 recommend a RT of 0.6 s to 0.7 s for good classroom acoustics. Table 6 indicates that only classroom A meets this standard. The RT value obtained for classroom C characterizes a room with excessive reverberation, which is not recommended for a classroom.

Fasold and Veres (2003) recommend D<sub>50</sub> > 50% for speech and the DIN 18041 (2004) standard establishes that, for a syllabic intelligibility of at least 85%, the Definition should be no less than 50%. According to these recommendations, classrooms A and B have an adequate D<sub>50</sub>, while that of classroom C is far below the minimum recommended.

The centre time (T<sub>s</sub>), similarly to the D<sub>50</sub>, is also not in line with the recommendations for good speech intelligibility in classroom C. The measured results indicate that only classrooms A and B, whose T<sub>s</sub> is lower than 80 ms, meet the recommendations for this parameter.

A comparison of the data in Table 6 with the subjective classification of the IEC16081:2003 standard (see Figure 7) indicates that the classification of intelligibility for classroom A is excellent, that of classroom B is good and that of classroom C is fair.

Rooms A, B and C characterize three very common architectural arrangements of Brazilian classrooms. In these rooms, in addition to the geometric characteristics of the space, the specification of the finishing materials is related directly to the acoustic performance of the classrooms.

The search for better acoustics should be the objective of designs for new rooms and for the restoration of existing ones. In both cases, acoustic planning of the classrooms is essential in order to achieve good results.

## 4. ACOUSTIC PLANNING OF A CLASSROOM

### 4.1. Computer Simulation

Simulations allow for the diagnosis and acoustic adjustment of classrooms in the design phase (Schroeder, 1969). The first acoustic predictions of a room are usually made using statistical reverberation models such as those presented here.

Larger rooms or rooms with greater geometric complexity require more complex analyses. Physical scale or computer simulation models are among the most widely used

methods. Computer simulations have gained popularity due to their lower cost and easier execution and testing of design alternatives compared to testing with scale models.

Suitable room acoustics simulation software programs allow not only for the identification of reverberation time but also of other relevant acoustic parameters. They also ensure the prediction of different combinations of the investigated metrics, the characteristics of the room and its background noise, which is an especially significant calculation capacity for STI evaluation (Huber et al., 2002).

There are two classical geometric methods for the simulation of enclosed rooms or spaces, called the ray tracing method and the image source method. These two methods can be used in combination, in which case they are referred to as the hybrid method, which has advantages over the individual methods (Bradley and Wang, 2007). Rindel (2000) claims that hybrid methods combine the best characteristics of the image source and ray tracing methods and require significantly less calculation time. A comparison of several computer simulation methods indicated that programs that use the hybrid method produce the best results (Bradley and Wang, 2007).

Figure 14 presents a simulation of the STI in a classroom, performed by a computer program that uses the hybrid method, the Odeon 9.0 software. The acoustic map shows the variation in intelligibility in the room, which is considered good to excellent, according to the qualitative attributes of the IEC 60268- 16:2003 standard (see Figure 7).

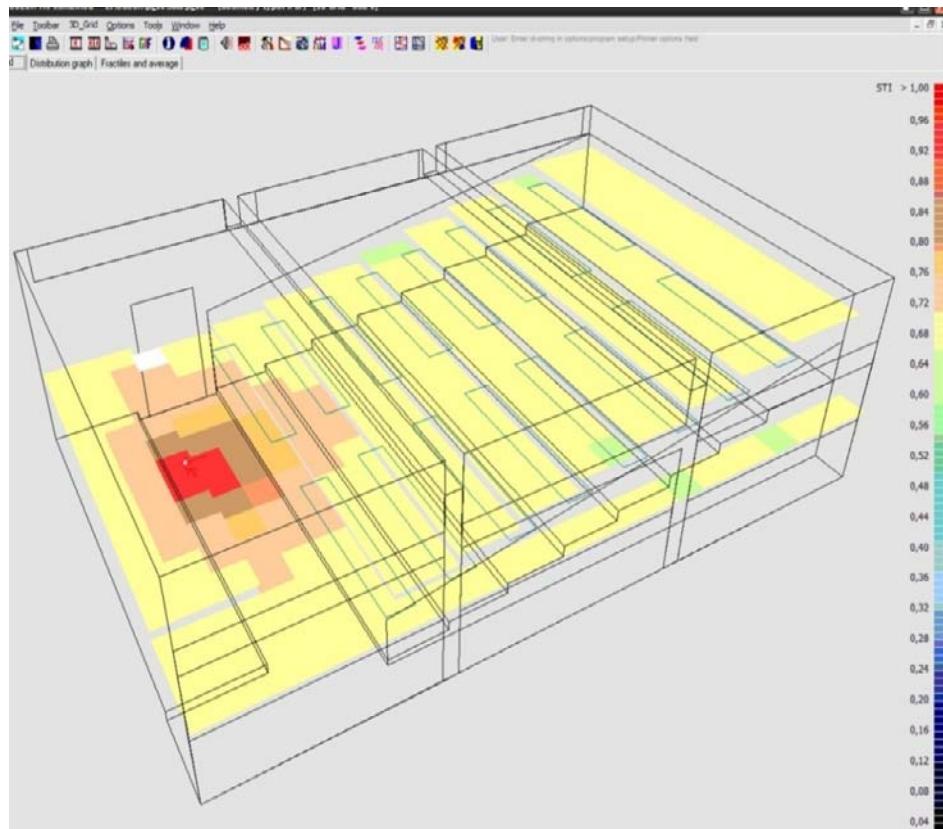


Figure 14. Simulation of the STI by Odeon software.

## 4.2. Influence of Absorbent Surfaces

Figures 15 and 16 depict two different types of ceiling panel materials for classrooms. The panel shown in Figure 15 was the original classroom ceiling material used in a classroom block built in the 1960s belonging to the Technology Sector of the Federal University of Paraná. Table 7 describes the absorption coefficient of the original ceiling panel illustrated in Figure 15.

**Table 7. Sound absorption coefficient of Acousti-Celotex Type C-7 ceiling panel**

| Frequency                               | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
|---|--------|--------|--------|---------|---------|---------|
| Sound Absorption Coefficient $\alpha^*$ | 0.25   | 0.49   | 0.69   | 0.78    | 0.61    | 0.48    |

\* Source: Knudsen and Harris, 1988.

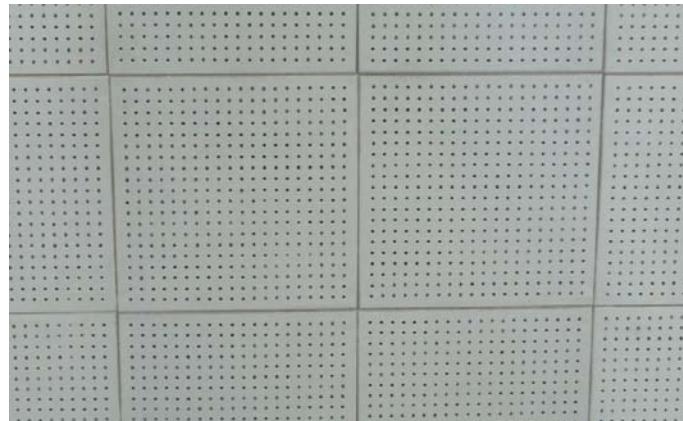


Figure 15. Acousti-Celotex Type C-7 ceiling panel.

The original ceiling panel was replaced with the PVC panel shown in Figure 16. The reasons cited for substituting the ceiling panel were as follows: 1) difficult maintenance and cleaning, and 2) difficult replacement of damaged panels.



Figure 16. PVC ceiling.

Figure 17 illustrates the reverberation time (RT) measured by the interrupted noise method in four classrooms with the original ceiling (see Figure 15) and with the new PVC panels (see Figure 16). The RT of the original ceiling was measured in 2004 and that of the PVC ceiling in 2009.

Figure 17 reveals the marked difference between the reverberation times measured in rooms with Acousti-Celotex Type C-7 ceilings (Knudsen and Harris, 1988) and in rooms with PVC ceilings. Based on the RT values measured in the two situations, the acoustic quality was evaluated against some of the standards presented in Table 3, such as the American standard ANSI S12.6:2002 (ANSI, 2002), the Brazilian standard ABNT-NBR-12179:1992 (ABNT, 1992), the French specifications listed in the Decree of 09 Jan 1995 (WHO, 2001) and the German standard DIN 18041:2004.

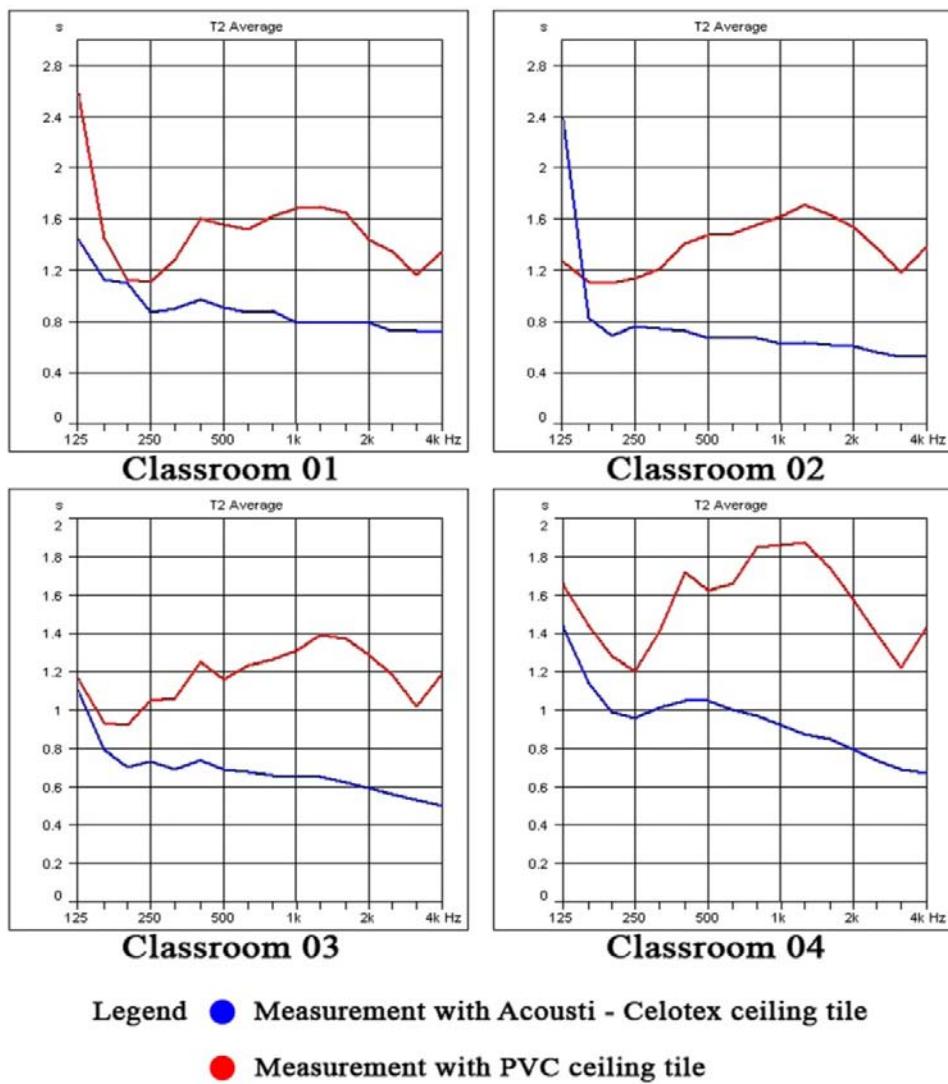


Figure 17. Measurement of reverberation time with acoustic ceiling panel and with PVC panel.

Table 8 summarizes this evaluation and demonstrates unequivocally that, prior to the substitution of the ceiling, most of the classrooms satisfied the quality standards for RT according to the four standards used as reference. Classroom 04 met the requirements only of the French standard. After the ceiling panels were replaced with PVC, none of the rooms met the requirements of the four reference standards.

**Table 8. Evaluation of the acoustic quality of classrooms with Acousti-Celotex and PVC ceilings**

| Classrooms |                 | American standard | French standard | German standard |
|------------|-----------------|-------------------|-----------------|-----------------|
| 01         | Acousti-Celotex | Adequate          | Adequate        | Adequate        |
|            | PVC             | Inadequate        | Inadequate      | Inadequate      |
| 02         | Acousti-Celotex | Adequate          | Adequate        | Adequate        |
|            | PVC             | Inadequate        | Inadequate      | Inadequate      |
| 03         | Acousti-Celotex | Adequate          | Adequate        | Adequate        |
|            | PVC             | Inadequate        | Inadequate      | Inadequate      |
| 04         | Acousti-Celotex | Inadequate        | Adequate        | Inadequate      |
|            | PVC             | Inadequate        | Inadequate      | Inadequate      |

#### 4.3. Influence of Occupation

Another interesting factor to observe in classrooms is the influence of occupation on the RT. To this end, the RT was measured in two models of classrooms, one built in the 1960s (Polytechnic Centre building – PC), Figure 18, and the other at the beginning of the 21st century (Botanical Garden building – BG), Figure 19. The classrooms in Figures 18 and 19 possess the following characteristics (Ferreira, 2006; Zannin and Ferreira, 2009):

**Table 9. Characteristics of the classrooms in the Polytechnic Centre (PC) building and the Botanical Garden (BG) building**

| Classroom                        | Maximum Number of Students | Volume [m <sup>3</sup> ] | Sound Absorption Area [m <sup>2</sup> ] | Reverberation Time RT [s]<br>* Mean RT at the frequencies of 500, 1000 and 2000 Hz<br>** Furnished and unoccupied rooms |
|----------------------------------|----------------------------|--------------------------|---|---|
| PC – Polytechnic Centre building | 50                         | 294.74                   | 58.89                                   | 0.6   |
| BG – Botanical Garden building   | 50                         | 277.49                   | 15.74                                   | 2.5   |

The RT measurements were taken with the classrooms empty, with 50% occupation, and with 100% occupation. As can be seen in Figure 20, the influence of occupation is negligible

in the PC classroom, where the RT already met the recommendations of the standards presented in Table 3 in the unoccupied condition.



Figure 18. PC Classroom.



Figure 19. BG Classroom.

A 50% and 100% occupation of the room resulted in a decrease in RT of 0.1 to 0.2 s. Conversely, in the BG classroom, whose RT in the unoccupied condition failed to meet any of the recommendations listed in Table 3, a 50% occupation of the room reduced the RT by 1.1 to 1.3 s at frequencies of 500, 1000 and 2000 Hz. However, even with this considerable reduction, the classroom still did not meet the aforementioned recommendations. Only with 100% occupation did the classroom satisfy the RT recommended by the French standard. Nonetheless, it continues not to meet the requirements of the other standards listed in Table 3. These results indicate that a classroom should perform adequately in the unoccupied condition. If the room's acoustic condition is poor, which is the case of the BG classroom, its occupation will only marginally benefit its acoustic condition.

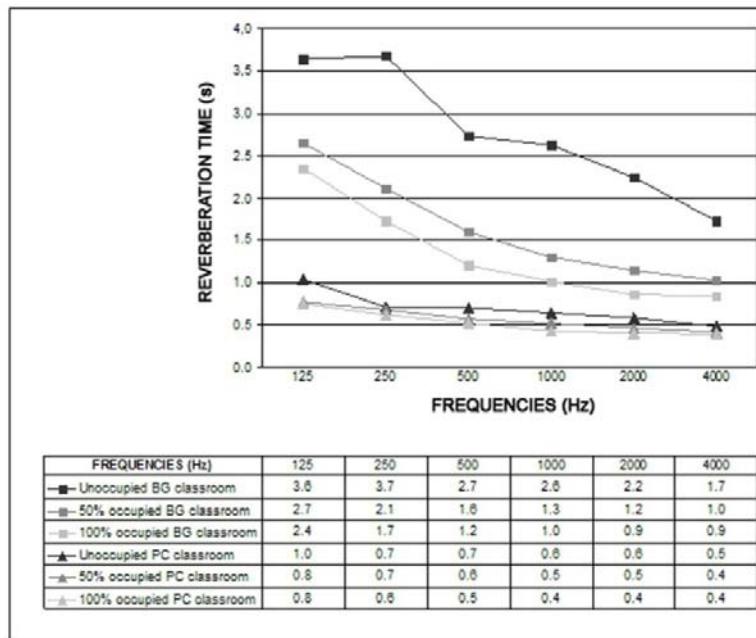


Figure 20. Comparison of reverberation time as a function of occupation.

#### 4.4. RELATIONSHIP BETWEEN ACOUSTICS PARAMETERS AND ACOUSTIC QUALITY

Good classroom acoustics is achieved through the combination of constructive elements that results in ideal acoustic parameters. As discussed earlier herein, one of the factors that exerts the greatest influence in obtaining such parameters is the acoustic absorption of the materials that make up the room. Acoustic absorption reduces the RT and affects parameters such as the  $D_{50}$ ,  $T_S$  and STI. In addition to reverberation, the STI combines the effects of noise in its final result. That is why this parameter is of the utmost importance in sound quality assessments of rooms for communication, which is the case of classrooms.

Based on these concepts, computer simulations were performed in a classroom of approximately  $250 \text{ m}^3$  to verify the influence of acoustic absorption on the RT,  $D_{50}$  and  $T_S$  parameters and the contribution of reverberation and background noise to the STI values.

For this study, which is described below, the room was considered to have low absorption materials on the floor and walls, no furniture and no occupation. Distinct sound absorption materials were used for the ceiling surface.

Table 10, below, lists the absorption coefficients of the materials used in the simulation of the classroom in situations A, B, C and D at the frequencies of 500, 1000 and 2000 Hz. To ascertain the influence of background noise, the STI was simulated in each of the four situations, using the following noise levels:  $L_{eq} = 35\text{dB(A)}$  and  $L_{eq} = 50\text{dB(A)}$ , where  $L_{eq}$  represents the equivalent sound level. The figure below presents the mean RT,  $D_{50}$  and  $T_S$  values at the frequencies of 500, 1000 and 2000 Hz and the acoustic map of the STI obtained by simulation using Odeon 9.0 software.

**Table 10. Sound absorption coefficient  $\alpha$  of ceiling materials in situations A, B, C and D**

| Situation | Sound absorption coefficient $\alpha$ |         |         |
|-----------|---------------------------------------|---------|---------|
|           | 500 Hz                                | 1000 Hz | 2000 Hz |
| A         | 0.55                                  | 0.72    | 0.70    |
| B         | 0.17                                  | 0.35    | 0.52    |
| C         | 0.17                                  | 0.09    | 0.10    |
| D         | 0.014                                 | 0.016   | 0.017   |

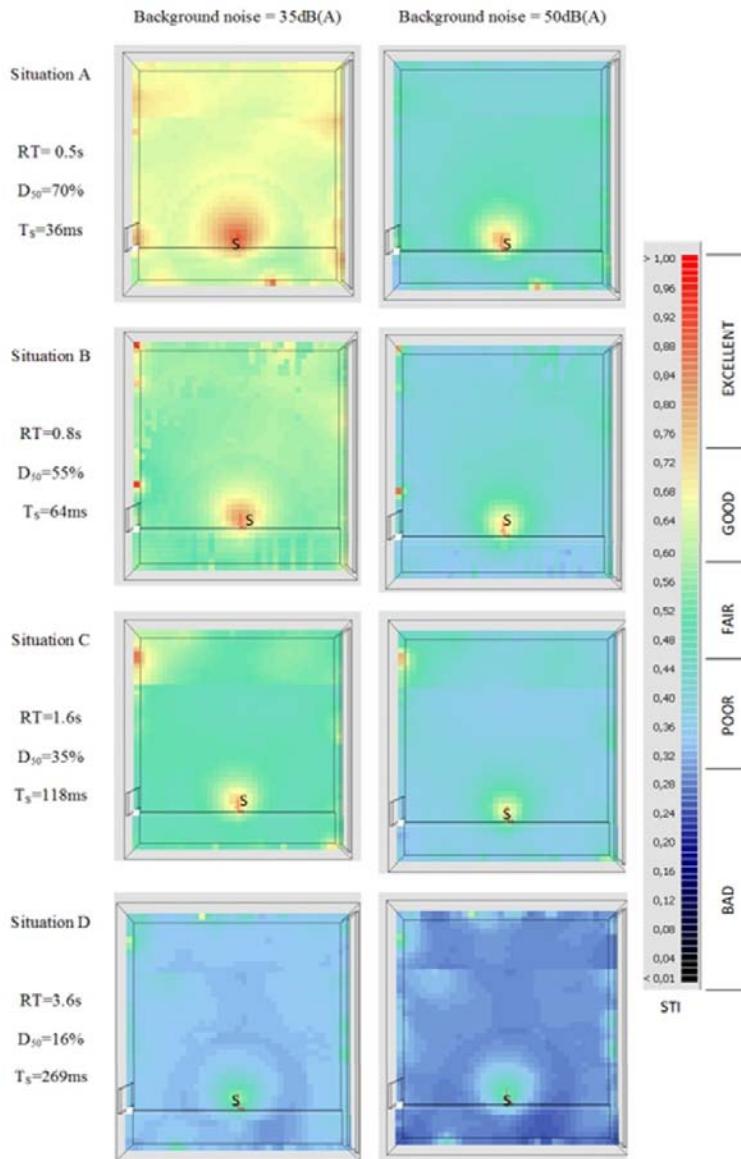


Figure 21. Computer simulation of a classroom with different sound absorption levels. On the STI map, S represents the position of the mouth simulator. Subjective classification of the STI according to the IEC 60268-16 standard.

In Figure 21, the simulation of situation A resulted in a reduced RT and  $T_S$ , and a high  $D_{50}$ , which appear to be adequate for classroom communication. However, excellent to good values of STI were only obtained with a low background noise of 35 dB(A) (IEC 60268-16 – 2003). With high background noise, 50dB(A), intelligibility can be classified as fair. In situations B (RT = 0.8s) and C (RT = 1.6s), the STI varied from good to fair in simulations with background noise of 35 dB(A) and from fair to poor with higher noise, 50 dB(A). In situation D, a reverberant room with a RT of 3.6s, intelligibility is classified as poor with a background noise of 35 dB(A) and bad with a background noise of 50 dB(A). Based on this analysis and an observation of the simulations in Figure 21, it is clear that a good or excellent STI (IEC 60268-16 – 2003) can only be achieved with a combination of brief reverberation time and low background noise (Huber et al., 2002).

## CONCLUSION

The classroom is a special environment, since it is here that humans will be in contact with knowledge, from childhood to adulthood. It is therefore crucial for the classroom to be as harmonious as possible, and one of the elements that make up this harmony is its acoustic quality. As the various sections of this chapter indicate, this quality is linked to several measurable physical parameters which can also be simulated computationally.

For knowledge – especially that transmitted orally – to reach the listener (student) clearly, good conditions must be established in the design of school buildings in general, and of classrooms in particular, to enable adequate reverberation time, definition and speech transmission index values to be achieved.

