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Aims and Scope

The Journal on Efficiency and Responsibility in Education and Science aims to publish perspectives of authors dealing with issues of efficiency and/or responsibility in education and related scientific disciplines. The focus is on topics such as:

- theory and methodology of pedagogy and education;
- theory and methodology of science;
- human resources and human relations management;
- knowledge management and knowledge engineering;
- systems engineering and information engineering;
- quantitative methods.

The journal accepts quantitative, qualitative and experience-based full research papers, short communications or review studies. Applications and case studies introducing and describing impacts of new theoretical approaches in real conditions of practical case are also accepted.

All papers passed a double-blind peer review process.

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USING CLASSROOM ASSESSMENT TECHNIQUES(CATS) AND DIARY KEEPING IN TEACHER TRAINING

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Abstract

This study describes the use of classroom assessment techniques and diaries as a reflection technique in the 3rd class students of English Language Teaching Department in Buca Faculty of Education. The outcome of this study suggests that the inclusion of learners in the learning-teaching process through the use of CATs(classroom asssessment techniques) provides teachers-in-preparation with access to important information about the learning process,their own teaching styles,teaching materials and activities they use and the importance of affective factors in teaching a foreign language.There were 33 3rd class students,each tutoring a learner they themselves chose.During the five-week period ,each practiced teaching one hour a week and each week they applied a different CAT to their learners to get feedback on their own teaching and learners´ learning.Totally 11 different CATs were used and learners´ ages were beetween 10 to 41. After each lesson and after getting CAT results they kept diaries as a self-reflection and evaluated themselves, their teaching and their drawbacks during the lessons.All of their reflections were collected under18 main headings.After their reports on CAT results and their diary entries were collected ,they informed that they found their learners´ CAT results very valuable to develop their way of teaching, and keeping diaries was invaluable for them to have a cool and objective look at their own teaching practice. It was hoped that trainee teachers would apply the information they get from CATs and their diaries to their lesson planning to reflect on their teaching and students´ learning and to make necessary changes in their teaching styles and in this way to develop their teaching to bring about more effective student learning.

Key Words

Self-assessment, diary keeping,teacher training

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Introduction

The role of learners in the process of teacher training is potentially dynamic and the direct involvement of learners in the training process can help teachers-in-preparation develop an awarenes about the learners´ ideas and perceptions of the teaching /learning process.As Cray and Currie (in Gray1998:29) have suggested, "Learners have ideas about such issues as the role of the classroom in language learning, the function of the teacher and the appropriateness and relevance of various teaching practices."

In her case study of the use of learner diaries at the British Language Centre in Madrid, Burke suggested that "the more learners are listened to, the more the trainers are likely to experience a genuinely effective teaching encounter"(in Gray,1998:30).

Classroom Assessment, which is a major component of classroom research, involves both teachers and students in the ongoing monitoring of students´ learning.The data obtained from CATs can be very useful for improving learning and teaching in various ways.For example, it provides teachers with feedback about their effectiveness as teachers and analyze themselves objectively and it enables students to measure their own progress as learners(in Enerson,2007:1).CATs help teachers to get useful feedback on what, how much and how well their students are learning, and furthermore they can provide early feedback about students´ learning at inital or intermediate levels so teachers can modify their teaching to make students´ learning more effective when it is less than satisfactory.The more you know about what and how students are learning, the more effectively you can plan learning activities to structure your teaching.These techniques are simple,anonymous, non-graded, in-class activities. CATs are formative evaluation methods which involve giving learners useful advice rather than marks or grades and comparing a learner´s attainment over time rather than with other learners´ attainments.

In Zekeriya Nartgün´s research(2010:113) he tried to examine the effect of CATs instruction in a Research Techniques Course on students´ competency levels and he also tried to show whether or not CATs used in the Research Techniques Course contributes to students´ learning within the framework of students´ opinions.The results revealed that students´competency levels of research techniques in the experiment group (instructed through CATs) are significantly higher than those of the students in the control group(instructed without these techniques) For teachers,frequent use of CATs can;

- provide feedback about day-to-day learning/ teaching process when it is still likely to make mid-course changes.
- provide useful information about what students have learned without preparing exams and checking papers.
- help to develop a good relation with students and encourage them to understand that teaching and learning are continuous processes that require full participation.

For students, the use of CATs can;

- help them to become better monitors of their learning and increase their ability to think critically about the lesson content.
- point out where they need to change study skills.
- help to reduce feelings of isolation.
- show that their teacher really cares about their success(in Angelo and Cross, 2011:1).

The primary goal of using CATs is to better understand students learning and in this way to improve teaching.

A diary study, "is a first-person account of a language learning or teaching experience, documented through regular , candid entries in a personal journal and then analyzed for recurring patterns or salient events"(in Bailey,1990:215).