From the measurements taken in real classrooms and from simulations in real and hypothetical classrooms presented here, it is evident that good acoustics depends on several factors, including: 1) the level of background noise of the site where the classroom is located, and 2) the materials covering the room's internal surfaces, particularly the ceiling.

Background noise, as we have seen, is highly detrimental to the room's performance in terms of its intelligibility, represented by the Speech Transmission Index – STI parameter. Using the measuring devices and simulation software programs currently available, one can consider the STI an excellent procedure for evaluating speech intelligibility (Lazarus et. al, 2007). Acoustic treatment is necessary but does not suffice to ensure adequate values for the descriptive parameters of a room. Concern regarding acoustics should begin in the early phases of the design, with the choice of the plot of land and the construction of the edifice. Buildings close to crossroads with heavy traffic, or which have openings facing noisy areas, will have higher background noise levels in their interior, resulting in reduced speech intelligibility.

Notably, of course, the issue of costs is a determining factor in the investment to be made in the quality of acoustic comfort that rooms in general – and particularly classrooms – will afford their occupants. With regard to acoustic treatment inside the room, to reduce reverberation and improve intelligibility, the measurements and simulations presented in this chapter have shown that ceiling covers made of material with good sound absorption already go a long way in significantly benefiting the room's acoustic quality. Hence, it can be

concluded that school buildings should include acoustic design and planning, since their absence may irreparably impair the learning process of an entire generation.

## REFERENCES

- American National Standard. ANSI S12.60: *Acoustical performance criteria design requirements, and guidelines for schools*. Melville, 2002.
- Arau-Puchades H. An improved reverberation formula. *Acustica*, 1988, 65: 163-179.
- Associação Brasileira de Normas Técnicas. NBR 12179: *Tratamento acústico em recintos fechados: procedimento*. Rio de Janeiro, 1992.
- Astolfi A, Pellerey F. Subjective and objective assessment of acoustical and overall environmental quality in secondary school classrooms, *Journal of the Acoustical Society of America*, 2008, 132(1): 163-173.
- Barron RF. *Industrial Noise Control and Acoustics*. New York, 2003.
- Beranek L, Vér IL. *Noise and vibration control engineering: Principles and applications*. United State of America, 1992.
- Bistafa SR, Bradley JS. Predicting reverberation times in a simulated classroom. *Journal of the Acoustical Society of America*, 2000, 108:1721-1731.
- Bozzoli F, Viktorovitch M, Farina A. Balloons of Directivity of Real and Artificial Mouth Used in Determining Speech Transmission Index. In: *AES Convention*, 2005, 118.
- Bradley DT, Wang LM. Comparison of Measured and Computer-Modeled Objective Parameters for an Existing Coupled Volume Concert Hall. *Building Acoustics*, 2007, 14 (2): 79–90.
- Building Bulletin 93, *Acoustic design of schools – a design guide*. London, 2003.
- DIN 1804: *Acoustic quality in small to medium-sized rooms* (Hörsamkeit in kleinen bis mittelgrossen Räumen). Germany, 2004.
- Ducourneau J, Planeau V. The average absorption coefficient for enclosed spaces with non-uniformly distributed absorption. *Applied Acoustics* 2003, 64:845-862
- European Norm. EN 12354-6: Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements, *Part 6: Sound absorption in enclosed spaces*. United Kingdom, 2000.
- Eyring CF. Reverberation time in “dead” rooms. *Journal of the Acoustical Society of America*, 1930, 1: 217-241.
- Fasold W, Veres E. Schallschutz und raumakustik in der praxis. *Planungsbeispiele und konstruktive lösungen*. Huss-medien GmbH, Berlim, 2003.
- Ferreira AMC. Avaliação do Conforto Acústico em Salas de Aula: *Estudo de Caso na Universidade Federal do Paraná*. Curitiba, 2006. Dissertation (Master).
- French NR, Steinberg JC. Factors Governing the Intelligibility of Speech Sounds. *Journal of the Acoustical Society of America*, 1947, 19 (1): 90-119.
- Fukuchi T, Ueno K. Guidelines on acoustic treatments for school buildings proposed by the Architectural Institute of Japan. In: *ICA – international conference on acoustic*, Kyoto, Japan, 2004.
- Hagen M, Huber L, Kahlert J. Acoustic School Design. In: *International Forum Acusticum Sevilha*, Sevilla, 2002. Proceedings... Sevilla, 2002.

- Harris CM. *Handbook of acoustical measurements and noise control*. USA: Acoustical Society of America, 1998.
- Hohmann R, Setzer MJ, Wehling M. Bauphysikalische formeln und tabellen. Germany, 2004.
- Huber L, Kahler J, Klatte M. *Die akustisch gestaltete Schule*. Germany, 2002
- Instruction Manual Dirac Room Acoustics Software Type 7841. Denmark: Brüel & Kjaer Sound & Vibration Measurement, 2003.
- International Electrotechnical Commission. IEC 60268- 16: Sound system equipment- Part 16: *Objective rating of speech intelligibility by speech transmission index*. Switzerland, 2003.
- International Organization for Standardization - ISO 9921: *Ergonomics — Assessment of speech communication*. Switzerland, 2003.
- International Organization for Standardization. ISO 3382-1: Acoustics — Measurement of Room Acoustic Parameters. *Part 1: Performance spaces*. Switzerland, 2009.
- International Organization for Standardization. ISO 3382-2: Acoustics — Measurement of Room Acoustic Parameters. *Part 2: Reverberation time in ordinary rooms*. Switzerland, 2008.
- Kang J. Numerical modeling of speech intelligibility in dining spaces. *Applied Acoustics*, 2002, 63: 1315- 1333.
- Knudsen VO, Harris CM. Acoustical Designing in Architecture. *Published for the Acoustical Society of America by the American Institute of Physics*, 1988.
- Knudsen VO. The Hearing of Speech in Auditoriums. *Journal of the Acoustical Society of America*, 1929, 1 (1): 56-82.
- Kuttruff H. *Room Acoustics*. Handcover, 2004.
- Lazarus H, Charlotte AS, Steckel R, Kulka M, Kurtz P. *Akustische Grundlagen sprachlicher Kommunikation*, Berlin, 2007.
- Lubman D, Sutherland LC. Good Classroom Acoustics is a good investment. In: *International Congress on Acoustics ICA*, 2001, Rome, Italy.
- Makrinenko LI. *Acoustics of Auditoriums in Public Buildings*. USA: Acoustical Society of America, 1994.
- Maxwell LE, Evans GW. The effect of noise on pre-school children's pre-reading skill. *Journal of Environmental Psychology*, London, 2000, 20 (1): 91-97.
- Millington G. A Modified Formula for Reverberation. *Journal of the Acoustical Society of America*, 1932, 4: 69-82.
- Müller S. Avaliação da Intelegibilidade com o STI. *Acústica e Vibrações*, 2007, 38: 25-38.
- Neubauer R, Kostek B. Prediction of the Reverberation Time in Rectangular Rooms with Non-Uniformly Distributed Sound Absorption. *Archives of Acoustics*, 2001, 26:183-201
- Passero CRM, Zannin PHT. Statistical comparison of reverberation times measured by the integrated impulse response and interrupted noise methods, computationally simulated with ODEON software, and calculated by Sabine, Eyring and Arau-Puchades' formulas, *Applied Acoustics*, 2010, 71(12): 1204-1210.
- Rindel JH. The use of computer modeling in room acoustics. *Journal of Vibroengineering*, 2000, 3 (4): 219-224.
- Ronsse L. Speech Intelligibility of Lecture Halls. *Journal of the Acoustical Society of America*, 2006, 119 (5): 3207.
- Schroeder MR. Computers in Acoustics: Symbiosis of an Old Science and a New Tool. *Journal of the Acoustical Society of America*, 1969, 45 (5): 1077- 1088.

- Sette WJ. A new reverberation time formula. *Journal of the Acoustical Society of America*, 1933, 4: 193-210.
- Shield BM, Dockrell JE. *The effects of noise on children at school: A review*. *Building Acoustics*, 2003, 10 (2): 97-106.
- Steinberg JC. Effects of Distortion upon the Recognition of Speech Sounds. *Journal of the Acoustical Society of America*, 1929, 1 (1): 121-137.
- World Health Organization – WHO – Regional Office for Europe. *Noise in Schools*, 2001.
- Zannin PHT, Ferreira AMC. Field Measurements of Acoustic Quality in University Classrooms. *Journal of Scientific & Industrial Research*, 2009, 68: 1053-1057.



## ***Chapter 8***

# **TWO WAYS OF CAPTURING LESSON-TO-LESSON VARIABILITY IN THE CLASSROOM SOCIAL CLIMATE: GENERAL TREND AND PROCESS ANALYSIS**

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## **ABSTRACT**

This chapter compares two complementing approaches to the analysis of longitudinal data on the classroom social climate. How students perceive the social climate of their classroom is related to student academic achievement and well-being (den Brok, Brekelmans, & Wubbels, 2004; Church, Elliot, & Gable, 2001; Davis, 2003), and to the psycho-social development of students (Pianta, 2006; Wentzel 2002). While the importance of the classroom social climate in general is widely acknowledged, not much research is conducted on how the social climate differs and evolves between classroom lessons.

A commonly used approach for studying developmental issues is to describe longitudinal data in terms of general trends over time (i.e., *multi-level growth curve modeling*). Thus, questions such as ‘do teachers get more directive during the school year?’ may be of interest in this regard. Rather than describing variability in the social climate between lessons by using a general trend (e.g., modeling a decline or increase in teacher or student variables), a second approach, called *multi-level process analysis* (Papp, 2004) can be used to examine whether factors other than time can account for variability in the classroom social climate. Questions such as ‘can classroom incidents account for between lesson variability in the classroom social climate?’ refer to this latter approach.

In this chapter, both approaches are applied to a longitudinal data set on students’ perceptions of the classroom social climate during the first months of a school year (Mainhard, Brekelmans & Wubbels, 2011; Mainhard, Brekelmans, den Brok & Wubbels, 2010). First, some background information on classroom social climate and the data set used is provided.

## CLASSROOM SOCIAL CLIMATE

Classroom social climate may be conceived as the social aspect of the classroom environment; that is, it refers to the overall quality of social relations in a classroom (i.e., peer- and teacher-student relationships). One way to assess the classroom social climate is by mapping students' perceptions of their teachers (e.g., Fraser, 1998; Wubbels, Brekelmans, den Brok, and van Tartwijk, 2006). Many different constructs have been used to conceptualize students' perceptions. One approach to describing students' perceptions is focusing on the degree to which students perceive teachers to express particular (interpersonal) traits in class. Such traits are, for example, authority and care (Woolfolk Hoy, & Weinstein; 2006) or their equivalents (e.g., Cornelius-White, 2007; Wubbels et al., 2006). In the present chapter, a data set is employed that maps students' perceptions of the classroom social climate in terms of a teacher's Control (i.e., *dominance* vs. *submission*) and Affiliation (*hostility* vs. *affection*) in class (Wubbels et al., 2006). The two dimensions, Control and Affiliation, have been shown to be primary for understanding social interaction and various interpersonal outcomes (Blackburn & Renwick, 1996; Fabrigar, Visser, & Browne, 1997; Gaines et al. 1997; Gurtman & Pincus, 2000). In the classroom context, Affiliation is conceived as the warmth or care, and Control as the authority or interpersonal influence a teacher conveys in class (Wubbels et al., 2006). Several studies have shown that students who attend classes with relatively high average levels of perceived teacher Control and Affiliation show greater cognitive achievement and more positive subject-related attitudes (Brekelmans, Sleegers, & Fraser, 2000; den Brok, Brekelmans, & Wubbels, 2004).

## THE DATA

The data used here consists of students' perceptions of their teachers' Control and Affiliation, collected with a questionnaire in several consecutive lessons of 48 secondary classroom groups (48 teachers and one of their classrooms; 1208 students; Mainhard et al., 2011). At the start of the research period, students were unacquainted with their teachers and the first questionnaires were completed directly after the first lesson a teacher provided to his or class. On average, teachers completed ten measurements during a four months period. Employing multiple short versions of the Questionnaire on Teacher Interaction (QTI; Wubbels, Créton, & Hooymayers, 1985; Wubbels et al., 2006) assured that students did not respond to the same set of items every week (Cronbach's alphas for Control and Affiliation ranged between .79 and .93).

For illustrative purposes, Figure 1 is included, which depicts the resulting data set in terms of raw Control and Affiliation trajectories for the 48 classrooms throughout the research period. As can be seen, both the intercepts and trajectories differ across classrooms for both dimensions. The trajectories for Affiliation are clearly more dispersed than those for Control, but no obvious development direction is apparent for either interpersonal dimension.

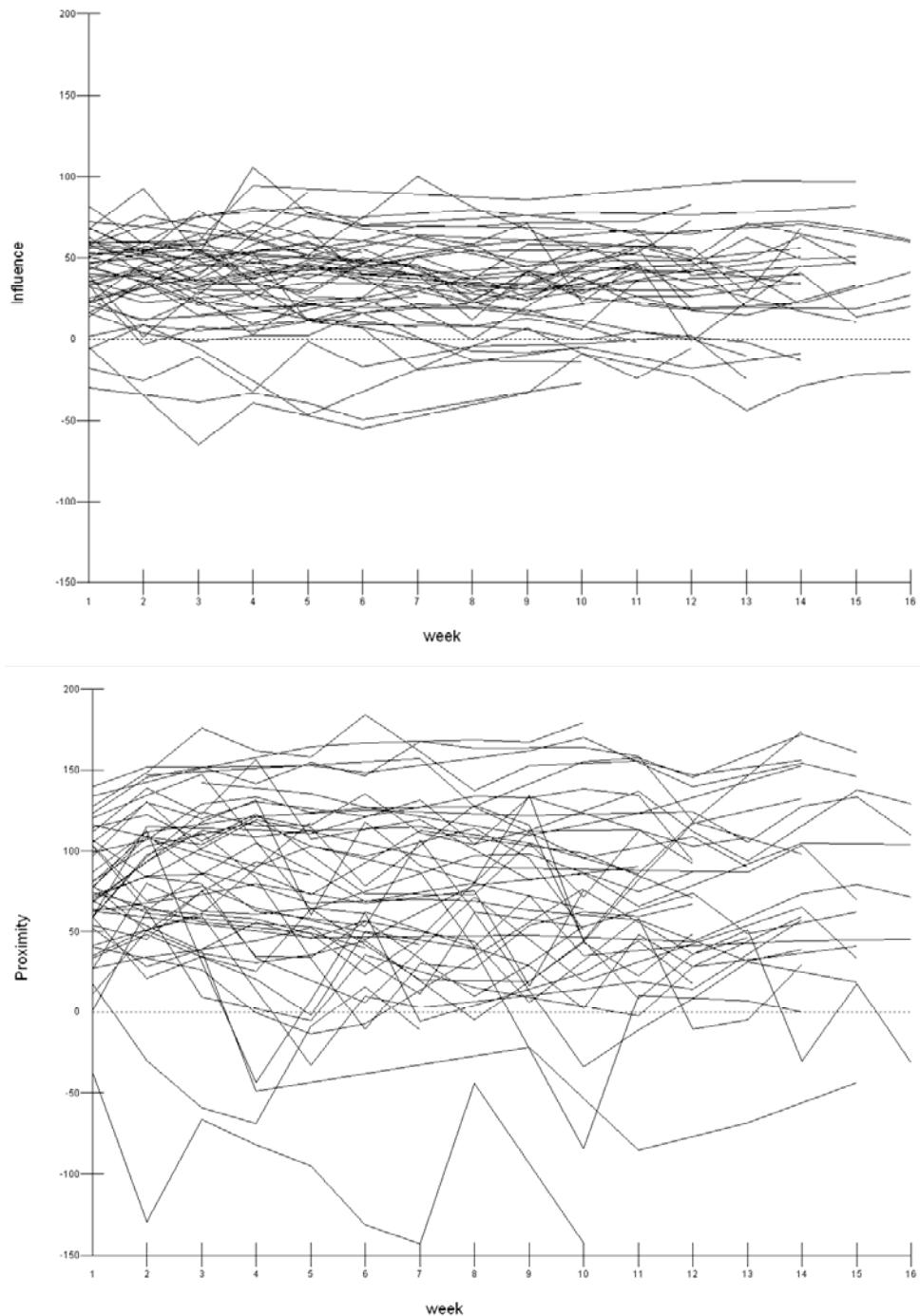


Figure 1. Raw trajectories of Control and Affiliation during the first 16 weeks of the school year (first published in Mainhard et al., 2010).

## TWO APPROACHES

First, the data is analyzed to describe the variability in Control and Affiliation over the measurement occasions in terms of a general trend. Then, process analysis is discussed which captures variability in Control and Affiliation in terms of specific incidents that occurred during lessons.

### **Approach 1. Development of the Classroom Social Climate, Examining General Trends across Time**

With regard to general trends in the development of classroom social climate, two issues are explored:

- Do Control and Affiliation, as indicators of the classroom social climate, systematically increase, decrease, or remain stable over time?
- How well do estimations of growth of Control and Affiliation generalize over classrooms?

In order to answer these questions, *multi-level growth curve modeling* (Hox, 2002) is used. This type of analysis models the outcome variable as a function of time.

The current data is represented in three-level hierarchical models with *classrooms* at the highest level, *students* at the intermediate level, and *measurement occasions* (i.e., weeks) at the lowest level. The inspection of the multi-level model, including no variables describing growth in the realm of Control or Affiliation (i.e., the unconditional model), shows that the variance in student perceptions is about equally divided across classrooms, students, and weeks. Then, in a stepwise manner, as is customary in multi-level growth modeling, it is assessed which components (e.g., components representing linear or quadratic growth) should be added to reach an adequate description of the variance in the data. A linear component describes steady positive or negative growth; quadratic components describe de- or acceleration of growth. See Mainhard et al. (2010) for a concise description of the analysis strategy applied. For the data used here, the growth or change rate in Control and Affiliation across time is best represented by a combination of linear (Control  $B=-1.43$ ,  $p<.001$ ; Affiliation  $B=-3.00$ ,  $p<.001$ ) and quadratic (Control  $B=0.08$ ,  $p<.001$ ; Affiliation  $B=0.13$ ,  $p<.001$ ) growth components. The relatively small  $B$ 's indicate that, on average, the nature of the classroom social climate remains near to its initial status, but at the same time, shows a slight tendency to decline with a u-shaped curvature during the research period (the theoretically possible range of Control and Affiliation is +/- 260). Including growth components reduces the variance associated with measurement occasions by approximately 14% for Control and 27% for Affiliation. The average development of Control and Affiliation is illustrated by the bold lines in Figure 2.

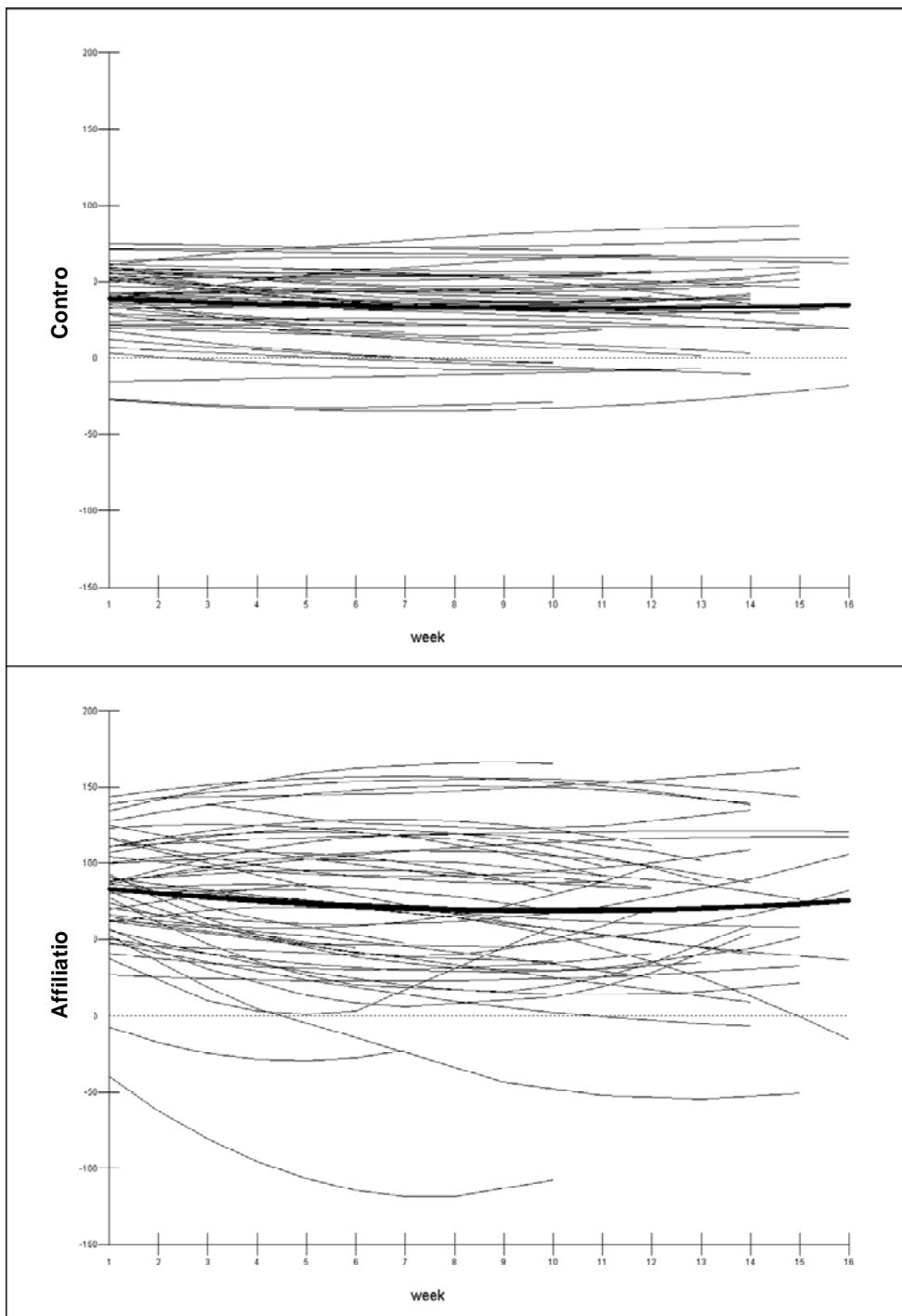


Figure 2. Trajectories of Control and Affiliation according to the best fitting multi-level growth curve models (first published in Mainhard et al., 2010).

Other studies have also shown that student perceptions of the classroom social climate (Brekelmans, 1989; Patrick, Turner, Meyer, & Midgley, 2003; Ryan & Patrick, 2001), student

attitudes towards schoolwork (Flanders, Morrison, & Brode, 1968), and teachers' communicated goal orientations (Patrick, Anderman, Ryan, Edelin, & Midgley, 2001) remain rather stable throughout the school year. Similarly, Skinner and Belmont (1993) found that teacher involvement, structure, and autonomy support and student engagement remained rather stable from fall to spring. Marsh and Roche (1993) found that student ratings of different dimensions of teaching effectiveness (e.g., individual rapport and group interaction) in a university sample were rather stable within semesters as well.

In order to evaluate the generalizability of the developmental trends found for Control and Affiliation, it is possible to calculate how many classrooms significantly divert from the average developmental trend of Control and Affiliation.<sup>1</sup> The average small decline in Control is highly generalizable over classrooms, only four classrooms divert from this trend. In just one classroom, Control significantly *increases* during the period under study. For Affiliation, the results of the multi-level growth curve analysis are less generalizable. Of the 48 classrooms, 24 divert from the average linear decline. Eleven classrooms show a stronger decline and 13 classrooms a smaller decline of Affiliation. Only three classrooms show a significant increase in Affiliation during the research period. Similar patterns are found for the quadratic growth components.

In terms of the quality of the classroom social climate, the findings draw a somewhat pessimistic picture for classrooms that start the school year with low, i.e., unfavorable levels of Control and Affiliation. In those classrooms, the social climate even got less favorable during the first months of the school year.

Overall, the classroom climate remained rather similar to the climate students experienced during the first lesson of the school year. Teachers should not expect that matters will improve simply as a result of the passing of time. Affiliation occurs to vary more than Control across the first months in class and differences between classrooms are bigger for Affiliation than for Control.

The major conclusion regarding the presented analyses is that (a) for Control, the average developmental trend largely applies to all of the classrooms in the sample; for Affiliation, about half of the classrooms divert from the average developmental trend and (b) only some of the variance associated with measurement occasions seems to be due to a specific development in Control or Affiliation.

## **Approach 2. Variability in the Classroom Social Climate, Examining the Role of Teacher Behavior Incidents**

The second approach that is discussed differs from the search of developmental trends in that it uses predictors other than time to describe variability in the classroom social climate. More specifically, we examine how incidents of coercive and supportive teacher behavior in class are associated with variability in Control and Affiliation. The analyses are guided by two questions:

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<sup>1</sup> In MLWin (Raudenbush & Bryk, 2002), the multi-level package used here, this can be achieved by using so-called caterpillar plots.

- How does teacher behavior, as observed by students during a classroom lesson, relate to the social climate *during the same lesson?*
- How do coercive and supportive teacher behavior in a lesson *one or two weeks earlier* affect the classroom social climate in the current classroom lesson?

In addition to the QTI, as described in the outline of the data set, students completed a teacher behavior checklist that mapped the occurrence of supportive and coercive incidents (Mainhard et al., 2011). Examples of a coercive and a supportive incident item are “In this lesson, the teacher yelled at us” (Cronbach’s alpha coercive scale .81), and “In this lesson, the teacher said we were doing well” (Cronbach’s alpha supportive scale .71). Supportive and coercive incident scores were negatively correlated (-.44;  $p < .01$ ).

As in the first approach, multi-level analyses are conducted (Level 1 represents the week or occasion level, Level 2 the class level).<sup>2</sup> To examine the within- and across-lesson associations between teacher behavior incidents and the classroom social climate, a special type of multi-level modeling, namely *multi-level process analysis*, is used (Papp, 2004). Rather than fitting a general trend across time in order to explain variability in the dependent variable, this analysis examines whether factors other than time can account for variability in students’ perceptions of teacher Control and Affiliation. In fact, in multi-level process analysis the predictor variable is anything except a representation of time (Papp, 2004). As Papp points out, process analysis is closely related to multi-level analysis with time-varying predictor variables (but without a variable representing time).

All explanatory variables used in the analyses are Level 1 variables, in the present case, collective perceptions of Control and Affiliation (i.e., the classroom means), and the teacher behavior incidents in a *specific* lesson, as indicated by the students. Analyses of the associations of supportive and coercive behavior with the classroom social climate *within a lesson* were controlled for perceived Control and Affiliation a week prior to the classroom lesson of interest. To find out whether teacher behavior incidents *in a lesson one or two weeks earlier* affect the current social climate, behavior incidents in a lesson one and two weeks before are entered into the models for Control and Affiliation. As Seidman, Green, Rafaeli, Shrout, and Bolger (2004), and Shrout, Seidman, Green, and Boulger (2008) have recommended, perceived Control and Affiliation one week earlier, as well as concurrent behavior incident measures, are left in the model. This approach minimizes floor effects and makes the interpretation of the resulting models more straightforward. Equivalent analyses were run for Control and Affiliation. Please refer to Mainhard et al. (2011) for a more comprehensive description of the analyses or to van Doorn, Branje, Hox, and Meeus, (2009) for another instructive example. Including behavior incidents in the current lesson and in lessons one or two weeks earlier reduced the variance associated with measurement occasions with 38% for Affiliation but only about 5% for Control.

The analyses show that coercive teacher behavior incidents (e.g., using sarcasm, yelling at students, or reprimanding students during a classroom lesson) are associated with lower teacher Affiliation during the same lesson and to lower Affiliation in a lesson a week later. Thus, using coercive behavior immediately disrupts the classroom social climate and, unfortunately, this effect of acting coercively does not just disappear in the ongoing stream of teacher behavior. Coercive teacher behavior is not associated to mere temporal disruptions of

<sup>2</sup> This analysis was conducted with average classroom scores of Control and Affiliation.

the classroom social climate in one lesson, but instead, its negative influence on the social climate lasts for one more week. However, if no new eruption of coercive behavior occurs after two weeks, a teacher's former level of Affiliation had been re-established. No associations between the current classroom climate and behavior incidents two weeks earlier were found.

It seems that coercive strategies are only slightly associated with greater teacher Control. The use of coercive behavior is associated with somewhat more Control in class, but acting coercively in two consecutive lessons occurs to counterbalance these associations. This finding is in contrast to more general theories on interpersonal power (French & Raven, 1959; Schrot et al., 2008) which assume that coercive behavior enhances interpersonal Control. It is, however, in line with some studies which show that coercive strategies are associated with more student misbehavior (Lewis, Romi, Qui, & Katz, 2005; Miller, Ferguson, & Byrne, 2000). Teachers who engage in coercive behavior may be aware of the detrimental effect of this behavior on their Affiliation with students. However, these teachers may more or less deliberately sacrifice Affiliation because they believe they will re-establish or consolidate their control in the classroom by acting coercively. Disciplinary actions may sometimes be necessary, but at the same time may ruin the classroom atmosphere.

Frequent supportive behavior towards students is associated with more perceived Affiliation during the same lesson and also in a lesson one week later. Two weeks later, the effect of the supportive incident fades away. Finally, more frequent supportive behavior is hardly associated with variability in teacher Control.

## GENERAL TREND OR PROCESS ANALYSIS?

Two approaches to longitudinal data on the classroom social climate were presented: describing between lesson differences in social climate in terms of a general developmental trend (i.e., multi-level growth curve analysis of teacher Control and Affiliation) and capturing between lesson variability by relating the classroom climate to incidents of teacher behavior within specific lessons (i.e., multi-level process analysis). While the former analysis is especially relevant for questions regarding the growth or decline of the social climate across a longer period of time (in this case, about four months), process analysis is not concerned with identifying such general developmental trends. Its focus is much more on the interplay of two or more variables from lesson-to-lesson. The analyses presented showed that focusing on the systematic, time-dependent proportion of variance in the classroom social climate produces quite different information on the climate than trying to explain how the climate in a specific classroom lesson is associated with incidents in the same lesson, or incidents in lessons a week or two weeks earlier. While the growth curve analyses showed that in most classrooms the classroom social climate remains in the proximity of the first lesson of a school year, the process analysis showed the ways in which, for example, coercive teacher behavior temporarily disrupts the classroom climate. One may argue that process analyses should be preferred above multi-level growths curve modeling because it explains more variance associated with measurement occasions. This is, however, only true for Affiliation. Furthermore, of course, not the results of the analyses but the underlying questions asked should be leading when choosing the strategy of analysis.

In line with Papp (2004), we think that being aware of the versatility of multi-level analysis in general, and specifically of process analyses, could assist educational researchers who have collected repeated-measures data. A single data set may produce multi-faceted information on the processes under study by taking different perspectives. To conclude, we hope that we provided the reader with instructive examples of the analysis of a longitudinal data set, that may inspire new research questions or that may illuminate or complement findings of earlier studies.

## ACKNOWLEDGMENT

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## REFERENCES

- Brekelmans, M. (1989). *Interpersonal teacher behavior in the classroom*. [In Dutch: *Interpersoonlijk gedrag van docenten in de klas*] Utrecht: W.C.C.
- Brekelmans, M., Sleegers, P., & Fraser, B. (2000). Teaching for active learning. In P. R. J. Simons, J. L. van der Linden, & T. Duffy (Eds.), *New learning* (pp. 227–242). Dordrecht: Kluwer Academic Publishers.
- den Brok, P., Brekelmans, M., & Wubbels, T. (2004). Interpersonal teacher behavior and student outcomes. *School Effectiveness and School Improvement*, 15(3), 407-442.
- Blackburn, R. & Renwick, S. (1996). Rating scales for measuring the Interpersonal Circle in forensic psychiatric patients. *Psychological Assessment*, 8, 76-84.
- Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, 77(1), 113-143.
- Church, M. A., Elliot, A. J., & Gable, S. L. (2001). Perceptions of classroom environment, achievement goals, and achievement outcomes. *Journal of Educational Psychology*, 93(1), 43-54.
- Davis, H. A. (2003). Conceptualizing the role and influence of student-teacher relationships on children's social and cognitive development. *Educational Psychologist*, 38(4), 207-234.
- van Doorn, M., Branje, S., Hox, J., & Meeus, W. (2009). Intra-individual variability in adolescents' perceived relationship satisfaction: The role of daily conflict. *Journal of Youth and Adolescence*, 38(6), 790-803.
- Fabrigar, L. R., Visser, P. S., & Browne, M. W. (1997). Conceptual and methodological issues in testing the circumplex structure of data in personality and social psychology. *Personality and Social Psychology Review*, 1(3), 184-203.
- Flanders, N. A., Morrison, B. M., & Brode, E. L. (1968). Changes in pupil attitudes during the school year. *Journal of Educational Psychology*, 59(5), 334-383.

- Fraser, B. J. (1998). Classroom environment instruments: Development, validity and applications. *Learning Environments Research, 1*(1), 7-34.
- French, J. R., & Raven, B. (1959). The basis of social power. In D. Cartwright (Ed.), *Studies in social power* (pp. 150-167). Ann Arbor, MI: University of Michigan Press.
- Gaines, S. O., Panter, A. T., Lyde, M. D., Steers, W. N., Rusbult, C. E., Cox, C. L., & Wexler, M. O. (1997). Evaluating the circumplexity of interpersonal traits and the manifestation of interpersonal traits in interpersonal trust. *Journal of Personality and Social Psychology, 73*, 610-623.
- Hox, J. (2002). *Multilevel analysis: Techniques and applications*. Mahaw, New Jersey: Lawrence Erlbaum.
- Gurtman, M. B., & Pincus, A. L. (2000). Interpersonal adjective scales: confirmation of circumplex structure from multiple perspectives. *Personality and Social Psychology Bulletin, 26*, 374-384.
- Lewis, R., Romi, S., Qui, X., & Katz, Y. J. (2005). Teachers' classroom discipline and student misbehavior in Australia, China and Israel. *Teaching and Teacher Education, 21*(6), 729-741.
- Mainhard, M. T., Brekelmans, M., Brok, d. P., & Wubbels, T. (2010). The development of the classroom social climate during the first months of the school year. *Contemporary Educational Psychology*. Advance online publication. doi:10.1016/j.cedpsych.2010.06.002.
- Mainhard, M. T., Brekelmans, M., & Wubbels, T. (2011). Coercive and supportive teacher behaviour: Within- and across-lesson associations with the classroom social climate. *Learning and Instruction, 21*(3), 345-354.
- Marsh, H. W., & Roche, L. A (1993). The use of students' evaluations and an individually structured intervention to enhance university teaching effectiveness. *American Educational Research Journal, 30*(1), 217 - 251.
- Miller, A., Ferguson, E., & Byrne, I. (2000) Pupils' causal attributions for difficult classroom behaviour. *British Journal of Educational Psychology, 70*(1), 85-96.
- Papp, L. M. (2004). Capturing the interplay among within- and between-person processes using multilevel modeling techniques. *Applied and Preventive Psychology, 11*(2), 115-124.
- Patrick, H., Anderman, L. H., Ryan, R. M., Edelin, K. C., & Midgley, C. (2001). Teachers' communication of goal orientations in four fifth-grade classrooms. *The Elementary School Journal, 102*(1), 37-58.
- Patrick, H., Turner, J. C., Meyer, D. K., & Midgley, C. (2003). How teachers establish psychosocial environments during the first days of school: Associations with avoidance in mathematics. *Teachers College Record, 105*(8), 1521-1558.
- Pianta, R. C. (2006). Classroom management and relationships between children and teachers: Implications for research and practice. In C. Evertson & C. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 685-710). New York: Erlbaum.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks: Sage.
- Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal, 38*(2), 437-460.

- Reeve, J., Bolt, E., & Cai, Y. (1999). Autonomy-supportive teachers: How they teach and motivate students. *Journal of Educational Psychology, 91*(3), 537.
- Schrodt, P., Witt, P. L., Myers, S. A., Turman, P. D., Barton, M. H., & Jernberg, K. A. (2008). Learner empowerment and teacher evaluations as functions of power use in the college classroom. *Communication Education, 57*, 180-200.
- Seidman, G., Green, A. S., Rafaeli, E., Shrout, P. E., & Bolger, N. (2004, January). *Can a statistic artifact make conflict appear good for marital satisfaction?* Poster presented at the Society for Personality and Social Psychology annual meeting, Austin, Texas.
- Shrout, P. E., Seidman, G., Green, A. S., & Bolger, N. (2008). *Short-term benefits of conflict in relationships* (Manuscript in preparation).
- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*(4), 571-581.
- Wentzel, K. R. (2002). Are effective teachers like good parents? Teaching styles and student adjustment in early adolescence. *Child Development, 73*(1), 287-301.
- Woolfolk Hoy, A., & Weinstein, C. S. (2006). Students' and teachers' perspectives on classroom management. In C. Evertson & C. S. Weinstein (Eds.), *Handbook for classroom management: Research, practice, and contemporary issue* (pp. 181-220). Mahwah, NJ: Lawrence Erlbaum.
- Wubbels, T., Créton, H. A., & Hooymayers, H. P. (1985). Discipline problems of beginning teachers, interactional teacher behavior mapped out. *Abstracted in Resources in Education, 20*(12), 153, ERIC document 260040.
- Wubbels, T., Brekelmans, M., den Brok, P., & van Tartwijk, J. (2006). An interpersonal perspective on classroom management in secondary classrooms in the Netherlands. In C. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice and contemporary issues* (pp. 1161-1191). New York: Lawrence Erlbaum Associates.



## ***Chapter 9***

# **COMFORT IN SCHOOL BUILDINGS IN THE MEDITERANEAN ENVIRONMENT**

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## **ABSTRACT**

A review of thermal comfort and air quality is the aim of this work. The numerical and experimental methodology is used in the evaluation of comfort in school buildings in the South of Portugal (Algarve region) with Mediterranean environment.

In this work, results about comfort in three typical schools buildings, in Winter and Summer conditions, equipped with natural and crossed ventilation, are presented. The thermal comfort level is evaluated by the Predicted Mean Vote value, while the air quality is evaluated by the carbon dioxide concentration.

## **INTRODUCTION**

In this work the numerical and experimental methodology is used in the evaluation of comfort in school buildings in the South of Portugal, with Mediterranean environment, namely the thermal comfort and the air quality.

In the numerical methodology, a numerical model that simulates the dynamic response of building is used, while in experimental methodology, indoor and outdoor climate analyzers are used. The software is used to define the building environmental field and evaluate the human thermal comfort and air quality levels, that the occupants are subjected.

The experimental tests, measured inside the classrooms and in the external environment, are used in the validation tests, in order to verify if the software reproduces well the building thermal response.

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The Predicted Mean Vote (PMV) and the Predicted Percentage of Dissatisfied people (PPD) indexes, developed by Fanger (1970) and presented in ANSI/ASHRAE Standard 55 (2004) and ISO 7730 (2005), are used to evaluate the thermal comfort conditions in moderate environments equipped with heating and air-conditioning systems either in cold or in warm climates during Winter or Summer conditions. The PMV index, given as a value on the seven-point comfort scale (-3 cold; -2 cool; -1 slightly cool; 0 neutral; 1 slightly warm; 2 warm and 3 hot), is based in four environmental parameters (air temperature, air velocity, air relative humidity and mean radiant temperature) and two personal factors (clothing and metabolic activity levels). In negative PMV values the body heat loss is higher than the body metabolic heat, in neutral PMV values the body heat loss is equal to the body metabolic heat, while in positive PMV values the body heat loss is lower than the body metabolic heat. For acceptable thermal comfort conditions the ISO 7730 (2005) defines three comfort categories (A, B and C), establishing limits for PMV and PPD indexes. In the category C, used in this work, the limits of the suggested PMV values change between 0.7 and -0.7 (PPD=15 %).

In warm environments, in buildings not equipped with air-conditioning systems, Fanger and Toftum (2002) presented an extension of the standard PMV model. This extension, that combines the "static" PMV model and the adaptive model, uses the traditional PMV model, that considers the human body thermal balance, and the expectations verified in the adaptive model.

The airflow rate inside an occupied compartment can be calculated using different recommendations and methodologies presented in national (D.L. nº 79/2006 of April 4<sup>th</sup>) and international (ANSI/ASHRAE 62.1, 2004) standards. Both standards recommended, in order to guarantee acceptable air quality, the internal carbon dioxide concentration should be lower than 1800 mg/m<sup>3</sup>. The Portuguese normalization, presented in D.L. nº 79/2006 of April 4<sup>th</sup>, defines an airflow rate of 35 m<sup>3</sup>/h per occupant (9.7 l/s).

## NUMERICAL MODELS

The multi-nodal building thermal behavior model, that operates in transient conditions, is based in energy and mass balance integral equations. The full energy balance equations are developed for the air (inside the compartments and several ducts system), the different windows glasses, the interior bodies (located inside the several spaces) and the different layers of building and bodies ducts system, while the mass balance integral equations are developed for the water vapor (inside the several spaces, ducts system and indoor surfaces) and air contaminants (inside the several spaces and ducts system).

In the resolution of these equations system the Runge-Kutta-Fehlberg method with error control is used.

The model considers the conductive, convective, radiative and mass transfer phenomena. The conduction is verified in the building's main bodies (doors, ceiling, ground, walls, etc.) and ducts system (fluid transport) layers. The natural, forced and mixed convection phenomena are considered, while in the radiation, verified inside and outside the building, the short-wave (the actual distribution of direct solar radiation in outdoor and indoor surfaces) and long-wave (heat exchanges between the building external surfaces and the surrounding surfaces as well as among the indoor surfaces of each space) phenomena are considered.

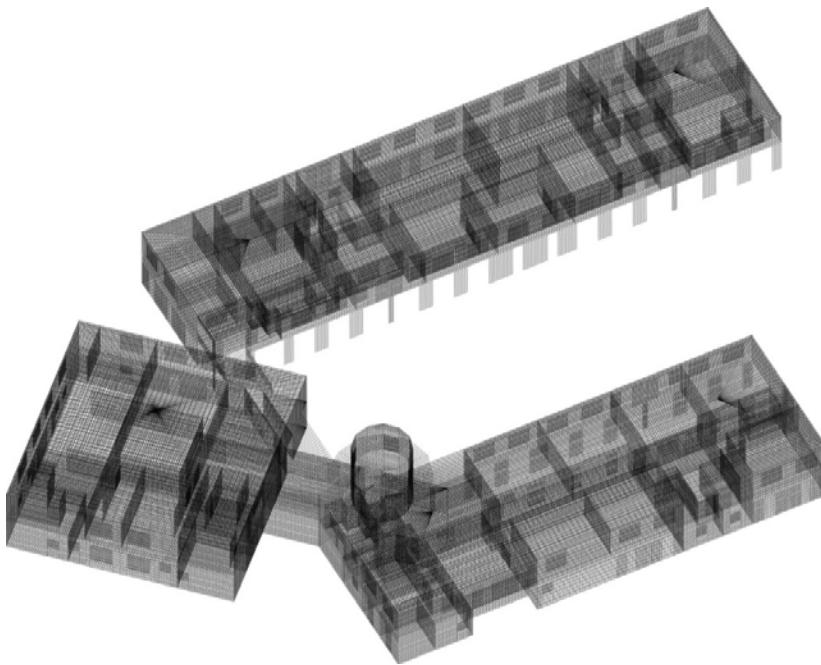


Figure 1. Scheme of the modern school building grid generation.

## BUILDINGS SCHEME

In this work three school buildings are considered. A modern school building, a school buildings complex and a kindergarten, are considered.

A modern school building (see figure 1), located in the Algarve region, is analyzed. In the analyzed school building, constituted by three blocks, with three floor levels, divided in 97 compartments, 1277 building main bodies and 211 windows, with simple transparent glasses, are considered. This simulation is made in typical school days with clear sky and with 800 occupants.

In this work, a school buildings complex (see figures 2) constituted with one main building and two other buildings, also located in the South of Portugal, is also considered. The 94 compartments, the 1578 building main bodies and the 307 windows and panels glasses are considered. The main school building is the larger building of the school buildings complex and has 3 floors and 56 rooms. The ground zero has the South and East elevations underground. The generality of the windows building are oriented to South and North. The NorthWest school building has 25 rooms and two floors. The ground floor rooms are mainly used for classrooms, while the first floor rooms are mainly used for classrooms and for auditorium. The generality of the building windows are oriented to South and North. The NorthEast building has 11 rooms and one floor.

In the analyzed kindergarten school building (see figures 3), divided in 24 compartments, 498 building main bodies and 42 windows glasses are considered. This building, also located in the South of Portugal, has three classrooms, for 3, 4 and 5 years old children, and other spaces for offices, administrative, WC, teachers and non-teachers staff and meeting room.

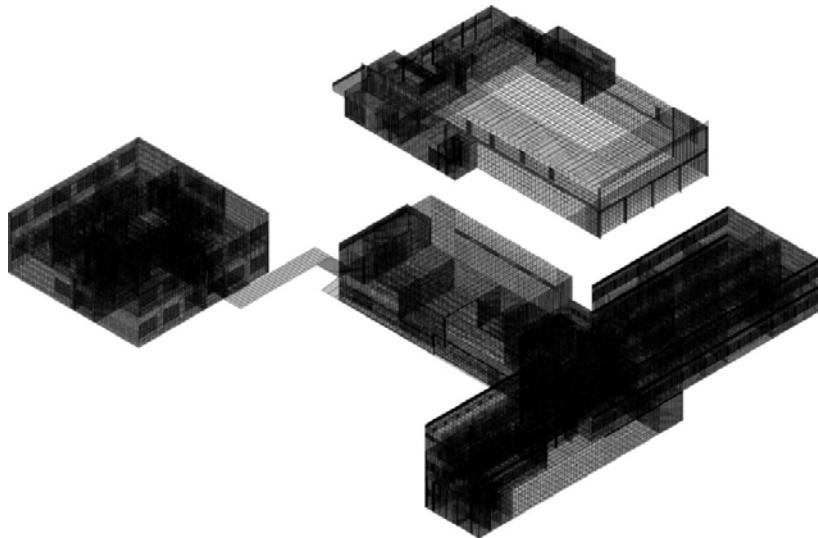


Figure 2. Scheme of the school buildings complex grid generation.

In the previous simulations the environmental variables, the occupation methodology and the ventilation strategies are used as input data. In the environmental variables the air temperature, the air relative humidity, the wind velocity and the wind direction are measured, in the occupation methodology the occupation cycle, the occupants' clothing level and occupant's activity level are considered, while in the ventilation strategies the airflow rate and the air velocity in the different conditions are measured in a real classroom.

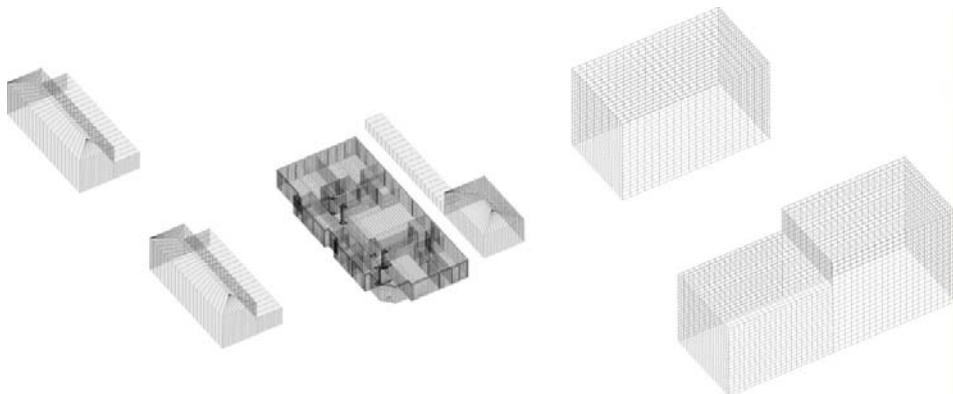


Figure 3. Scheme of the kindergarten school building grid generation.

## RESULTS AND DISCUSSION

In this section a review of thermal comfort and air quality, in school buildings located in the South of Portugal, with Mediterranean environments, is made. A modern school building, a school buildings complex and a kindergarten are analyzed.

## Modern School Building Thermal Response

In the modern school building the building thermal response, the human thermal comfort, the air quality and the external solar radiation, are evaluated. The validation, without surrounding buildings presence, is also made in Winter and Summer conditions.

In Conceição et al. (2004) a numerical study of thermal response of school buildings and a numerical model validation in Winter conditions is made. In the validation experimental values about the air temperature and relative humidity, obtained in the real building, are compared with numerical values, obtained in the numerical model. The spaces with highest and lowest air temperature levels are also identified and the different kinds of existing shadings devices are evaluated.

The validation shows a good agreement between numerical and experimental results. In general, the difference between numerical and experimental air temperature values is lower than 2°C, being verified a maximum difference of 4 °C in the compartments with windows turned South, only during some hours in the afternoon. The difference of numerical and experimental air relative humidity values, in general, changes between 10 and 20 %, being this value highest in the first hours of the day.

In Conceição and Lúcio (2005) the numerical simulation of the shading effect verified in school buildings with complex topology, in Winter conditions, is analyzed. In accord to the obtained results is verified that, in Winter conditions with low external air temperature and with clean sky, spaces with windows not subjected to solar radiation or subjected to shading effect, non acceptable thermal comfort levels are verified.

In Conceição and Lúcio (2006a) the air quality inside compartments of a school building is analyzed. The air exchange monitoring, evaluation of carbon dioxide and assessment of ventilation strategies is made. An adjusted airflow model, in order to increase the internal air quality, is developed in the work. The adjusted airflow model is used, mainly, in compartments with long occupation period, subjected to polluted air produced by occupation of corridors and atria.

The air exchange and flow rate is evaluated experimentally using the tracer gases method in the first phase of the work, while in the second part, after being calculated the air flow rate, are estimated the evolution of carbon dioxide inside spaces with different air flow typologies.

In the experimental tests is verified that the crossed natural ventilation system, implemented in the building's compartment increase the air flow rate. In general, the office and the auditorium air flow rates are lower than in the classroom, teachers' and computers rooms air flow rates.

This fact is associated to the presence of a high number of open small windows located upper the doors and windows area in the classrooms, teachers' and computers rooms.

In the numerical simulation, related to crossed natural ventilation flow philosophy, is verified that the carbon dioxide concentration is higher than the recommended value by the Portuguese standard (1800 mg/m<sup>3</sup>).

When the forced crossed ventilation philosophy is installed, without air flow adjustment, is verified that the classrooms, in general, are subjected to carbon dioxide concentration lower than the recommendation presented in the Portuguese standard. The corridors, atria and small offices, are subjected to carbon dioxide concentration higher than the recommendation presented in the Portuguese standard. However, when the forced crossed ventilation philosophy is used, with air flow rate adjustment, good results are shown.

In Conceição and Lúcio (2006b) a numerical study of thermal response of school buildings and a numerical model validation, in summer conditions, is made. In the validation experimental values about the air temperature and relative humidity, obtained in the real building, are compared with numerical values, obtained in the numerical model.

The validation tests show a good agreement between experimental and numerical values in all analyzed spaces. In general, the error verified is around 1°C. Nevertheless, some discrepancies are verified. These discrepancies are due to aspects associated to simplification factors. It is verified that the heating system, with PMV control, installed in occupied spaces, promotes good thermal comfort levels. In general, the uncomfortable occupants are lower than 15%, nevertheless, in some spaces, less than 6% of uncomfortable persons are verified.

The reduction of the building's energy consumption and the increase of the occupants' thermal comfort levels, using the high solar radiation levels available in this region, is the aim of Conceição and Lúcio (2008a). The heating systems equipped with control based with the PMV index and three air collectors located above the roof area (to heat the air injected in uncomfortable rooms) are numerically analyzed.

It is observed that, in general, the rooms with windows turned North, the compartments with windows subjected to shading devices and the interior spaces without windows with low occupation level, presented the highest uncomfortable thermal conditions.

The implementation of heating systems in uncomfortable spaces promotes good thermal comfort levels. It is verified that using a control based in PMV index is possible to guarantee high comfort levels with low energy consumption level in the heating process. The highest consumption level is observed in the first hours of the day, mainly in compartments which have their main occupation time during break times.

It is verified that the solar air collectors, mainly highest ones, promote, in the afternoon, acceptable thermal and air quality levels in the spaces considered. In order to promote simultaneously thermal comfort and air quality good levels, uncomfortable occupied spaces are ventilated and heated using warm air from the collector, comfortable or lightly comfortable spaces are ventilated and heated using light warm air from the corridor and the small comfortable occupied spaces are ventilated using clean air coming directly from the external environment. The ventilation philosophy implemented in the school building, using three big solar air collectors placed above the roof area, create an acceptable thermal and air quality levels in the afternoon, with low-energy consumption level.

In Conceição and Lúcio (2008b) a thermally more efficient ventilation system, to be implemented in a school building, in Winter conditions, using simultaneously the Predicted Mean Vote index and carbon dioxide concentration as control system is implemented. The ventilation system presented, that promotes simultaneously acceptable air quality and thermal comfort, with low levels of energy consumption, uses three air collectors located above the roof area. The solar air collectors presented can provide, especially in the late morning and afternoons, acceptable levels of heating in most occupied spaces, although the smaller collector presents more difficulty in securing these conditions than the larger ones.

In Conceição and Lúcio (2009) the school building thermal response for four different orientations, either in Winter or Summer conditions, is evaluated. In this study the numerical study of the thermal efficiency of a school building with complex topology for different orientations is made.

The work identifies uncomfortable spaces and promotes several solutions that could be introduced for each orientation, in order to improve the thermal comfort and the air quality

levels and decrease the building's energy consumption levels. The information obtained from this study could be used to help a designer's choice which thermal systems and solutions are more suitable for a preferred school building orientation.

In Conceição and Lúcio (2010a) a numerical study of the influence of opaque external trees, with pyramidal shape, in the thermal behavior of a school building, in Summer conditions, in transient conditions, is presented. The shading devices are guaranteed with 49 opaque trees with pyramidal shape placed in front to the windows in one side of each considered building. Two situations with the same configuration are analyzed. In the first one, the trees, located in front to the windows, are placed in the West and South-West direction, while in the second one, after a 180° building rotation, the trees are placed in the East and North-East direction. Both situations are studied with and without presence of trees. The building temperatures and the occupant's thermal comfort conditions are calculated.

The obtained results show that when the trees are placed in front to windows turned West decrease the indoor air temperature and it is verified mainly in the afternoon, nevertheless, when the trees are placed in front to windows turned East the decrease indoor air temperature is verified mainly in the morning. In this study is verified that the maximum indoor air temperature decrease, due to the trees presence, in the first situation is around 3 °C, while in the second situation is around 4 °C.

The thermal comfort conditions that the occupants are subjected, in spaces with windows turned West and East, without trees presence, in general, is very uncomfortable. Nevertheless, if the trees presence is considered, lightly uncomfortable thermal conditions are verified.

## School Buildings Complex Thermal Response

In the school buildings complex an adaptive thermal comfort model is applied in the occupant's thermal comfort evaluation. This adaptive comfort model is developed using the Fanger Predicted Mean Vote index corrected with the external air temperature.

In Conceição et al. (2010) the application of a school building thermal response numerical model in the evolution of the thermal comfort level in Mediterranean environment is made.

In accord to the obtained results, the Fanger Predicted Mean Vote index presents similar values to the adaptive Predicted Mean Vote index in optimal thermal comfort conditions, for Fanger Predicted Mean Vote index equal to zero. However, when the Fanger Predicted Mean Vote index increases the adaptation influence is higher.

In Winter conditions the adaptive Predicted Mean Vote index reduces a maximum value of 5.5 % the Predicted Mean Vote index, while in Summer conditions the adaptive Predicted Mean Vote index reduces a maximum value of 12.5 % the Predicted Mean Vote index. However in some transition months the variation is not verified. The adaptive comfort model can be used to evaluate a more realistic comfort level that the students feel in particular situations and in particular thermal conditions. This kind of model, that can be used more efficiently than the existing natural energy resources, show that a school space can provide satisfactory comfort conditions in Summer and Winter conditions, than a standard model without correction.

The application of an adaptive comfort philosophy can be used to improve the thermal comfort level and to reduce the energy consumption level.

## Kindergarten School Building Thermal Response

In the kindergarten school building the building thermal response and the human thermal comfort is evaluated. The validation, with surrounding buildings presence, is also made in Winter and Summer conditions.

In Conceição et al. (2007) the thermal comfort level and energy consumption in school buildings in the South of Portugal is made.

In the kindergarten school building is verified that the surrounding buildings must be considered in the numerical simulation. It is also verified that the classrooms with windows turned South are thermally comfortable, nevertheless the classrooms with windows turned North are thermally uncomfortable.

In Conceição et al. (2008a) the energy and thermal comfort management in a kindergarten school building in the South of Portugal in Winter conditions is made, while in Conceição et al. (2008b) the application of an indoor greenhouse in the energy and thermal comfort performance in a kindergarten school building in the South of Portugal in Winter conditions are analyzed. Without occupation, with surrounding buildings, the validation in Winter conditions, the identification of potential spaces used as greenhouse and the thermal comfort level that occupants are subjected, are evaluated.

The validation of the numerical model, being considered the kindergarten school building and the surrounding buildings, shows good agreement between the numerical values and the experimental data.

In accordance with the internal air distribution temperature levels, is suggested to consider the hall, with significant area of glassed windows turned South, as greenhouse used to warm the air to be used in the classrooms with window turned North (see also Conceição et al., 2008b).

The classrooms with windows turned North are thermally uncomfortable, nevertheless the comfort level in the afternoon in the classroom with windows turned South are in accord to the standards.

In Conceição et al. (2008c) the indoor environment comfort in a kindergarten school building in the South of Portugal in Summer conditions is made.

In accord to the obtained results, the introduction of the surrounding buildings improves better agreement between the numerical values and the experimental data. The higher difference, between numerical values and experimental data, in general, is not higher than 2°C.

All compartments are thermally uncomfortable during the occupation time. The classroom with windows turned South is the most uncomfortable. It is suggested, in Summer conditions, to introduce external shading devices located above the windows turned South and an external thermal insulation located above the kindergarten school building. It is also suggested to introduce crossed ventilation in the North classrooms and displacement ventilation in South classrooms. The presence of occupants in the simulation will increase the thermal levels and the introduction of the air ventilation decrease these levels. Nevertheless, in spaces with high occupation level it's important to introduce these changes in the numerical simulation.

In Conceição and Lúcio (2010b) the heating, ventilating and air conditioning systems control based in the Predicted Mean Vote index is made. In this work the application of

heating, ventilating and air conditioning systems control, based in the Predicted Mean Vote index, is analyzed.

The heating system worked only for negative Predicted Mean Vote index values and the heating power increases when the negative Predicted Mean Vote index values increases. The control methodology, presented in this study, guarantees, in general, acceptable thermal comfort conditions in all occupied spaces.

In Conceição and Lúcio (2010c) the implementation of passive and active solar strategies in a kindergarten in Mediterranean external conditions, with natural and forced ventilation, in Summer and Winter conditions, is made. The simulation, with a real occupation cycle, passive and active strategies were developed in a kindergarten in order to guarantee, in occupied spaces, acceptable thermal comfort and air quality conditions, with low energy consumption level.

In passive strategies the kindergarten is equipped with multiple inclined aluminum shading devices placed above the transparent windows level and in front to the transparent door facing South, removable inclined tissue shading devices placed in front to the transparent windows facing East and horizontal fabrics shading devices placed above the transparent panel levels facing South, South-West and West. This passive system, in Winter conditions, a maximum solar radiation and, in Summer conditions, a minimum solar radiation, in shaded transparent surfaces, is presented.

In the active strategies, without forced ventilation, the internal air quality is not acceptable, while with forced ventilation the internal air quality is acceptable, in spite of (in the beginning) some spaces in Winter conditions are not acceptable. In Winter conditions the greenhouse is very important in the heating phase, nevertheless, is suggested that the forced ventilation operates not before the local 10 a.m. In Summer conditions the forced ventilation during the night is very important, in order to cold the spaces, and the use of the stored cold air during the day is very import due to the higher external air temperature levels.

The combination with the passive and active strategies, developed in this work, guarantees, in general, acceptable comfort conditions in the occupation spaces with low energy consumption level.

In Conceição et al. (2009) the energy and thermal comfort evaluation for different passive solutions in a kindergarten in Summer conditions is made. The introduction of a roof placed in the top of the kindergarten, horizontal shading devices placed above the windows level facing South and external pyramidal opaque trees placed in front to the windows facing West and East, used to reduce the indoor temperature level and to increase the indoor thermal comfort level, are analyzed.

In accord to the obtained results, the new roof and the horizontal shading devices are thermally efficient, nevertheless the external pyramidal opaque trees are not thermally efficient due to the surrounding buildings presence.

When the kindergarten, the surrounding buildings, the horizontal shading devices and the roof are considered the thermal comfort level is acceptable. However, in spaces, like South classroom, corridor, office room, for example, the comfort level can be improved. In accord to the obtained results the introduction of forced ventilation is suggested.

## ACKNOWLEDGMENTS

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## REFERENCES

- ANSI/ASHRAE Standard 55, 2004. Thermal environmental conditions for human occupancy. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- ANSI/ASHRAE Standard 62.1. 2004. ASHRAE Standard – Ventilation for acceptable indoor air quality, Atlanta, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2006a. Air Quality Inside Compartments of a School Building: Air Exchange Monitoring, Evaluation of Carbon Dioxide and Assessment of Ventilation Strategies, *The International Journal of Ventilation*, UK, Vol. 5, N. 2, September 2006, pp. 259-270.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2008a. Thermal Study of School Buildings in Winter Conditions, *Building and Environment*, Vol. 43, No. 5, May 2008, pp. 782-792.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2008b. Projecto de um Sistema de Ventilação Eficiente de um Edifício Escolar em Condições de Inverno na Região do Algarve, Revista INGENIUM, II<sup>a</sup> Série, *Ordem dos Engenheiros*, Nº 107, September/October 2008, pp. 76-80.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2009. Numerical Study of the Thermal Efficiency of a School Building with Complex Topology for Different Orientations, *Indoor and Building Environment*, Vol. 18, N.1, February 2009, pp. 41-51.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2010a. Numerical Study of the Influence of Opaque External Trees with Pyramidal Shape in the Thermal Behaviour of a School Building in Summer Conditions, *Indoor and Building Environment*, December 2010; Vol. 19, 6: pp. 657-667.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2010b. Heating, Ventilating and Air Conditioning Systems Control Based in the Predicted Mean Vote Index, *Proceedings of the IFAC Conference on Control Methodologies and Technology for Energy Efficiency - CMTEE 2010*, University of Algarve, Vilamoura, Portugal, 29 - 31 March 2010.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2010c. Implementation of Passive and Active Solar Strategies in a Kindergarten in Mediterranean External Conditions, *Building Simulation*, Volume 3, September 2010, pp. 245–261.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2005. Numerical Simulation of the Shading Effect Verified in School Buildings with Complex Topology in Winter Conditions, *Fourth International Conference on Computational Heat and Mass Transfer*, Cachan-Paris, France, 17 - 20 May 2005.
- Conceição E. Z. E. and Lúcio M<sup>a</sup> M. J. R. 2006b. Numerical Study of Thermal Response of School Buildings in Summer Conditions, *Healthy Buildings 2006*, Lisbon, Portugal, 4 - 8 June 2006.

- Conceição E. Z. E., Lopes M. C. and Lúcio M<sup>a</sup>. M. J. R. 2008a. Energy and Thermal Comfort Management in a Kindergarten School Building in the South of Portugal in Winter Conditions, *4th WSEAS/IASME International Conference on Energy, Environment, Ecosystems and Sustainable Development (EEESD '08) and 1st WSEAS International Conference on Landscape Architecture (LA '08)*, Faro, Portugal, 11 - 13 June 2008.
- Conceição E. Z. E., Lopes M. C. and Lúcio M<sup>a</sup>. M. J. R. 2008c. *Indoor environment comfort in a kindergarten school building in the South of Portugal in Summer conditions*, Indoor Air 2008, Copenhagen, Denmark, 17 - 22 August 2008.
- Conceição E. Z. E., Lopes M. C. and Lúcio M<sup>a</sup>. M. J. R. 2009. Energy and Thermal Comfort Evaluation for Different Passive Solutions in a Kindergarten in Summer Conditions, *11th International Building Performance Simulation Association Conference - Building Simulation 2009*, Scotland, Glasgow, 27 - 30 July 2009.
- Conceição E. Z. E., Lúcio M<sup>a</sup>. M. J. R. and Lopes M. C. 2008b. Application of an Indoor Greenhouse in the Energy and Thermal Comfort Performance in a Kindergarten School Building in the South of Portugal in Winter Conditions, *WSEAS Transactions on Environment and Development*, Issue 8, Volume 4, August 2008, pp. 644-654.
- Conceição E. Z. E., Lúcio M<sup>a</sup>. M. J. R., Vicente V. D. S. R., Lopes M. C. and Teixeira A. R. P. A. 2007. Thermal Comfort Level and Energy Consumption in School Buildings in South of Portugal, *REHVA World Congress CLIMA'2007 WellBeing Indoors*, Helsinki, Finland, 10 - 14 June 2007.
- Conceição E. Z. E., Nunes A. R. L., Gomes J. M. M. and Lúcio M<sup>a</sup>. M. J. R. 2010. Application of a School Building Thermal Response Numerical Model in the Evolution of the Adaptive Thermal Comfort Level in Mediterranean Environment, *The International Journal of Ventilation*, UK, Volume 9, N. 3, December 2010, pp. 287-304.
- Conceição E. Z. E., Silva A. I. and Lúcio M<sup>a</sup>. M. J. R. 2004. Numerical Study of Thermal Response of School Buildings in Winter Conditions, *RoomVent'2004 - 9th International Conference on Air Distribution in Rooms*, Portugal, Coimbra, 5 - 8 September 2004.
- Decreto-Lei nº 79. 2006. *Regulamento dos sistemas energéticos de climatização em edifícios (RSECE)*, Diário da República, I Série- A, Nr 67, April 4<sup>th</sup>.
- Fanger, P. O. 1970. Thermal comfort: analysis and applications in environmental engineering. McGraw-Hill Book Company. USA.
- Fanger, P. O. and Toftum, J. 2002. Extension of the PMV model to non-air-conditioned buildings in warm climates. *Energy and Buildings*. Elsevier. N. 34. pp. 533-536.
- ISO 7730, 2005. *Ergonomics of the Thermal Environments – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria*. International Standard. Switzerland.



## ***Chapter 10***

# **CLASSROOM DISCIPLINE: DISCIPLINE STRATEGIES, PREVENTING STUDENT MISBEHAVIORS AND RESEARCH ON STUDENT MISBEHAVIORS IN THE CLASSROOM**

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## **ABSTRACT**

Classroom is the keystone of a formal education system. Conducting the aim of the education system depends on the success of the teaching-learning process in the classroom. The success of the learning-teaching activity depends on efficient classroom management. Knowing the characteristics of students and arranging the process according to this, arranging in-class relationships, arranging the physical structure of the class, providing student motivation, managing in-class activities and learning processes, sustaining the discipline and managing student misbehaviors are among the functions of classroom management. Sustaining the discipline and managing student misbehaviors have great importance in the success of the learning-teaching process. Improving students' learning in classrooms requires teachers to be effective in coping with classroom misbehaviors (Ding et al. 2008; Ding et al. 2010).

We cannot speak of the success of the teaching-learning process in a classroom where the teachers spend most of their times sustaining the discipline and preventing student misbehaviors. When a teacher who is responsible for the success of the learning and teaching process in the class feels himself inadequate in managing discipline and student misbehaviors may have depression, come down with psychosomatic diseases and even (for beginners, especially) may resign. In this sense, it is of great importance for teachers to be educated about managing discipline and student misbehaviors.

In this study; classroom discipline, discipline strategies, student misbehaviors and coping strategies were elaborated. Moreover, a literature review of the writer on elementary school students' misbehaviors in Turkey was examined. 450 teachers who

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serve in elementary schools in Antalya participated in the study. A 5- graded likert-type scale named "Student Misbehaviors Scale" which was developed by the researcher himself, was used in the study. In the analysis of study, arithmetic average, standard deviation, t-test, one way ANOVA, LSD and Scheffe test were used. According to the result of the study, there are significant differences among the frequency level of student misbehaviors in the sense of gender, age, seniority, branch and technical means of classroom. Misbehavior which is observed most frequently in schools is the types of "student misbehaviors towards each other". Young teachers who are below 30 are exposed to these misbehaviors more than elder teachers. There are significant differences between misbehavior frequency in the sense of classes with poor and good technical means. As the technical means of classrooms increase, level of student misbehavior decrease.

**Keywords:** Classroom discipline, discipline strategies, classroom management, student misbehaviors.

## INTRODUCTION

### a) Concept of Discipline

In every country, attaining the goals of the education system depends on attaining the goals of the school; and attaining the goals of the school depends on attaining the goals of the classroom. Like in many organizations, there are common goals included in the curriculum and expected to be accomplished. Attaining these common goals effectively are only possible in an orderly designed classroom. Orderly designed classrooms provide an effective learning-teaching process. Enabling suitable studying order in the classroom by activating specific rules and disciplines in the operation of the classroom is defined with the term of "discipline". Discipline has two meanings according to the behavior. For example, we say "discipline is quite bad in this class". The second one is the operations the teacher carries out in order to enable desirable behaviors in students (Charles, 2005; Kayikci, 2009). Discipline should not be considered as giving punishment to students (Sabancı, 2009). Discipline should be regarded as teaching students to control themselves (Cummings, 2000). When we consider these descriptions, the main point can be said obeying the order, enabling the order and creating the order.

Order provides clearness, stability to the operation of system, directs it; prevents the arbitrariness of obscurity, discomfort of unknown. When the order is distracted, so is the control of operation, it is not possible to estimate where, how and why it is going, it becomes inevitable to divert from the goals. Diverting from the goals is diverting from the reasons of the system foundation and existence (Basar, 2008). Classroom order based on rules and principles that would serve to the aim of class prevents possible problems in the classroom and diverting from goals; helps the learning-teaching process to be effective. When we consider in this sense, classroom discipline is perceived as one of the most important elements of classroom management. Classroom management includes creating a suitable environment for learning, physical arrangements, teaching process and time management, arranging in-class relations according to specific rules, arrangement of communication and enabling student motivation. Discipline includes reaction and actions of teachers towards

student behaviors which influence, prevent order and security of the class or learning (Karip, 2003).

Providing the order that would enable the learning-teaching process to be effective is not an easy thing that everybody can do. Teachers who are not effective enough in the sense of classroom management and discipline spend most of their time with discipline problems. In time, such kinds of teachers focus not on the goal of lesson but on student misbehaviors and managing misbehaviors becomes the primary goal. The teacher who cannot cope with misbehavior may lose self-confidence and may be in conflict with students regarding these misbehaviors as a threat towards himself. Inevitable disorders which are repeated frequently may cause frustration, outburst or even destruction for the teacher if he does not have the ability of coping with them (Emmer, 1991).

When the circumstances below happen, discipline problems are likely to occur (Edwards 1997; Celep, 2002):

- When children find themselves in a meaningless learning environment,
- When the help given to students in learning, independent thinking is inadequate,
- When the children do exercise by force,
- When punishment is favored.

## b) Discipline Theories and Models

### *Discipline Theories*

1. *Retributive Discipline Theory*: It is based on the philosophy of primitive people. Authority and rules can be used with personal goals and expectations. Some of the teachers can use discipline as a means of revenge by personalizing it (Sarıtaş, 2000).

2. *Punitive Discipline Theory*: In this theory, discipline was formed on punishment. Punishments to be given in the event of disobeying rules are determined in advance.

3. *Preventing by Fear Discipline Theory*: Philosophical basis of the theory is founded on the pessimist approach of human nature. According to this theory, a human being has badness in himself. He is rebellious, lazy and violent. It is necessary to prevent badness and reveal goodness and people should be controlled not considering any ethic rule. An individual should be controlled by various preventions and prohibitions. Misbehaviors should be prevented by way of shouting, walking all over, bullying. The student who performs misbehavior stands before the class and forms the source of fear for other students.

4. *Reformative Discipline Theory*: Using punishment as a sanction in every circumstance is not possible. When the dissuasive effect of punishment decreases or is removed, it becomes difficult to enable control in the class and manage the classroom. Therefore, it is needed to form a thought of obeying present order and rules among students. Every student can perform misbehavior, what is needed to be done is to detect the condition which causes students to misbehave and remove it. In reformative theory, students are informed about possible negative results of his misbehavior and enabled not to do them. This theory can be applied with an efficient consultation and guidance.

*5. Preventive (Formative) Discipline Theory:* It is based on the optimistic approach of human nature. According to this theory, people are born good and pure. They learn badness, laziness and selfishness with the effect of environment. The aim of preventive discipline is to make logical arrangements and prepare students to manage himself. Characteristics of preventive discipline are;

- a) The aim of discipline is not to frighten, punish but to reform, help, attain and support the confidence,
- b) Character and personality of every student is taken into consideration,
- c) It is based on support and temptation rather than forbid,
- d) It pays attention to student participation,
- e) It is objective, unbiased and just,
- f) It is based on cooperation (Sarıtaş, 2000).

### ***Discipline Models***

There are various models in classroom management which are in the aim of detecting, correcting and preventing the repetition of misbehaviors in class. Some of them are listed below:

*1. Canter Model:* The model is based on the thought of teacher's being active in the class. The aim is to teach the teacher to be calm but at the same time powerful in the class. He struggles with misbehavior with the same determination from the beginning of term. He clearly makes use of the power of reward and non-physical punishment (not having a break, staying at the school after courses, or being sent to the headmaster's room). He informs students and their family about classroom rules and their possible results. He especially wants students to be respectful, kind and responsible towards the teacher, each other and school management.

*2. Realistic Therapy Model of Glaser:* Glaser model is the guidance activity which directs students towards reality and supports them to be responsible to compensate his needs in real-life conditions. Realistic therapy helps students make positive choices by making relations between his behaviors and their results (Erdem, 2011).

*3. Group Dynamics Model of Kounin:* This model was founded on group management and the ripple effect. According to this model, when the teacher prevents the wrong behavior of the student, this event creates a wave effect among students and prevents other students from performing a similar behavior in the future. Clearness and determination are the most important factors of this model. The teacher knows well what the students have done wrong and what he should do instead of it. Directing towards the group is regarded as an important dissuader of misbehaviors. The teacher should avoid severe physical threats since it would irritate class. According to this model, the teacher should make kind shifts between courses, should not suspend the course and move from one subject to another without order. Kounin has concluded that in the prevention of misbehavior, teachers should do interrogation rather than management (Admiraal et al. 2000).

*4. Behavioral Model:* It is based on the thoughts of behavioral psychologist Skinner. Reinforcement can be utilized in order to change specific dimensions of student behaviors. Students who perform desirable behaviors should be rewarded with various presents. Students

who perform misbehavior should be left devoid of attention and presents. Students obtain specific presents or activities in return of his points at the end of specific periods.

5. *Effective Teacher Model*: This model was developed by Thomas Gordon. The aim of this model is to teach teachers how to form positive relationships with students. Gordon supports the idea that misbehaviors can be decreased with clear and calming communication. The basis of this model is to detect who the problem belongs to. If the problem is caused by a student, the teacher helps student to solve the problem himself by listening to him actively (Empathic listening). According to this approach, if the teaching activity is prevented by the students' misbehaviors (speaking, making noise); this problem is caused by the teacher himself. It is the problem of the teachers not to attain the goals of the lesson. Gordon has detected that although the problem is in fact caused by the teachers, they use "you language" message (you are wrong; you are stupid, lazy etc.). However, the model suggests teachers to tell what he expects by using "I language"(Gordon, 1974).

6. *Rational Results Model*: The aim of this model, which was developed by Dreikurs, is to improve self-discipline in children. The base of this model is to teach the student that he is responsible for his behaviors. The model anticipates solving problems in the classroom as democratically as possible. The student learns that he is responsible for his behaviors. For example, the one who draws something on the classroom wall cleans it. The one who has not done his homework, does it at the break or at lunch. Rational results that the student will confront as a result of his misbehaviors are explained to him and he is expected to decide to show desired behaviors (Sarıtaş, 2000). Dreikurs' approach to discipline depends on understanding the incentive behind student behaviors. According to him, students react negative feelings by improving defense mechanisms which aims to protect their self-respect. Dreikurs suggests teachers to determine the aim of students and use this information to make them understand the aim of their behaviors. Every student wants respect and their misbehaviors are caused by this desire. When he cannot attain the respect he wants, he begins to show misbehavior (Larrivee. 2005; Finger & Bamford).

7. *Fred Jones's Positive Classroom discipline*: Clinic psychologist Fred Jones has searched how to make the teaching process more active for long years. This positive discipline model was formed by observing methods of successful teachers. The fundamental aim of this model is to provide the student with the ability of controlling himself and enable him to develop suitable, positive behaviors. Jones states the importance of effective body language, the necessity of participation by using supportive methods and guiding role of the teacher (Charles, 2005). The way of intervening student's misbehavior is important. One of the promising approaches is to support children's positive behavior as being respectful towards other students. Punishing, beating the student; humiliating him before other students should be chosen, positive student behaviors should be preferred (Soodak, 2003).

8. *Marvin Marshall's Discipline through Raising Responsibility*: Marshall has served as a teacher, consultant and director in all stages of education. Marshall's discipline model aims to develop good and suitable behaviors whatever the elements are, by increasing individual responsibility. According to Marshall; in fact, the individual has the tendency to act responsibly, but needs help to reveal this behavior. He asserts that this help can be attained by giving responsibility to the individual. Negative behaviors can be decreased by having conscious of responsibility. Since it is easy to understand and apply, it is preferred more by the teachers (Charles, 2005).

*9. Jane Nelsen, Lynn Lott, and H. Stephen Glenn's Positive Discipline in the Classroom:* Nelsen, Lott and Glenn base their concepts on a positive discipline approach. Their aim is to teach adults and children to respect themselves and others and have responsibility. Teachers should create the environment in which they will have responsibility, respect each other and develop cooperation. This environment can be improved with regular classroom activities where positive discipline rules are discussed and applied. In this model, it is suggested to respect the student. In these classes, the students should not be despised or exposed to negative criticism even if he performs misbehavior, he should rather learn how to transform fault to success. In addition to this, he should know how to solve problems by interacting with teachers and friends. It is necessary to create an environment in which he will feel enthusiastic for life and learning rather than fear and inadequacy. In this process, the student will improve the feelings of belonging, commitment and regard (Nelsen & et al., 2000).

*10. Richard Curwin and Allen Mendler's Discipline with Dignity:* the basis of this discipline model is founded on respect and hope. All of the negative behaviors including violence can be solved in long-term. It aims to study actively with students who are difficult to cope with. According to this approach; the students whose self-respect is under threat has the tendency to perform misbehavior. We should have hope to direct these students towards a positive way. Curwin and Mendler have two contributions to school discipline: 1) strategies of developing in-class behaviors by improving student self-respect and hope 2) strategies of forming effective communication with offensive students. The fundamental aim of the model is to provide better opportunities to all students in order to be successful. In performing this, the sense of hope and respect play important role (Curwin & Mendler, 1988; Charles, 2005).

*11. Barbara Coloroso's Inner Discipline:* Coloroso lists student behaviors in three groups: 1. Faults 2. Naughtiness 3. Chaos.

When such kinds of behaviors occur, he draws attention to enabling active discipline rather than the punishment method. In an inner discipline model, it is important to show the student what he has done wrong and make him think about the solution of the problem without harming his personality. It is asserted that learning how to think rather than what to think improves inner discipline. The individual should make his own decisions and know that he is responsible for the decisions he has made. There are 3 main points for enabling active discipline:

- The student must be honored and respected,
- The individual should be informed that he has a right on his own experiences,
- The individual should give his own decisions with his free will; he should learn that he is responsible for his success and faults.

*12. Budd Churchward's Honor Level System of Discipline:* Honor level behaviors are expected to be revealed. Churchward has put forward a discipline system which is attractive for all teachers. This approach is named the "Honor Level System". Churchward observes student behaviors for 14 days and determines various honor levels for positive or negative results. The most superior side of the model is removing the stress due to monitoring student behaviors closely. Students are aware of the things they should do in order to reach high levels of honor. In this sense, the teacher should behave coherently. Shouting at or long advices are not suggested for coping with misbehavior. As a result of misbehavior, rules

which are already known by the students begin to operate. For example, the student who has disobeyed the rules compensates his condition by behaving good for 1-2 weeks. Chruchward asserts that behavior results should be listed regularly by using a computer-based program (Churchward, 2003; Charles, 2005).

*13. Spencer Kagan, Patricia Kyle, and Sally Scott's Win-Win Discipline:* Representatives of the model assert that disorder and discipline problems in the class provide opportunity to learn expected behaviors. These negative environments provide an opportunity to learn valuable human skills such as "controlling oneself, anger management, making good-decision, strong personality and understanding others' feelings". With this in mind, concepts which form the keystone of the model can be explained as such: 1) Cooperation of teacher, student and family is important for creating the feeling of responsibility. 2) Long-term solutions should be taken depending on student-teacher interaction. 3) The environment should be designed for the student to make his own decisions by using his responsibilities.

Kagan, Kyle and Scott list four types of misbehavior as such: anger, disobedience, challenge, and losing interest towards social environment. Moreover, seven situations of students which cause misbehavior are given: drawing attraction, escaping from defeat, being angry, enabling control, being active, getting bored of the environment and not being aware of the events. All of these positions emerge from the wrong choices in compensating the needs of people. There are two main aims of discipline approach based on mutual benefit: 1) showing how to fulfill needs by way of positive and responsible behaviors 2) providing valuable life styles. Students and teacher meeting at common emotions and thoughts and having consensus have importance in forming active classroom discipline. "We" language which shows that both sides meet at common point must be used. In providing discipline, the problem is examined; not the source of problem. Fast and long-term solutions based on the problem should be created (Kagan. S. & et al, 2004).

*14. Linda Albert's Cooperative Discipline:* It is a kind of discipline based on close cooperation of student and teacher in taking classroom decisions. The role of family cannot be ignored in activating the learning. Preferences of students have an important place at the basis of this model. Students are motivated to behave the way they like. Having wrong aims cause emergence of misbehaviors. Teachers can direct choices of students by supporting them or by cooperating with them. Students should feel that they are valuable members of the classroom. Students should be supported to study in cooperation with their friends. Participation of students and families should be enabled in the planning of a classroom discipline system.

The basis of the cooperative discipline model developed by Albert depends on the regulation of positive and negative behaviors of students in order to compensate their needs. As long as these basic needs are fulfilled and students are encouraged in a positive way, the number of misbehaviors is minimized and cooperative participation between teacher-student increases. Rather than removing this totally, the teacher should minimize the condition as much as possible by developing positive attitudes (Charles, 2005).

*15. C.M. Charles's Synergetic Discipline:* C.M. Charles who has received his master degree in the field of education psychology focuses on a cooperative teaching method which depends on developing a qualified learning environment and positive student behaviors. A discipline system in which mutual content turns into energy is aimed. "Synergy" means high power or energy that emerges in the process of social interaction between two or more people.

In a discipline model, a teaching approach which is based on increasing energy, responsibility and desired behaviors is dominant. For preventing misbehaviors, reasons behind these should be considered. In making the decisions of the classroom, participation of students should be enabled. When misbehaviors occur, people should behave in a positive and respectful attitude way. Charles expresses the importance of activating students in order to remove common reasons behind misbehaviors and increase motivation. In this model, teachers are not suggested to dominate students or have struggles with them. We can rather speak of students' willful sharing with love and respect. Charles, in this sense, mentions the importance of being a society and ethic behaviors (Charles, 2000; Charles.2005).

*16. Alfie Kohn's Beyond Discipline:* In the basis of this model which aims at thinking, punishing and cooperating; there is an approach based on improving the "conscious of society" rather than a popular discipline model. According to Kohn, punishment and reward system is the reason of distrusting their judgments. Environments in which students can explain their thoughts and study towards solution in a cooperation are created. Two contributions provided by Kohn in classroom discipline are explained as such: 1) The teacher is only a guide in attaining information and "constructivist theory" which is formed by the experiences of the student should be based on. According to this approach, directing the students towards subjects which they regard important is a good method for providing discipline in the classroom. The second contribution of Kohn is to develop the conscious of an in-class society which is based on educating responsible students. In this way, Kohn asserts that a discipline approach which considers others in class would occur and that would prevent misbehaviors (Charles, 2005).

### **c) The Effect of Student Misbehaviors on the Learning-Teaching Process and Teacher**

Classroom misbehavior is taken as any "activity which (a) annoys, upsets or distresses teachers, (b) is disruptive of good order in the classroom and causes trouble, and (c) leads teachers to comment continually" (Houghton, Wheldall, & Merrett, 1988; Ding et al. 2010). Such kinds of problems can be experienced as a result of misbehaviors. The emotional environment of the class is distracted; education of all the students is prevented, discomfort and chaos are experienced in the classroom, the teacher becomes nervous. Student misbehaviors not only prevent students' learning but also prevents them from keeping the information they have learned (Seidman, 2005).

Inefficient and inadequate classroom management and discipline causes student misbehavior and also student misbehavior influences the success of the teacher and education process negatively. According to a study conducted in 2004, 75% of teachers have stated that if student misbehaviors were less in their classroom, they would spare more time for teaching and teaching activities. Student misbehaviors (talking and walking in the class without permission) prevent students who are interested in the learning process (Guardino & Fullerton, 2010).

It was found that teachers who had greater concerns about student misbehaviors tended to be less confident in managing classrooms and thereby were more likely to use non-physical punishment and refer the student to other school personnel (Martin et al.,1999). Interestingly, recent comparison studies revealed that Chinese teachers appeared less punitive than Israeli and

Australian teachers (Lewis, Romi, Qui, & Katz, 2005, 2008). Chinese teachers favored positive coping strategies such as recognition (or reward) and discussion (or negotiation) (Ding et al. 2010).

According to the study of Blasé, it was detected that the teacher is the main stress resource of classroom interaction; stress is composed of discipline, indifference, low success and absenteeism. Moreover, stress is the most important resource in the decrease of teacher performance and level of student's learning. The reasons of teacher's stress are poor discipline among students, rudeness and continuous speaking, struggle of creating a silent environment in the classroom. "I feel myself like an animal trainer not a teacher"; this sentence heard from a teacher who cannot cope with the pressure of student behaviors adequately represents the struggle of many recent teachers (Admiraal et al. 2000). It is a well-established fact that student misbehavior is a factor in teacher burnout and the decision of novice teachers to leave the profession (Public Agenda, 2004; Allen, 2010).

#### **d) Resources of Student Misbehaviors in the Class**

A study involved pupils from the first year of secondary schooling (i.e., 11- and 12-year-olds) in one inner city school. The results of the study indicated that pupils' attributions for misbehavior at school were best represented by four factors, - 'fairness of teachers' actions', 'pupil vulnerability', 'adverse family circumstances' and 'strictness of classroom regime'. The first two of these factors were also seen as more significant contributors to pupil misbehavior than the latter two, - a finding in marked contrast to the results from studies of teachers' views of the causes of pupil misbehavior (Croll & Moses, 1985; Miller, 1995; Miller, Ferguson & Moore, 2002).

There are many resources of student misbehaviors at school. Most important of these are family, peer groups, the student himself, teachers, school management, environment of school, mass communication means (radio, television, media and internet), course program and school rules. We can list these resources as in-class and non-class resources.

##### **a) Non-class Resources**

*1. Family:* Investigations have repeatedly shown that teachers view parents and home circumstances as being the major cause of pupil misbehavior in schools (Croll & Moses, 1985; Miller, 1995). Croll and Moses (1985) used a postal survey to elicit the views of 428 junior school teachers and found this group to attribute misbehavior in schools to parents in 66% of cases (Miller, Ferguson & Moore, 2002). Miller (1996) found that teachers located the origins of pupils' difficulties with factors under the control of parents in 71% of cases. For example, as a result of mother and father living separate and children being devoid of concern and compassion may cause various behavioral problems. Such kinds of students expect much more attention from the teacher and may perform misbehavior in order to attain his goal. Students who are the only child of the family and who are over-spoiled; and thereby whose every wish have been fulfilled, expect their friend to give priority to their needs and sometimes live problems with their friends. Indifference of families towards a child and his lessons influence motivation of children negatively and may cause misbehavior. Children who are exposed to violence by their parents may have the tendency to show violence to his friends and cause misbehaviors. When there is a contrast between family education and

education given at school, children may live an inner conflict and reflect it to classroom. For example, if the student adopts the principles he has obtained from family education, he may have discussions with the student, sometimes be indifferent towards the course, deal with something else and distract other students. Parents' comparing their children with other students and expecting more than the capacity of student influences student behavior negatively.

Support of parents is needed for the prevention of student misbehavior. A strong cooperation between family-school management and teacher in preventing student misbehaviors at school and forming successful discipline system is required. Students adapting to the order of school and parents' support in this process make it easy for students to attain positive behavior habits at school. Providing education for the family is the responsibility of school.

*2. Peer Groups:* One of the other important elements which influence student behaviors at school is peer groups. As a member of peer groups, students try to adapt to the behavioral norms of these groups. Therefore, peer groups may sometimes play positive or sometimes negative roles on student behaviors. Peer groups which influence students and are taken as a model by them, directing their behaviors in the class. Students resolve to behave according to the norms of peer group they belong to or behavior norms of peer group suppress the behaviors of students. Students being included in a peer group which has positive behavior norms influence their behavior positively and they should be encouraged by teacher and family for this inclusion. School management, parents and teacher should cooperate to amend the groups which have negative behavior norms (Sarıtaş, 2000).

*3. School Management:* School management's adequacy about forming and applying discipline rules may cause student misbehaviors at school and in the classroom. School management that is not based on science of management, inadequacy in problem-solving, an administration where the interests and needs of student is not taken into regard may cause disorder in the discipline of school and class. Rules which do not operate actively form the basis of discipline problems in time.

*4. Uncontrolled Media:* Uncontrolled and dangerous media publishing influence attitude and behavior of students and may cause students to show misbehavior in the classroom.

#### **b) In-Class Resources**

*1. Student Characteristics:* a) Students who do not have self-confidence may not want to be involved in the activities thinking that they might be unsuccessful. Successful sides of these students shall be expressed and they should be enabled to experience success. B) Students are more sensitive, resentful and unstable in adolescence. In this period, students live uneven and rough days. These unstable feelings are reflected in different ways. This reflection is sometimes as admiration, commitment, and sometimes as anger, hatred, grudge, rebellion and violence. In this situation, the teacher should be understanding and help the student. C) Another element which directs students to misbehavior is anxiety. Especially test anxiety which creates serious discipline problems on students. Students should focus on learning rather than exams (Sarıtaş, 2000). D) Students who have different backgrounds carry their cultural features with them and may live problems in adapting to the behaviors and rules required by the culture of the class. Some of the students may perform misbehavior towards their teacher and friends in the process of adaptation and may violate the rules of school easily. Students who think that they do not attain the respect they deserve may make noise, hit

the desk with a pencil or ruler in order to draw attention. Students who are seeking power may challenge their friends and sometimes even their teacher. Moreover, revengeful students are too brave that they do not stand away from being punished (Finger & Bamford, 2006).

*2. Program and Teaching Models:* Program contents which do not especially consider the attention, expectation and requirements of student and based on memorizing may cause discipline problems among students. Students do not pay attention to learn the information which they believe to be useless. Students memorize this information just in order to pass the exam and forget after the exam. Since they would not be busy with courses which are not useful and interesting for them, it would be difficult for the teacher to involve these students into the course and these students would perform misbehavior. Moreover, the usage of unsuitable teaching methods which do not comply with multiple-intelligence of the teacher would decrease students' interest towards the lesson and cause misbehaviors. That the duration of courses are not suitable to the development of the student, in other words, long courses which would force the attention of the student, having mathematics at the final hours, not using enough teaching technology (projection – computer etc) may direct students to misbehave.

*3. Classroom environment and climate:* While determining classroom management strategies, socio-economic and cultural background of students should be regarded. When students with autocratic backgrounds are educated in a democratic environment, or vice versa, it is possible to live some problems. In addition to this, depending on all of the requirements of modern education, a democratic environment should be based on and students should be included in all of the processes in the class and directed toward taking responsibility. This approach can also help the student to adopt self-discipline. Forming a warm and positive environment in the classroom and sincere – fiduciary relationship between students and teachers can be effective in decreasing student misbehaviors. It is the teacher who is especially responsible for this duty. A classroom management based on rivalry causes behaviors of cooperation between students, sharing and supporting each other to decrease and causes students to be reserved and violent towards each other. This situation causes communication and interaction problems among students. Not setting classroom rules together with students makes it difficult for students to obey the rules. Students violate the rules which they do not understand thoroughly, they do not believe to be useful and find it difficult to obey.

*4. Physical Order of the Classroom:* Researchers have studied the relationship between classroom environment, student behavior and academic study. Well-organized classrooms enable possible misbehaviors between teacher and student to be less (Guardino & Fullerton, 2010). Changing the environment of the classroom may help to interfere the student who performs misbehavior (Conroy & et al., 2002). Order of the classroom is an important element which increases or decreases the motivation of the student and teacher. The physical structure of the classroom gives the student the opportunity to behave free and participate in the activities; while problematic behaviors would occur in classrooms which are not well-organized. Small or big desk, chair of the student and student sitting at an unsuitable place are important factors which influence misbehavior. Size of the class (large classes frequently cause misbehaviors) and monotonous classes (monotonous classes influence the interest of student negatively) are the factors which effect student behaviors (Seidman, 2005). The motivation and participation of students will increase in well-organized classes and the frequency of experiencing problems will decrease (Jones and Jones, 2004). According to a

study, when the order of classroom is changed suitably, it was seen that time spent with academic study increases and time spent with misbehavior decrease (Guardino & Fullerton, 2010).

*5. Personal and Occupational Characteristics of the Teacher:* Although the teacher is expected to prevent student misbehaviors by way of efficient class discipline, they can be the reasons of misbehaviors. The most important reason of this is the inadequacy of teacher's classroom management skill. According to the studies about classroom management, misbehaviors of teachers may be the reason of misbehaviors of students (Cummings, 2000). Excreting specific hormones as a result of stress influences learning negatively (Cummings, 2000; Kayikci, 2009).

Effective communication skills of the teacher are important keys for the success of the teacher. As an adult, the teacher has to accept the student as an individual regardless of his age and avoid behaviors which would insult him before the class (shut up, get off my sight etc.) and avoid speeches, attitude, actions and behavior which would cause frustration. Misbehavior of teachers in the sense of students were defined as such (Sarıtaş, 2000): shouting, threatening, using physical power, walking towards the students, bullying, insulting, swearing, behaving rudely, giving order, dominating, mocking, scorning, tagging negatively, judging, reprimanding, leaving lesson, not being sorry even in when he is wrong, contradiction, being unprepared, inability of using time effectively, punishing the failure, paying attention only to successful students. Türenkülu et al. (2001) reported that resources of discipline problems in primary schools in Turkey are crowded classrooms, lesson materials and tools, curriculum, social activities, play grounds and canteen, social environment of the school, teacher, insufficient counseling services and personal characteristics of students.

#### e) Attaining Classroom Discipline with Efficient Classroom Management Strategies

Self-educated and skillful teachers on the issue of class management and discipline can prevent or minimize student misbehaviors enabling efficient classroom discipline with classroom management strategies. In his research, Kayikci (2009) reported a negative and significant relation observed between the teachers' classroom management dimensions of "Teacher-student relation and communication", "Recognition of student characteristics and needs", "Application of teaching process and motivation", "Setting up class rules and application" and "Arrangement of classroom environment and physical structure" and all dimensions (Towards spoiling teaching process, Students towards each other, Towards the teacher, Towards violation of disciplinary rules) related to the students' disciplinary behavior. There is a positive and significant relation between teachers' classroom management dimension regarding "Management of undesirable behavior" and students' disciplinary behavior dimension of "Towards violation of disciplinary rules".

Teachers being successful with classroom management and discipline depend on their having necessary information and skill. In order to manage student behaviors efficiently, teachers should educate themselves about human psychology, group behavior, and efficient communication, problem-solving and should reflect this to application. It is an important factor for teachers to have occupational experience to attain this. It is expected from a teacher

who has the information and skills listed above to apply these strategies in forming classroom order and attaining discipline.

1. *Preparation and Planning before Lesson:* An important part of student misbehaviors emerges from the failure in the process of learning-teaching. Most of these failures arise from not preparing enough, not bringing the equipments to the class on time, gaps between activities, not using time efficiently and actively and not giving correct decisions in the sense of suitable learning teaching strategies. The most effective way of removing these failures is to make an applicable plan suitable to the objective conditions of the class and to apply it successfully. Education and teaching being effective and efficient is possible by giving necessary importance to planning and teachers getting prepared for class (Kayikci, 2011). Conducting classroom activities in the frame of a specific plan increases the confidence of especially recent teachers. In addition to this, planning helps to prevent possible student misbehaviors.

2. *Group Dynamics:* Teacher should analyze friends groups (informal groups) to which students belong to and their structure as well and form a relationship which helps to the aim of course in the classroom. The teacher should use the energy of the class in the aim of course without ignoring informal groups. The teacher should for a classroom culture that is not based on rivalry but cooperation.

3. *Acknowledging and Considering Individual Characteristics:* When the teacher knows student and features of students well, for example, knows cultural environment, affective features, cognitive features (academic level, learning styles, multiple intelligence etc.) and give education in regards of this, he will not leave the success to chance and prevent or at least minimize discipline problems during the course.

Students come to school from different backgrounds.. Every student behaves according to the culture and behavior norms of the environment in which he is brought up. The environment of school and classroom make it necessary for students to keep pace with classroom culture. In this adaptation process, there may be adaptation problems both among students and between students and teacher. This must be regarded as something natural. During this process, the teacher should know the culture of students and help them to adapt. This process sometimes lasts long and sometimes short for students. Teachers should be patient, conscious and understanding towards students overcoming this process successfully. Teachers that know personal features, interests and expectations of students is an important factor which determines teacher's behavior in class and his expectations from students.

Another field in which teachers should know and pay attention about students is the emotions of students. Students are resentful, aggressive, easily angry and under the pressure of sexual development (Tierno, 1991). A teacher who detects this is more efficient in understanding the student and preventing possible negative situations. Teachers should first of all understand student requirements and the relationship of behaviors related to it. Later on, a good classroom management should be provided in order to compensate personal needs of students in the classroom (Celep, 2002). In an active classroom management, it is expected from teachers to regard expectations of students, participate actively in the course, construct the education thematically, behave towards the student in a friendly way and provide cooperative education conditions (Jones and Jones, 2001).

4. *Positive teacher-student relations and positive classroom culture:* Organizing teacher-student relations is not the only responsibility of the teacher in the classroom. Creating positive, moderate and confident relationships among students is also the task of the teacher.

Teachers should adopt a classroom management strategy which is based on not rivalry but on cooperation. It is because in a classroom management which is based on competition and rivalry, conflicts between students and misbehaviors increase. Students' cooperating and supporting each other is possible with a classroom culture which is based on cooperation. Positive culture and atmosphere created in the classroom prevent and decrease possible misbehaviors.

The teaching-learning process in the classroom depends on, in a way, to the communication process of teacher-student and students among themselves. Therefore, communication skills and positive relationships of the teacher in classroom management is regarded as one of the most important elements of his success. Warm and sensitive ways of communication between teacher and student is an important factor in decreasing misbehaviors. The respect of the teacher towards the student, being sincere and moderate are important factors which effect students' attitude and motivation of the student. Effective teachers make eye contact with students, have clear body language, listens to students with respect and always seem attentive. This is a method which decreases teacher-student conflict (Meyers, 2003; Seidman, 2005).

The quality of teacher-student relationships effect academic success and student behavior. Students prefer sincere and friendly teachers. When teachers are more sympathetic and have more positive roles for students, it is no doubt very important for students to have more positive judgments towards school and teachers (Jones & Jones, 1998; Celep, 2002). Good relationships between teachers and students require enabling specific basic conditions. According to this, the relationship between teacher and students should be clear, transparent, direct and based on honesty, teacher and students should value each other and have the feeling of mutual commitment; it must be regarded that every student has unique characteristics, interests and abilities and these differences should be considered; and needs of teachers and students should be compensated mutually (Gordon, 1974). In the meta-analysis of more than 100 recent studies (Marzano, 2003), it was concluded that the quality of teacher-student relationship is the keystone of classroom management elements. In fact, meta-analysis studies show that teachers who have good relations with students averagely experience 31% less discipline problems, violations and attention problems (Marzano, 2003).

## f) Student Misbehaviors in the Class

In fact, it is difficult to draw the limits of misbehaviors because the factors which make behaviors undesirable depend on a sequence of variables such as conditions, circumstances, place etc. (Aydın, 2007). Every kind of behavior which prevents educational efforts at school is named as a misbehavior. Their effects are graded. In this sense, misbehaviors are listed in a wide range from the one that is not destructive to the most destructive (Başar, 2008). Some of the misbehaviors are not regarded as destructive ones but as the ones which direct towards misbehavior. Not bringing equipments such as the course-book, notebook, forgetting trainers, sports-clothes and not completing the homework can be listed among these (Lemlech, 1988). Misbehaviors abuse and ignore common rights of teachers and students, effect negatively and prevent educational aims, plan and activities.

Student misbehaviors were classified according to specific features by various writers. For example, Seidman (2005) classifies misbehaviors in five ways. These are: aggression,

immorality, disobedience towards authority, classroom disorder and faults done stupidly. Some of these behaviors may occur wrongly (coughing, sneezing ...) while some are done deliberately (talking, yawning loudly, leaving the class early). Meyers (2003) has classified misbehaviors as apparent and obscure behaviors. Behaviors carried out apparently are talking all through the lesson, eating and drinking something loudly or discussing with teacher. Teachers find these behaviors as immature and disgusting. Obscure behaviors are those carried out more passively and carelessly such as sleeping during the course, missing classes, laziness, insensibility and leaving the class early. This list can be offered as misbehaviors in the classroom: being late for class, shouting at others, walking towards them, bullying, threatening, assaulting, outraging, talking rudely and swearing, verbal harassment, making false accusations towards friends, cheating, unreasonable absenteeism, leaving the class and walking in the class without permission, not listening to the course, preventing others listening and studying, whistling, walking on the desks and table, talking without permission, talking continuously, acting rudely and disrespectfully, giving harm to the goods of the class and teacher,, stealing others' goods, smoking cigarettes and using addictive drugs, lying (Sarıtaş, 2000). Not obeying rules of clearness and manners, irritating others, not being careful and attentive while doing task, being rude and disrespectful towards teacher, not listening to friends or preventing them study, talking while others are talking, giving harm to the goods of friends are misbehaviors that are frequently experienced (Basar, 2008). In many classes there is negative feeling and sense of hostility which covers all the students. In these classes there is a reaction towards homework, not participating in the lesson deliberately and making complaints (Meyers, 2003). In the largest survey of bullying in schools in the United States to date (Nansel, Overpeck, Pila, Ruan, Simmons- Morton, & Sccheidt, 2001), 29,0 % of students were found to be involved in bullying. Dynamics: 13 % as bullies, 10,6 % as victims, and 6.3 % as bully-victims. (Allen, 2010) The literature also suggests that gender is a consistent factor in students' disruptive behavior (Cameron, 1998). Boys tend to be more disruptive than girls, and also tend to manifest more aggressive modes of disruption (Wright & Dusek, 1998).

### **g) Approaches and Strategies of Coping with Student Misbehaviors in the Class**

#### *Approaches of Managing Misbehaviors*

1. Non-interventionist Approach: This is the approach which informs the students about the problem and makes them solve the problem. It estimates that the student has good intent and is reliable and should control himself and can do this if he is given the opportunity. The teacher is not a dictator but a mediator.
2. Behavioral Approach: It is an approach in which the teacher directs behavior of student when needed. Environment is responsible for the behavior. Rules and result of (dis)obeying them are determined in advance. Obeying the rules is rewarded and disobeying them is punishable, or the student is left devoid of advantages.
3. Interactive Approach: It is among behavioral and helping approaches. The teacher shares the authority with student. The teacher accepts that he is capable of solving the problem of the student but still needs the help of an expert. Rules are set together and solutions are searched together as well. In the choice of these approaches,

characteristics of behavior, student and environment is considered (Salend, Whittaker, & Reeder 1993; Basar, 2008).

### ***Strategies of Managing Misbehaviors***

Actions teacher can do against student misbehaviors can be listed as such: Ignoring little faults, ignoring provocative actions, making eye-contact, getting close, warning, reprimanding, changing the place he sits, smiling, changing the subject, giving time-out, talking to, leave him deprives from rights and freedom, keeping at class, not doing his wish, getting into contact with family, making contract, giving non-physical punishment (Elrod & Terrel, 1991; Başar, 2008). Before directing these options, what should be done is to understand misbehavior and search for the reasons of this. In this way, it would be easy to attain which strategy to choose for the action.

*Understanding the problem:* It is composed of recognizing the behavior, determining and commenting on it. Determination of the behavior requires having information about the behavior, behavior and environment. Commenting on the behavior directs the teacher to its possible reasons. It must be detected that how many people are irritated by the behavior.

*Ignoring:* Behavior which does not spoil the classroom discipline and happens unintentional can be ignored. Teachers who ignore little carelessness and focus on direct academic activities rather than dealing with misbehaviors can be successful (Brophy, 1988).

*Warning:* Sometimes students may misbehave unintentionally. In this situation, the teacher warns the student with mimic or body language and tries to prevent their petition of behavior. If the student does not understand this, the teacher gets close to students and makes eye contact with him. If the student does not understand this as well, teacher can gently poke the student. The teacher's poking to the shoulder of the student gently can make him aware of the fault he has done. These acts are almost always effective. Yet other strategies can be applied in the event of them being unsuccessful. One of them is a verbal warning. First of all, the students are warned by whispering and if this does not give results, the student can be warned loudly. Verbal warnings should be done softly; in a voice which does not have different meaning or sense.

*Making changes in the lesson:* If the student misbehaves in cooperation with the friends, his seat can be changed. If the student continues his misbehaviors, he can be placed in a remote place of the class with the aim of leaving him alone (Celik, 2005). If the problem has increased between teacher and student, the lesson was left in the background, emotion is dominant over logic, a break can be given. Another activity can be done and participation can be enabled do in this way misbehaviors can be prevented. Apart from these;

*Giving Responsibility:* It is natural for a student who thinks he has nothing to do or nothing interesting for him to misbehave. In this situation, giving him responsibility, changing his task with an interesting one can be effective (Başar, 1988).

*Talking with Student:* If it is not possible to prevent the misbehavior by warning or in another way, it can be effective for the teacher to talk with the student. This conversation can be in class or out of the class; individually or with group. Students can be expected not to repeat the misbehavior by telling him the results of his behaviors.

*Communication with School management and Family:* Rather than coping with the problematic situations alone, the teacher should cooperate with school management and family. This method should be used when the teacher is stuck in a difficult situation and

needs the help of their support, when the problem arises from school or family and the solution requires their contribution.

*Punishing:* there can be circumstances in which the worst means should be used. Punishment is one of them. Punishment can be used as a means of preventing misbehavior and providing the order (Rich, 1991).

These suggestions are set forward in the prevention of in-class misbehavior of higher education student which causes them to be rusticated (Meyers, 2003):

- a) Sensible and warm communication among people.
- b) A basis on which common decisions are taken in the class.
- c) Creating learning groups in the classroom.
- d) Teachers being understanding and empathetic towards students' emotions in order to decrease potential misbehaviors.
- e) Helping students to evaluate their own alternatives.
- f) Using suitable methods of problem solving.

Palardy & Palardy (2001) listed below nine preventive strategies which are essential. Even if all the preventive strategies described here are used, behavior problems may still emerge. But if the strategies are used, the number and intensity of these problems will be reduced significantly.

1. Teacher must feel comfortable with themselves, their pupils, and their subject matter.
2. Teachers must believe in their students' capacity and propensity for appropriate classroom conduct.
3. Teachers must ensure that their instructional activities are interesting and relevant.
4. Teachers must match their instructional activities with their pupils' capabilities.
5. Teachers must involve their pupils in setting up "the rules."
6. Teachers must make certain that their pupils know and understand "the routine."
7. Teachers must identify their problem times. When do pupils tend to act up? Or toward the end of the period? On the playground? In the lunchroom? In the halls? On Monday, or Wednesday, or Friday?
8. Teacher must remember that pupils are not "little adults."
9. Teacher must give evidence that they genuinely like and respect their pupils.

Brophy and Mc Caslin (1992) have searched effective methods used by teachers in dealing with problematic students. Generally, teachers who have had the best result are those who touch the student or draw his attraction by coming close to him, in contrast, teachers who choose to wait rather than intervening in the situation and who rarely states his discontent with misbehavior has become unsuccessful. According to Wubbels et al., teachers' efforts of discipline such as warning or sending off students may cause problems in teacher-student interaction. The reaction given to aggressive behaviors may cause more aggressive behaviors. This situation may cause a vicious circle between trainee teacher and student (Admiraal et al. 2000). According to Rudolf Dreikurs et al., (1982) misbehavior arises from students' perception of social status inefficiency of the student and this is one of the ways of gaining reputation. Problems occur when the student cannot make himself distinguished with socially acknowledged means. Dreikurs have made explanations to four types of misbehavior which

he calls as drawing attraction (Finger & Bamford, 2010). Explanations of Dreikurs about these four misbehaviors are summarized in Table 1.

**Table 1. Reasons and Management Strategies of Four kinds of Misbehaviors according to Dreikurs**

| Misbehavior  | Reason  | Management Strategy   |
|--|---|---|
| The most common ones are making noise continuously, hitting the desk with pencil or ruler, asking for help even if it is not required.   | Desire to draw attention when he thinks he could not attain the reputation he deserves. | Students are made to feel that their behaviors are recognized, students can be directed to routine tasks, their studies can be expressed in group.  |
| He refuses to fulfill the demands of teacher and obey the rules. He gets into discussion with teacher apparently.  | Seeking for strength.   | He should not be reacted with anger, not get into fight of strength. Teacher should recess for a while, and then talk to student one to one, student can be given tasks which would enable him reputation and status.   |
| Deliberately, pouting, not cooperating, tries to hurt those around him, threatening teacher and students, giving harm to school equipment.   | Seeking for revenge.  | Teacher should be calm, say to student that his behaviors are unacceptable, he shouldn't retaliate, draw the student away from the environment or you suspend from the environment, do physical intervention in the frame of rules. Later meeting can be carried out in Glasser method. |
| These are students who are indifferent towards school and do not have any effort. They seem to be doing something and say "I cannot accomplish teacher". They express their desperation. | The student who has learned helplessness.   | Teacher should talk with the student and he must be made to deal with tasks suitable to his level, his effort and success should be expressed and student should be encouraged in order to fulfill his responsibilities.  |

## **A RESEARCH ON THE OBSERVATION OF STUDENT MISBEHAVIORS IN ELEMENTARY SCHOOLS IN TURKEY IN THE SENSE OF VARIOUS DEMOGRAPHIC FEATURES**

*The aim of the study* is to detect the reasons of student misbehaviors in elementary schools, frequency of these misbehaviors and detect whether there are significant differences in the frequency of misbehaviors according to various demographic features. In this way, it is aimed to make suggestions to prevent and deal with misbehaviors in the classroom and to educate them with in-service education. In this aim, the questions below were studied:

1. What are the student misbehaviors and frequency of them? What are the most experienced student misbehaviors in every level?
2. Does the frequency level of student misbehaviors have a significant difference according to the gender of teachers?
3. Does the frequency level of student misbehaviors have a significant difference according to the age of teachers?

4. Does the frequency level of student misbehaviors have a significant difference according to the rank of teachers?
5. Does the frequency level of student misbehaviors have a significant difference according to the branch of teachers?
6. Does the frequency level of student misbehaviors have a significant difference according to the technical means of the classroom?

## Method

This study is a descriptive study and was carried out in a literature review model. The study was conducted in the 2008 academic year, in Turkey – Antalya city center and Konyaaltı, Muratpaşa, Kepez, Manavgat, Alanya and Kumluca.

*Universe and Sample:* The universe of research is the elementary schools in Antalya city center and Konyaaltı, Muratpaşa, Kepez, Manavgat, Alanya and Kumluca. The sample of the study is elementary school teachers in 40 elementary schools chosen randomly.

*Data Collection Tool and Collection of Data:* In the study scale of “Student Misbehaviors” prepared in 5-graded Likert type and developed after validity and reliability analyses were done. Choices, points and arithmetic average used in the scale and arithmetic average intervals were shown in Table 2.

**Table 2. Choices, points and arithmetic average used in the scale**

| Points | Choices   | Arithmetic Average Intervals |
|--------|-----------|------------------------------|
| 1      | Never     | 1.00 - 1.79                  |
| 2      | Rarely    | 1.80 - 2.59                  |
| 3      | Sometimes | 2.60 - 3.39                  |
| 4      | Often     | 3.40 - 4.19                  |
| 5      | Always    | 4.20 - 5.00                  |

In order to test content validity of the scale, views of academicians and teachers were obtained. Researches on classroom management and discipline, books and data obtained from literature review were utilized. In addition to this, an item pool was formed by collecting the same comments to the question “what are students misbehaviors in your class?” from 60 teachers who serve in 10 different schools and chosen randomly. Statements in the item pool were evaluated in the sense of being compatible with the aim of the study, compatible with the problem, easily understood and suitable to scale development techniques. After necessary regulations are done; pilot scheme of the scale which is formed of 54 items was applied on 120 teachers who serve in 10 different schools.

Total item correlation and factor analysis were done for the test of structure validity of the survey. These stages were followed in the development of scale: KMO was calculated as 97.1 ; Bartlett's 17678,801. In this way, it was detected that the data is suitable for factor analysis and so they were done factor analysis. Factor loads were calculated with varimax rotation by applying principal components technique. Items whose factor load values are over 0.45 were evaluated in this scale. It was suitable to take factor loads whose values vary

between 0.30 and 0.40 as under cut point in the formation of factor pattern (Neale and Liebert, 1980; Tavşancı, 2006).

Exploratory factor analysis was used in the development of scale. These analyses are defined as types of studies in which information about the nature of measured factors are tried to attain rather than examining a specific hypothesis (Crocker and Algina, 1986; Tavşancı, 2006). Internal consistency was calculated for the calculation of scale reliability and Cronbach alpha values of each dimension were found. The scale was composed of 46 items and 4 dimensions after removing some of the items. Number of items, names and Cronbach Alpha values of these dimensions are, respectively;

- 1) 18 items of "towards violating teaching process": .96;
- 2) 15 items of "towards students each other": .96;
- 3) 9 items of "students towards teacher": .92;
- 4) 4 items of "towards violating discipline rules": .79.

It is suitable for the internal consistency coefficient (alpha) to be at least 0.70 (Nunnally, 1978; Tavşancı, 2006). 64% of the variance are described with the factors. Variance rates which vary between 40% and 60% are regarded to be adequate in the analyses on social sciences (Scherer, Wiebe, Luther ve Edams, 1988; Tavşancı, 2006). After studies of reliability and validity, "Scale of Student Misbehavior" composed of 46 items was applied to 520 teachers and data from 450 scales which turned back were evaluated. In the analysis of the data, SPSS 16 package program was used. In the analysis, arithmetic average ( $x$ ), standard deviation ( $S$ ), t-test, one-way variance analysis (ANOVA), LSD and Scheffe tests were used as well. The level of relevance was accepted as 0.05

## **Findings and Comments**

1. Student misbehaviors in the classroom and frequency of these behaviors and the most frequent student misbehaviors according to various dimensions were given in Table 3 and Table 4.

**Table 3. Student misbehaviors in the classroom according to the dimensions**

| NO  | Student Misbehaviors  | Levels |      |     |
|-----|---|--------|------|-----|
|     |   | N      | X    | S   |
| I   | Student misbehaviors towards violating the teaching process | 450    | 2,44 | .72 |
| II  | Student misbehaviors towards students each other            | 450    | 2,51 | .68 |
| III | Student misbehaviors towards teacher                        | 450    | 1.89 | .67 |
| IV  | Student misbehaviors towards violating discipline rules     | 450    | 1.74 | .68 |
| V   | Total   | 450    | 2,29 | .62 |

When Table 3 was observed, it was detected that the most frequently experienced misbehavior is in the dimension of "misbehaviors towards students each other" ( $x=2.51$ ). It was seen that the most frequently experienced misbehavior in the second rank is in the dimension of "misbehavior towards violating education process" ( $x=2.44$ ), in the third rank

there is “misbehavior of students towards teacher” ( $x=1, 89$ ); and the least frequently experienced misbehavior is in the dimension of “misbehaviors towards violating discipline rules” ( $x=1.74$ ). It is seen that the student misbehaviors are generally “rarely” experienced ( $x=2,29$ ). Students’ showing misbehaviors towards their friends and peers can be related to their forming horizontal communication and their relationship being profound both nominally and in the sense of depth. Moreover, it can be thought that students’ misbehaviors towards each other can be tolerated more than other fields. The most frequent behavior in this dimension is students pushing each other and sniping at each other.

**Table 4. Arithmetic average (x) and standard deviation (s) values according to frequency level of the most frequently student misbehaviors -according to various dimensions**

| Items  | Students misbehaviors and frequency of these behaviors that the teachers face in the classroom | Frequency of and standard deviations of students misbehaviors |           |   |
|--|--|---|-----------|---|
|  |  | N=450   | $\bar{x}$ | S |
| <b>I- Student Behaviors Aimed at Disrupting the Teaching Process</b>       |  |   |           |   |
| 1  | Students making noise in lessons   | 2,60  | ,91       |   |
| 2  | Students talking with other students around them   | 2,68  | ,91       |   |
| 3  | Students interrupting while others are talking   | 2,73  | ,90       |   |
| 4  | Students conducting behaviors that will disrupt the course of lesson                           | 2,34  | ,93       |   |
| 5  | Students paying attention to irrelevant (extracurricular) activities in classroom              | 2,36  | ,89       |   |
| 6  | Students disrupting classroom environment with arbitrary behaviors                             | 2,23  | ,94       |   |
| 7  | Students not following or listening to the lesson  | 2,52  | ,89       |   |
| 8  | The indifference of students towards the lesson  | 2,48  | ,85       |   |
| 9  | Students not bringing class-related equipment  | 2,45  | ,83       |   |
| 10   | Students polluting the classroom and his/her environment                                       | 2,45  | ,96       |   |
| 11   | Students taking a walk, changing their places in classroom without permission                  | 2,22  | 1,02      |   |
| 12   | Students not doing the activity that they need to do in classroom                              | 2,36  | ,85       |   |
| 13   | Students disrupting the lesson with irrelevant topics  | 2,21  | ,92       |   |
| 14   | Students talking in class without taking the floor   | 2,79  | ,91       |   |
| 15   | Students not cooperating with their group in group activities                                  | 2,40  | ,85       |   |
| 16   | Students not participating in class  | 2,33  | ,92       |   |
| 17   | Students not abiding by in-class rules   | 2,48  | ,88       |   |
| 18   | Students drawing/writing on fixed-asset inventories of school (desk, table, wall)              | 2,32  | 1,0       |   |
| <b>II- The Undesired Behaviors of Students Directed Towards Each Other</b> |  |   |           |   |
| 19   | Students resorting to brute force towards their friends  | 2,46  | ,81       |   |
| 20   | Students speaking vulgar language towards their friends  | 2,58  | ,83       |   |
| 21   | Students fighting with each other  | 2,36  | ,84       |   |
| 22   | Students swearing and cursing to each other  | 2,13  | ,93       |   |
| 23   | Students disrespecting their friends with their expressions and behaviors                      | 2,41  | ,88       |   |
| 24   | Students hurting their friends’ feelings with their expressions and behaviors                  | 2,33  | ,87       |   |
| 25   | Students shoving and scuffling with each other   | 2,85  | ,80       |   |
| 26   | Students disturbing their classmates   | 2,53  | ,85       |   |
| 27   | Students playing practical jokes on their friends  | 2,66  | ,90       |   |

**Table 4. (Continued).**

| Items  | Students misbehaviors and frequency of these behaviors that teachers face in the classroom | Frequency of and standard deviations of students misbehaviors |           |     |
|--|--|---|-----------|-----|
|  |  | N=450   | $\bar{x}$ | S   |
| 28   | Students sniping to their friends  |   | 2,77      | ,88 |
| 29   | Students reporting their friends   |   | 2,93      | ,93 |
| 30   | Students throwing paper, notes etc. at each other  |   | 2,34      | ,94 |
| 31   | Students acting sarcastic and derogatory to their friends                                  |   | 2,23      | ,86 |
| 32   | Students conducting behaviors, which disturb their friends                                 |   | 2,76      | ,76 |
| 33   | Students damaging their friends' belongings  |   | 2,34      | ,81 |
| <b>III- The Undesired Behaviors of Students Towards Teacher</b>                  |  |   |           |     |
| 34   | Students disrespecting towards teacher   |   | 1,93      | ,93 |
| 35   | Students disobeying teacher  |   | 1,68      | ,81 |
| 36   | Students showing verbal and behavioral reactions to their teacher                          |   | 1,86      | ,84 |
| 37   | Students laying down the law to teacher  |   | 1,94      | ,87 |
| 38   | Students criticizing teacher's lecturing method  |   | 1,65      | ,79 |
| 39   | Students making vulgar expression and behavior to teacher                                  |   | 1,49      | ,78 |
| 40   | Students conducting behaviors that will make teacher's lecturing difficult                 |   | 2,09      | ,92 |
| 41   | Unpleasant dialogues experienced among students and teachers                               |   | 1,91      | ,79 |
| 42   | Students not listening to teacher  |   | 2,46      | ,97 |
| <b>IV- The Undesired Behaviors Directed To The Violation of Discipline Rules</b> |  |   |           |     |
| 43   | Students cheating on exams   |   | 1,98      | ,91 |
| 44   | Students violating the rules formed about appearance                                       |   | 2,22      | 1,0 |
| 45   | Students using harmful substances such as smoking, drinking and drugs                      |   | 1,41      | ,81 |
| 46   | Students using cell phones in class  |   | 1,33      | ,73 |

When Table 4 is observed, it is seen that the misbehaviors of "students towards violating the education process" are respectively, "talking in the lesson without permission" ( $\bar{x}=2,79$ ), in the second rank "intervening their friends' speeches" ( $\bar{x}=2,73$ ), in the third rank "talking with their friends during lesson" ( $\bar{x}=2,68$ ). The misbehaviors of "students towards each other" are respectively, "student pushing each other" ( $\bar{x}=2,85$ ), in the second rank "sniping at each other" ( $\bar{x}=2,77$ ), in the third rank "disturbing each other" ( $\bar{x}=2,76$ ). The misbehaviors of "students towards teacher" are respectively; "not listening to his teacher" ( $\bar{x}=2,46$ ), in the second rank "performing behaviors which make teacher's having lesson difficult" ( $\bar{x}=2,09$ ), in the third rank "speaking with authority towards teacher" ( $\bar{x}=1,94$ ). The misbehaviors of "students towards violating discipline rules" are respectively, "disobeying rules of clothing" ( $\bar{x}=2,22$ ), in the second rank "cheating in the exam" ( $x=1,98$ ), in the third rank "smoking cigarette and using addictive drugs" ( $\bar{x}=1,41$ ).

2. Comparison of frequency level of student misbehavior according to gender with dimension. When Table 5 is observed, it is seen that there is a significant difference among frequency levels of student misbehaviors in the sense of gender in the fourth dimension of "misbehavior towards violating discipline rules" [ $t(448)=,84$ ;  $p<.05$ ]. Male teachers experience student misbehaviors towards violating discipline rules ( $\bar{x}=1,81$ ) more than female teachers ( $\bar{x}=01,67$ ). In other dimensions, there is no significant difference among

frequency levels of student misbehaviors in the sense of gender in the dimension of misbehavior towards violating discipline rules.

**Table 5. "t" test results about comparison of frequency level of student misbehavior according to gender with dimension**

| Dimensions                             | Variables (gender) | N   | $\bar{X}$ | S   | sd  | T    | P   |
|--|--------------------|-----|-----------|-----|-----|------|-----|
| I- Towards violating education process | Female             | 239 | 2,42      | ,69 | 448 | ,74  | ,46 |
|  | Male               | 211 | 2,47      | ,76 |     |      |     |
| II- Among students                     | Female             | 239 | 2,51      | ,68 | 448 | ,02  | ,99 |
|  | Male               | 211 | 2,51      | ,69 |     |      |     |
| III- Towards teacher                   | Female             | 239 | 1,84      | ,62 | 448 | 1,36 | ,18 |
|  | Male               | 211 | 1,93      | ,71 |     |      |     |
| IV-Towards violating discipline rules  | Female             | 239 | 1,67      | ,63 | 448 | 2,25 | ,03 |
|  | Male               | 211 | 1,81      | ,73 |     |      |     |
| Total                                  | Female             | 239 | 2,27      | ,59 | 448 | ,84  | ,40 |
|  | Male               | 211 | 2,32      | ,66 |     |      |     |

**Table 6. Results of variance analysis (Anova) about the frequency levels of student misbehaviors in the classroom according to the age of teachers.**

| Factor                                 | Variable (age)    | N   | $\bar{X}$ | S   | F     | P    | Difference (LSD) |
|--|-------------------|-----|-----------|-----|-------|------|------------------|
| I- Towards violating education process | (a) below 30      | 49  | 2,66      | ,79 | 3,114 | ,026 | (a)-(c)          |
|  | (b) between 30-40 | 157 | 2,51      | ,74 |       |      | (a)-(d)          |
|  | (c) between 41-50 | 188 | 2,35      | ,71 |       |      |                  |
|  | (d) above 51      | 56  | 2,37      | ,57 |       |      |                  |
|  | Total             | 450 | 2,44      | ,72 |       |      |                  |
| II- Among students                     | (a) below 30      | 49  | 2,75      | ,79 | 2,578 | ,053 | -                |
|  | (b) between 30-40 | 157 | 2,52      | ,67 |       |      |                  |
|  | (c) between 41-50 | 188 | 2,46      | ,66 |       |      |                  |
|  | (d) above 51      | 56  | 2,43      | ,66 |       |      |                  |
|  | Total             | 450 | 2,51      | ,68 |       |      |                  |
| III- Towards teacher                   | (a) below 30      | 49  | 2,23      | ,79 | 6,688 | ,000 | (a)-(b)          |
|  | (b) between 30-40 | 157 | 1,93      | ,69 |       |      | (a)-(c)          |
|  | (c) between 41-50 | 188 | 1,81      | ,60 |       |      | (a)-(d)          |
|  | (d) above 51      | 56  | 1,73      | ,54 |       |      |                  |
|  | Total             | 450 | 1,89      | ,67 |       |      |                  |
| IV-Towards violating discipline rules  | (a) below 30      | 49  | 1,88      | ,82 | 2,154 | ,093 | -                |
|  | (b) between 30-40 | 157 | 1,79      | ,73 |       |      |                  |
|  | (c) between 41-50 | 188 | 1,65      | ,60 |       |      |                  |
|  | (d) above 51      | 56  | 1,76      | ,65 |       |      |                  |
|  | Total             | 450 | 1,74      | ,68 |       |      |                  |
|  | (d) above 51      | 56  | 1,87      | ,82 |       |      |                  |
|  | Total             | 450 | 1,79      | ,73 |       |      |                  |
| Total                                  | (a) below 30      | 49  | 2,54      | ,72 | 4,001 | ,008 | (a)-(b)          |
|  | (b) between 30-40 | 157 | 2,33      | ,63 |       |      | (a)-(c)          |
|  | (c) between 41-50 | 188 | 2,22      | ,59 |       |      | (a)-(d)          |
|  | (d) above 51      | 56  | 2,21      | ,53 |       |      |                  |

|       |     |      |     |  |  |  |
|-------|-----|------|-----|--|--|--|
| Total | 450 | 2,29 | ,62 |  |  |  |
|-------|-----|------|-----|--|--|--|

3. Frequency levels of student misbehaviors in the classroom according to the age of teachers.

When the findings in Table 6 are observed, it is seen that there are significant differences in the sense of teachers' ages about the frequency of student misbehaviors [ $F(3-446)= 4,00$ ;  $p< .05$ ].

As a result of LSD test applied in order to find the age frequency of this significant difference, there are significant differences between teachers below the age of 30 and the frequency of student misbehavior in the third dimension (student misbehaviors towards teacher) and total dimension with all the teachers in other groups of age (b) between 30-40, (c) 41-50, (d) above 51. In the first dimension, the views of teacher who are below 30 upon the frequency of student misbehaviors are different from the views of teachers who are at the age of 41-50 and above 51. As it can be observed from Table 5 that the average of teachers who are below 30 is higher than that of all teachers in other dimensions. According to this, it is seen that teachers who are below 30 experience student misbehavior much more than others. This situation shows us that students feel freer to perform misbehaviors towards young teachers. The most frequent student misbehavior which is experienced by teachers below 30 are in the dimension of misbehavior of students towards each other ( $\bar{x}=2,75$ ) and towards violating the education process ( $\bar{x}=2,66$ ). When we regard the averages in total, it is seen that as the age group of teachers increases, frequency of student misbehaviors decreases.

4. Frequency levels of student misbehaviors in the classroom according to the seniority of teachers.

When the findings in Table 7 are observed, it is seen that there is a difference between the duration of educational service and frequency level of student misbehavior. [ $F(3-446)= 5,54$ ,  $p< .05$ ] There is a significant difference in the third and total dimension of misbehaviors towards the teacher between teachers who have less than 6 years of experience and teachers who have 16-24 years and 25 years and more experience. Similarly, this difference was found between teachers who have 6-15 years of experience and teachers who have 16-24 years and 25 years and more experience. According to this, it is seen that young teachers who have occupational experience up to 15 years are exposed to misbehavior towards the teacher when compared with other experienced teachers. When we consider in the sense of misbehaviors towards violating the education process, it is seen that teachers who do not have enough experience (less than 6 years and between 6-15 years) ( $\bar{x}=2,58$  and  $\bar{x}=2,61$ ) are exposed to misbehavior towards violating the education process more than teachers who have 25 years and more teaching experience. When we regard the averages in total, it is seen that as the level of seniority increases, frequency of student misbehaviors decreases.

5. Frequency levels of student misbehaviors in the classroom according to the branches of teachers.

When the findings in Table 8 are observed, it is seen that the views of teachers about the misbehavior of students show significant difference according to branches [ $F(2-447)= 28,93$ ;  $p< .05$ ]. According to this, there is a significant difference between classroom teacher and branch teachers at all dimensions when their views about the frequency level student misbehaviors are compared. As it can be observed in the table, the frequency level of student misbehavior experienced in the classroom by classroom teachers is more than branch

teachers. In other words, more student misbehaviors can be observed in the classes of branch teachers compared to classroom teachers.

**Table 7. Results of variance analysis (Anova) about the frequency levels of student misbehaviors in the classroom according to the seniority of teachers**

| FACTOR                                 | VARIABLE<br>(seniority) | N   | $\bar{x}$ | S   | F    | P    | Difference<br>(LSD)                      |
|--|-------------------------|-----|-----------|-----|------|------|--|
| I- Towards violating education process | (a) less than 6 years   | 43  | 2,58      | ,78 | 5,11 | ,002 | (a)-(d)<br>(b)-(d)                       |
|  | (b) 6-15 years          | 128 | 2,61      | ,78 |      |      |  |
|  | (c) 16-24 years         | 174 | 2,36      | ,70 |      |      |  |
|  | (d) 25 years and more   | 105 | 2,30      | ,61 |      |      |  |
|  | Total                   | 450 | 2,44      | ,72 |      |      |  |
| II- Among students                     | (a) less than 6 years   | 43  | 2,66      | ,80 | 2,60 | ,052 |  |
|  | (b) 6-15 years          | 128 | 2,60      | ,71 |      |      |  |
|  | (c) 16-24 years         | 174 | 2,48      | ,64 |      |      |  |
|  | (d) 25 years and more   | 105 | 2,39      | ,65 |      |      |  |
|  | Total                   | 450 | 2,51      | ,68 |      |      |  |
| III- Towards teacher                   | (a) less than 6 years   | 43  | 2,17      | ,77 | 8,73 | ,000 | (a)-(c)<br>(a)-(d)<br>(b)-(c)<br>(b)-(d) |
|  | (b) 6-15 years          | 128 | 2,05      | ,72 |      |      |  |
|  | (c) 16-24 years         | 174 | 1,82      | ,60 |      |      |  |
|  | (d) 25 years and more   | 105 | 1,70      | ,57 |      |      |  |
|  | Total                   | 450 | 1,89      | ,67 |      |      |  |
| IV-Towards violating discipline rules  | (a) less than 6 years   | 43  | 1,83      | ,77 | 4,62 | ,003 | (b)-(c)                                  |
|  | (b) 6-15 years          | 128 | 1,89      | ,77 |      |      |  |
|  | (c) 16-24 years         | 174 | 1,60      | ,57 |      |      |  |
|  | (d) 25 years and more   | 105 | 1,73      | ,68 |      |      |  |
|  | Total                   | 450 | 1,74      | ,68 |      |      |  |
| Total                                  | (a) less than 6 years   | 43  | 2,46      | ,72 | 5,54 | ,001 | (a)-(c)<br>(a)-(d)<br>(b)-(c)<br>(b)-(d) |
|  | (b) 6-15 years          | 128 | 2,44      | ,67 |      |      |  |
|  | (c) 16-24 years         | 174 | 2,23      | ,58 |      |      |  |
|  | (d) 25 years and more   | 105 | 2,16      | ,55 |      |      |  |
|  | Total                   | 450 | 2,29      | ,62 |      |      |  |

When the averages are considered in the sense of dimensions, while average of misbehavior towards violating education process is ( $\bar{x}=2,88$ ) it is 2,77 for branch teachers. The frequency level of student misbehaviors towards each other is more for branch teachers ( $\bar{x}=2,79$ ) than classroom teachers ( $\bar{x}=2,39$ ). The frequency level of student misbehaviors towards the teacher is more for branch teachers ( $\bar{x}=2,19$ ) than classroom teachers ( $\bar{x}=1,74$ ). Generally, branch teachers are exposed to misbehaviors ( $\bar{x}=2,61$ ) more than classroom teachers ( $\bar{x}=2,15$ ) and pre-school teachers ( $\bar{x}=2,31$ ).

There is a significant difference in the dimensions of behaviors of students towards each other and violation of discipline rules between branch teachers and pre-school teachers. According to this, branch teachers are exposed to student misbehaviors more than pre-school teachers. The most important reason of this is that branch teachers have more classes compared to other teachers and therefore have less information about the students. While both classroom teachers and pre-school teachers have but one class, branch teachers have many. In addition to this, since pre-school and classroom teachers regard the classes as their own, they are integrated with their classes and are more sensitive towards the problems of their classes. These teachers spend more time with their students and this has a positive effect on students.

**Table 8. Results of variance analysis (Anova) about the frequency levels of student misbehaviors in the classroom according to the branches of teachers.**

| Factor                                 | Variable<br>(Branch)       | N   | $\bar{X}$ | S   | F     | P    | Difference<br>(LSD) |
|--|----------------------------|-----|-----------|-----|-------|------|---------------------|
| I- Towards violating education process | (a)classroom teacher*      | 298 | 2,28      | ,65 | 17,31 | ,000 | (a)-(b)             |
|  | (b)Branch teacher**        | 139 | 2,77      | ,77 |       |      |                     |
|  | (c)Pre-school teacher. *** | 13  | 2,57      | ,65 |       |      |                     |
|  | Total                      | 450 | 2,44      | ,72 |       |      |                     |
| II- Among students                     | (a)classroom teacher       | 298 | 2,39      | ,60 | 17,31 | ,000 | (a)-(b)<br>(c)-(b)  |
|  | (b)Branch teacher          | 139 | 2,79      | ,76 |       |      |                     |
|  | (c)Pre-school teacher.     | 13  | 2,39      | ,55 |       |      |                     |
|  | Total                      | 450 | 2,51      | ,68 |       |      |                     |
| III- Towards teacher                   | (a)classroom teacher       | 298 | 1,74      | ,56 | 24,82 | ,000 | (a)-(b)             |
|  | (b)Branch teacher          | 139 | 2,19      | ,76 |       |      |                     |
|  | (c)Pre-school teacher.     | 13  | 2,03      | ,63 |       |      |                     |
|  | Total                      | 450 | 1,89      | ,67 |       |      |                     |
| IV-Towards violating discipline rules  | (a)classroom teacher       | 298 | 1,55      | ,53 | 44,58 | ,000 | (c)-(b)<br>(a)-(b)  |
|  | (b)Branch teacher          | 139 | 2,15      | ,75 |       |      |                     |
|  | (c)Pre-school teacher.     | 13  | 1,48      | ,99 |       |      |                     |
|  | Total                      | 450 | 1,74      | ,68 |       |      |                     |
| Total                                  | (a)classroom teacher       | 298 | 2,15      | ,53 | 28,93 | ,000 | (a)-(b)             |
|  | (b)Branch teacher          | 139 | 2,61      | ,68 |       |      |                     |
|  | (c)Pre-school teacher      | 13  | 2,31      | ,59 |       |      |                     |
|  | Total                      | 450 | 2,29      | ,62 |       |      |                     |

\*Teacher who is responsible for the classroom and gives all cultural courses to 7-11 age group.

\*\*Specific branch teachers of students at 7-14 age group.

\*\*\*Teacher who gives education to students getting ready for elementary school at the age of 6.

## 6. Frequency levels of student misbehaviors in the classroom according to the technical means of class.

When Table 9 is observed, it is seen that there is a significant difference between technical means in the classroom and the frequency of student misbehaviors. [ $F(2-447)= 7,31$ ;  $p< .05$ ] When the averages are considered, it is seen that as the technical means of classroom increases frequency of student misbehavior decreases. There is a significant difference in the sense of student misbehaviors between classes with good technical means and poor technical means in all dimensions. Moreover, there is a significant difference in the sense of student misbehavior between classes with poor and mediocre technical means in the dimension of students' behavior towards teacher. In the dimension of behaviors towards violating discipline rules, there is a significant difference in the sense of student misbehavior between classes with mediocre and good technical means.

**Table 9. Results of variance analysis (Anova) about the frequency levels of student misbehaviors in the classroom according to the technical means of class.**

| FACTOR                                 | VARIABLES (technical means of class) | N   | $\bar{X}$ | S   | F      | P    | Difference (Scheffe) |
|--|--------------------------------------|-----|-----------|-----|--------|------|----------------------|
| I- Towards violating education process | (a) poor                             | 128 | 2,57      | ,71 | 4,847  | ,008 | (a)-(c)              |
|  | (b) mediocre                         | 159 | 2,46      | ,74 |        |      |                      |
|  | (c) good                             | 163 | 2,31      | ,68 |        |      |                      |
|  | Total                                | 450 | 2,44      | ,72 |        |      |                      |
| II- Among students                     | (a) poor                             | 128 | 2,64      | ,73 | 4,153  | ,016 | (a)-(c)              |
|  | (b) mediocre                         | 159 | 2,51      | ,65 |        |      |                      |
|  | (c) good                             | 163 | 2,40      | ,65 |        |      |                      |
|  | Total                                | 450 | 2,51      | ,68 |        |      |                      |
| III- Towards teacher                   | (a) poor                             | 128 | 2,08      | ,75 | 9,377  | ,000 | (a)-(c)<br>(a)-(b)   |
|  | (b) mediocre                         | 159 | 1,86      | ,63 |        |      |                      |
|  | (c) good                             | 163 | 1,75      | ,58 |        |      |                      |
|  | Total                                | 450 | 1,88      | ,66 |        |      |                      |
| IV-Towards violating discipline rules  | (a) poor                             | 128 | 1,93      | ,73 | 13,922 | ,000 | (a)-(c)<br>(b)-(c)   |
|  | (b) mediocre                         | 159 | 1,79      | ,72 |        |      |                      |
|  | (c) good                             | 163 | 1,53      | ,53 |        |      |                      |
|  | Total                                | 450 | 1,73      | ,68 |        |      |                      |
| Total                                  | (a) poor                             | 128 | 2,44      | ,65 | 7,306  | ,001 | (a)-(c)              |
|  | (b) mediocre                         | 159 | 2,30      | ,62 |        |      |                      |
|  | (c) good                             | 163 | 2,16      | ,56 |        |      |                      |
|  | Total                                | 450 | 2,29      | ,62 |        |      |                      |

## CONCLUSION

It was detected that the most frequent student misbehaviors experienced by the teachers is in the dimension of “students’ misbehavior towards each other”. It was seen that the second most frequent student misbehavior experienced by the teachers is in the dimension of “misbehavior towards violating the education process”; students having communication with each other freely and their being numerous may cause increase in misbehaviors. Moreover, physical closeness of students, covering their behaviors or thinking that teacher would not see it or thinking that they will not complain of each other can be effective in the increase of misbehaviors. That the most frequent misbehavior in this field is “pushing each other and sniping to each other” comply with the reasons listed above. Misbehaviors towards the education process, as Finger and Bomford (2006), are regarded as the behaviors which student do in order to draw attention. According to them, these are the behaviors which, in fact, are not too bad but irritate the class and generally cause discomfort for other students.

The most frequent behaviors of “students towards each other” were detected as “pushing each other”, “sniping”, and “irritating friends”. The most frequent behavior in the dimension of “misbehaviors towards violating education process” was determined as “speaking without permission”, “disturbing others’ speeches”, “talking with friends around in the class”. The most frequent behavior in the dimension of “students’ misbehavior towards teacher” was determined as “not listening to teacher”, “performing behaviors that make the course difficult”, “speaking with authority towards teacher”. The most frequent behaviors in the

dimension of “misbehavior towards violating discipline rules” was determined as “disobeying clothing rules”, “cheating in the exam”, “smoking or using addictive drugs”.

There is a significant difference between frequency levels of student misbehaviors towards violating discipline rules experienced by female and male teachers. Male teachers are exposed to more misbehavior compared to female teachers in this sense.

There is a significant difference in the sense of the frequency level of student misbehaviors experienced by young teachers below 30 when compared with all the other age groups in all other dimensions. When we regard the total averages, it is seen that as the age group of teachers increases, the frequency of misbehaviors decrease. According to this, it can be said that as the gap between teacher and students increases, the authority of teachers in class become more and more respected.

In the sense of service years, there is a significant difference in the frequency level of student misbehaviors according to service years. When we consider the dimensions, it can be said that these misbehaviors are experienced in the dimensions of misbehavior towards violating the education process, towards teacher, towards violating discipline rules. Generally regarding, it is seen that as the seniority of teachers increase, student misbehaviors decrease. These findings confirm the hypothesis that teacher's success is not only composed of academic success but only can give good results when it is accompanied with experience. The teacher who combines his occupational knowledge with experience knows his students better, himself better, and is more advantageous in choosing the most suitable method in providing classroom management and discipline. The most important point is that with occupational experience, the teacher increases his skills in classroom management. According to the study of Kayikci (2009), it was detected that as the skills of teachers in classroom management increase, discipline problems and student misbehaviors decrease.

There is a significant difference between frequency levels of student misbehaviors according to branches in the sense of dimensions. According to this, there is significant difference between branch teachers and classroom teachers in all dimensions. Frequency levels of student misbehaviors experienced by classroom teachers are lower than branch teachers. the most important reasons of this is that branch teachers have too many classes, have a distributed responsibility and give only one or two hours of course to each group in a week. Classroom teachers know their students better and therefore have authority on them since they, contrary to branch teachers, have courses at specific hours of the week only in their own class (which is only one class).

There is a significant difference between frequency levels of student misbehaviors and technical means of the classroom. When we consider the averages, it is seen that as the technical means of the classroom increase student misbehaviors decrease. There is a significant difference in the sense of student misbehaviors between classes with good technical means and poor technical means in all dimensions. As education technology develops, the opportunity of participating in the courses and more sense organs would be addressed. As technology develops, it would become easier to use modern education techniques and methods with students. Moreover, much as technology is used, it would become easier to have lessons according to multiple intelligence and both the motivation and participation of students would increase. Naturally, as motivation and participation increase, student misbehavior would decrease.

**APPENDIX:**  
**DIMENSIONS AND FACTOR LOADINGS OF THE QUESTIONNAIRE**

**Dimensions and Factor Loadings Pertaining To Students' Undesired Behaviors**

|   |  | 1 <sup>st</sup><br>Dim. | 2 <sup>nd</sup><br>Dim. | 3 <sup>rd</sup><br>Dim. | 4 <sup>th</sup><br>Dim. |
|---|--|-------------------------|-------------------------|-------------------------|-------------------------|
| <b>I- Student Behaviors Aimed at Disrupting the Teaching Process</b>      |  |                         |                         |                         |                         |
| 1   | Students making noise in lessons   | ,770                    |                         |                         |                         |
| 2   | Students talking with other students around them   | ,755                    |                         |                         |                         |
| 3   | Students interrupting while others are talking   | ,752                    |                         |                         |                         |
| 4   | Students conducting behaviors that will disrupt the course of lesson                                     | ,728                    |                         |                         |                         |
| 5   | Students paying attention to irrelevant (extracurricular) activities in classroom                        | ,712                    |                         |                         |                         |
| 6   | Students disrupting classroom environment with arbitrary behaviors                                       | ,698                    |                         |                         |                         |
| 7   | Students not following or listening to the lesson  | ,691                    |                         |                         |                         |
| 8   | The indifference of students towards the lesson  | ,690                    |                         |                         |                         |
| 9   | Students not bringing class-related equipments   | ,677                    |                         |                         |                         |
| 10  | Students polluting the classroom and his/her environment   | ,651                    |                         |                         |                         |
| 11  | Students taking a walk or changing their places in classroom without permission                          | ,649                    |                         |                         |                         |
| 12  | Students not doing the activity that they need to do in classroom  | ,649                    |                         |                         |                         |
| 13  | Students disrupting the lesson with irrelevant topics  | ,639                    |                         |                         |                         |
| 14  | Students talking in class without taking the floor   | ,612                    |                         |                         |                         |
| 15  | Students not cooperating with their group in group activities  | ,607                    |                         |                         |                         |
| 16  | Students not participating in class  | ,606                    |                         |                         |                         |
| 17  | Students not abiding by in-class rules   | ,595                    |                         |                         |                         |
| 18  | Students drawing and writing something on the fixed-asset inventories of school (desk, table, wall etc.) | ,452                    |                         |                         |                         |
| <b>II-The Undesired Behaviors of Students Directed Towards Each Other</b> |  |                         |                         |                         |                         |
| 19  | Students resorting to brute force towards their friends  | ,751                    |                         |                         |                         |
| 20  | Students speaking vulgar language towards their friends  | ,747                    |                         |                         |                         |
| 21  | Students fighting with each other  | ,744                    |                         |                         |                         |
| 22  | Students swearing and cursing to each other  | ,723                    |                         |                         |                         |
| 23  | Students disrespecting their friends with their expressions and behaviors                                | ,686                    |                         |                         |                         |
| 24  | Students hurting their friends' feelings with their expressions and behaviors                            | ,685                    |                         |                         |                         |
| 25  | Students shoving and scuffling with each other   | ,680                    |                         |                         |                         |
| 26  | Students disturbing their classmates   | ,664                    |                         |                         |                         |
| 27  | Students playing practical jokes on their friends  | ,637                    |                         |                         |                         |
| 28  | Students sniping to their friends  | ,636                    |                         |                         |                         |
| 29  | Students reporting their friends   | ,635                    |                         |                         |                         |
| 30  | Students throwing paper, notes etc. at each other  | ,635                    |                         |                         |                         |
| 31  | Students acting sarcastic and derogatory to their friends  | ,631                    |                         |                         |                         |
| 32  | Students conducting behaviors which disturb their friends  | ,566                    |                         |                         |                         |
| 33  | Students damaging their friends' belongings  | ,545                    |                         |                         |                         |

|  |  |  |      |  |
|--|--|--|------|--|
| III- The Undesired Behaviors of Students Towards Teacher                 |  |  |      |  |
| 34   | Students disrespect towards teacher  |  | ,766 |  |
| 35   | Students disobeying teacher  |  | ,762 |  |
| 36   | Students showing verbal and behavioral reactions to their teacher          |  | ,736 |  |
| 37   | Students laying down the law to teacher                                    |  | ,682 |  |
| 38   | Students criticizing teacher's lecturing method                            |  | ,661 |  |
| 39   | Students making vulgar expression and behavior to teacher                  |  | ,641 |  |
| 40   | Students conducting behaviors that will make teacher's lecturing difficult |  | ,638 |  |
| 41   | Unpleasant dialogues experienced among students and teachers               |  | ,637 |  |
| 42   | Students not listening to teacher  |  | ,598 |  |
| IV-The Undesired Behaviors Directed To The Violation of Discipline Rules |  |  |      |  |
| 43   | Students cheating in exams   |  | ,656 |  |
| 44   | Students violating the rules formed about appearance                       |  | ,640 |  |
| 45   | Students using harmful substances such as smoking, drinking and drugs      |  | ,593 |  |
| 46   | Students using cell phones in class  |  | ,489 |  |

## REFERENCES

- Admiraal, W. F., Fred. A. J. & Wubbels. T. (2000). Effects of student teachers' coping behavior. *British journal of educational psychology*.70. pp. 33-52
- Allen, P. K. (2010). Classroom management, bullying, and teacher practices. *The Professional educator*. Vol.34. No.1.
- Aydin, A. (2007). *Sınıf yönetimi*. [Classroom management]. Ankara. Tekagac yayını.
- Basar, H. (2008). *Sınıf yönetimi*. [Classroom management] Ankara: Anı yayıncılık. 14. Bası.
- Brophy, J. E.& Mc Caslin, (1992). Teachers' reports of how they perceive and cope with problem students. *Elementary school journal* Vol:93, pp. 13-68.
- Brophy, J. (1988)Educating teachers about managing classroom and students. *Teaching and Teacher education.vol 4, nr.1 (1-18)*.
- Cameron, R. J. (1998). School discipline in the United Kingdom: Promoting classroom behavior which encourages effective teaching and learning. *School Psychology Review*, 27, 33-44.
- Celep, C. (2002). *Sınıf yönetimi ve disiplini*. [Classroom management and discipline] Anı yayıncılık.Antalya. 2. baskı.
- Celik, V.(2005). *Sınıf yönetimi*. [Classroom management] Ankara: Nobel yayınları. 3. baskı
- Charles, C. M. (2000). *The synergistic classroom*. Boston: Allyn and Bacon
- Charles, C. M. (2005). *Building classroom discipline*. Collaboration by Gail W. Senter. Boston. 8th ed.
- Churchward, B. (2003). Discipline by design: The honor level system. [www.Honorlevel.com](http://www.Honorlevel.com).
- Conroy, M. A., Davis, C. A., Fox, J. J. & Brown,W. H. (2002). Functional assessment of behavior and effective supports for young children with challenging behaviors. *Assessment for effective intervention* Vol.27, No.4, 35-47.
- Crocker, L. M. & Algina, J. (1986). *Introduction to classical and modern test theory*. New York: Holt, Rinehart and Winston.

- Croll, P., & Moses, D. (1985). *One in five. The assessment and incidence of special educational needs*. London: Routledge & Kegan Paul.
- Cummings, C. (2000). *Winning strategies for classroom management*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Curwin, R. & Mendler, A. (1988). *Discipline with dignity*. Alexandria, VA Association for supervision and curriculum development.
- Davis, B. G. (1993) *Tools for teaching*. San Francisco:Jossey- Bass.
- Ding, M., Li, Y., Li, X., & Kulm, G. (2008). Chinese teachers' perceptions of students' classroom misbehaviors. *Educational Psychology*, 28, 305 - 324.
- Ding, M., Li, Y., Li, X & Kulm, G. (2010). Chinese teachers'attributions and coping strategies for student classroom misbehavior *Asia Pacific Journal of Education* Vol. 30, No. 3, September 2010, 321-337
- Edwards, C.H, (1997). *Classroom discipline and management*. Printic hall, Inc. New Jersey
- Elrod, w.T. & Terrel, S.M.(1991). Schools without Corporal Punishment: There are alternatives . *Contemporary Education.vol62. nr.3* (188-193)
- Emmer, E.T. (1991). Once more with feeling: Teacher emotion and the discipline and management functions. *Contemporary Education. Vol62.Nr.3* 167-173.
- Finger, J. & Bamford, B. (2006) *The classroom teacher's book of management essentials.sinif yönetimi stratejileri öğretmen kılavuzu Turgut Karaköse (çeviri Ed)*. Çev: öğrenci davranışlarının yönetimi- Yahya Altinkurt, Yücel şimşek. Nobel Yayınevi Ankara.Australia.
- Finger, J., & Bamford, B. (2006). *The classroom teacher's book of management essentials*. Brisbane: Australian Council for Educational Leaders with Fernfawn Publications.
- Gordon, T. (1974). TET. Teacher effectiveness training.New York: Peter H. Wyden.
- Guardino, C. A. & Fullerton, E. (2010). Changing behaviors by changing the classroom environment. *Teaching exceptional children*. Vol.42, No. 6, pp. 8-13
- Houghton, S., Wheldall, K., & Merrett, F. (1988). Classroom behavior problems which secondary school teachers say they find most troublesome. *British Educational Research Journal*, 14, 297 - 312.
- Jones, V & Jones, L. (2004). *Comprehensive Classroom Management*. Boston: Pearson Education Inc.
- Kagan. S., Kyle, P. & Scot, P. (2004). *Win-win discipline*. San clemente, CA: Kagan publishing.
- Kaplan, A., Gheen, M. & Midgley, C. (2002). Classroom goal structure and student disruptive behavior . *British Journal of Educational Psychology*, 72, 191-211.
- Karip, E. (2003). *Sinif yönetimi. [Classroom management]*pegem yayincılık.Ankara.
- Kayikci, K. (2011). Sinif ici ogretim etkinliklerinin yönetimi.[*Managing Teaching Activities in Classroom*] In R.Sarpkaya (ed). *Sinif Yönetimi.[Classroom management]*(pp. 213- 255). Ankara: İhtiyaç Yayıncılık.
- Kayikci, K. (2009). The Effect of Classroom Management Skills of Elementary School Teachers on Undesirable Discipline Behavior of Students. *Procedia - Social and Behavioral Sciences*, 1(1), 2009, p.1215-1225.
- Kounin,J. S. (1970). *Discipline and group management in the classroom* . Holt , Rineholt and WinstonInc. Ne- York.
- Larrivee. B. (2005). *Authentic classroom management. Creating a learning community and building refl active practice*. Boston, MA: Pearson education.

- Lemlech, J. K. (1988). *Classroom management*. Longman, inc. Second ed. New York.
- Marzano, R. J. (With Marzano, j. S. & Pickering, D. J.) (2003). *Classroom management that works*. Alexandria, VA:ASCD.
- Marzano, R. J. & Marzano, J. (2003). The key to classroom management. Building classroom relationships. *Educational leadership*. Vol.61, pp. 6-13.
- Meyers, S. A. (2003). Strategies to prevent and reduce conflict in college classrooms. *College Teaching*. Vol. 51, No.3. pp. 94-98.
- Miller, A. (1995). *Teachers' attributions of causality, control and responsibility in respect of difficult pupil behavior and its successful management* *Educational Psychology*, 15, 457-471.
- Miller, A., Ferguson, E. & Moore, E. (2002). Parents' and pupils' causal attributions for difficult classroom behavior. *British Journal of Educational Psychology* 72. 27-40
- Nansel, T. R., Overpeck, M., Pila, R. S. Ruan, W. J. , Simmons- Morton, B & Sccheidt, P. (2001). Bullying behaviors among US youth: Prevalence and association with psychosocial adjustment. *Journal of the American Medical Association*, 285. 2094-2100
- Neale M. N and Liebert, R.M. 1980) *Science and behavior: an introduction to method of Research*. London: Prentice- Hall International, Inc.
- Nelsen, J. , Lott, L. ,& Glenn. H. (2000). *Positive discipline in the classroom*. Rocklin. CA:Prima. Revised editions,
- Nunnally, J. C. (1978). *Psychometric theory*. 2.nd edition. New York : Mc Graw -Hill.
- Palardy, J. M. & Palardy, T.J. (2001). Classroom Discipline: Prevention and intervention strategies. *Education*. Vol.108.No:1. 87-92
- Rich.J. M. (1991). Should students be punished? *Contemporary Education*.Vol.62. Nr.3. (180-184).
- Sabancı, A. (2009). Sinif yönetiminin temelleri.[The Essentials of classroom management]. In M.Çelikten(ed) *Yapilandirmaci yaklasima gore sinif yönetimi*.[classroom management aspects constructivism] (pp. 27-51) Ankara: Anı yayincılık.2.bası
- Salend, S.J.; C. Whittaker; E. Reeder.(1993) Group evaluation:A Collaborative Peer-mediated Behavior management System. *Exceptional Children* vol59, nr.3. (203-209).
- Saritas, M. (2000). Sinif yönetimi ve disiplinle ilgili kurallar gelistirme ve uygulama.L.Kucukahmet (Eds.) *sinif yönetiminde yeni yaklasimlar*. [New approaches in classroom management].Ankara. (47-89).
- Scherer, R. F. , Wiebe, F. A. , Luther D.C., Adams. J. S. (1988). "Dimensionality of Coping: Factor Stability Using the Ways of Coping Questionnaire. *Psychology Reports*. 62, 763-770.
- Seidman, A. (2005). The learning killer: Disruptive student behavior in the classroom. *Reading Improvement*. V 42 n1. Project Innovation, Inc., P.O. Box 8508, Spring Hill Station, Mobile, AL 36689-0508. Web site: <http://journals825.home.Mindspring.com/csj.html>.
- Soodak, L.C. (2003). Classroom management in inclusive settings. *Theory into practice*, Vol. 42, No:4, Taylor & Francis, Ltd. <http://www.jstor.org/stable/1477396>
- Tavşancıl, E. (2006). *Tutumların ölçülmesi ve SPSS ile veri analizi*. [Measuring attitudes and Data analysis with SPSS]. Ankara: Nobel Yayınlari. 3. Baskı.

- Tierno, M.J. (1991). Responding to the socially-motivated behaviors of adolescents: Recommendations for classroom management. *Adolescence*. Vol26.nr.103.
- Türnükü, A., Zoraloglu, Y.& Gemici, Y. (2001). İlköğretim okullarında okul yönetimine yansıyan disiplin sorunları.[Discipline problems which reflect school management of elementry school]. *Kuram ve uygulamada eğitim yönetimi.Educational administration-theory and practice*.
- Wright, J. A., & Dusek, J. B. (1998). Compiling school base rates for disruptive behaviors from student disciplinary referral data. *School Psychology Review*, 27 , 138-147.



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