Diary studies in language research and pedagogy have been used to document language learning experiences ,student-teachers´ reactions to academic courses, and language teaching experience(in Bailey,1990:215).In this study the third one was used.

Diary writing is a procedure which is becoming a valuable tool for developing critical reflection.In diary keeping participants keep a regular account of learning or teaching experiences,which may be used as a basis for a later reflection. In writing for reflections, observations should be focussed on a specific aspect of teaching, that is, keeping the problem "small" is important.Records may be short or lenghty depending on participants´ time and inclination to write.The aim is to raise the consciousness of teachers-in-preparation about their teaching. (in Barlett,1990:210)

The main point in diary writing is that these entries must be candid if the diarist wants to get benefit from them.Teachers or trainee teachers must feel free to reflect, criticize, express frustration and raise questions in their diaries.Otherwise, its benefists will be minimized .It is also important to support reflective comments in the entries with examples from class sessions.A diarist has commented on the advantages of conducting a diary study "…Keeping a diary helped me very much in clarifying my thoughts and feelings about learning and my way of handling problems that came forth from doing real learning."(in Bailey,1990:224).

Katleen Bailey used the diary study with her graduate students in the practicum which is the course in which the graduate students complete a teaching practice.The resulting diaries have focused on issues such as lesson planning, time management, creativity, classroom control, group work and difficult teacher-student relations (in Bailey,1990:217).According to Katleen Bailey diaries are often very useful for teachers-in preparation both in generating behavioral changes and in developing self-confidence.

This study tries to show that the use of CATs and diary keeping will help teachers-in –preparations to learn more about their teaching styles, problems and their students´ learning process, and in this way to develop their way of teaching and make necessary changes to cause more effective learning.

Material and Methods

33 3rd class students of English Language Teaching Department in Buca Faculty of Education tutored a learner they themselves chose for five weeks. During this period, each practiced teaching one hour a week and each week they applied a different CAT to their learners to get feedback on their own teaching and learners´ learning.Totally 11 different CATs were applied, and the learners´ ages were beetween 10 to 41(10x2,11,12,14x3,15x2, 16,18x2,19x2, 20x9,21x4,22x2,23,25,30,41). After each lesson and after getting CATs results, they kept diaries as a self-reflection and evaluated themselves, their teaching and drawbacks during the lessons.All their reflections were collected under 18 main headings.

11 Classroom Assessment Techniques which were used are the followings:

1.One-Minute Paper:(32 students used it)During the last few minutes of the class period,ask students to write " the most important thing I learned today and what I understood least."

2.Muddiest Point:(26 students)Only ask students to describe what they didn´t understand and what they think might help.

3.Application Cards:(20 students)During the last fifteen minutes of the class period after teaching an important principle,rule or procedure, ask students to write down at least one real-world application of what they have learned to find out how well they can transfer their learning.

4.One-Sentence Summary:(16 students)Students summarize knowledge of a topic by constructing a single sentence.

5.Chain Notes:(8 students)Pass around an envelope with a question about the class content.Each student writes a short answer, puts it in the envelope and passes it on.However, because they had only one student they were tutoring, they wrote a question on a piece of paper and left the student alone to answer it.

6.Memory-Matrix:(7 students)Students fill in cells of a two-dimensional diagram for which the teacher has provided labels.

7.Suggestion Box:(6 students)Put a box near the classroom door and ask students to leave notes about any class issue.

8.Student-Generated Test Questions:(4 students)Allow students to write test questions and model answers.This will give students the opportunity to evaluate the course content, reflect on what they have understood and what good test items are.

9.Exam Evaluations:(2 students)Select a test and add a few questions at the end which ask students to evaluate how well the test measures their knowledge and skills.

10.Directed Paraphrasing:(1 student)Ask students to paraphrase something they have learned to their partner to assess their ability to comprehend.

11.Student Rep Group:(1 student)On a regular basis discuss with the students how the course is progressing, what they are learning and suggestions for improving the course.

Results

Analysis of Teachers-in-preparation's Diary Entries about CATs Results

After the five-week period, their diary entries about CATs results ,their own teaching and the learning process were collected. Trainee teachers´ comments and reflections covered a wide range of areas, which were collected under 18 main headings:

1.Maximizing Student Speaking Time:About allocating students more time to speak ,here are teachers-in-preparations´ reflections after getting CATs results;

- I should have encouraged my student to speak during the activities.
- I should have had more speaking practices.
- I have realized that I need to create more meanigful and communicative activities.
- After my 2nd lesson, I have noticed that I should maximize the use of the target language to make the student speak.
- In my 3rd lesson I realized that I talked more than my student and later paid attention not to talk too much and not to interrupt my student while he was doing exercises.

2.Teaching Vocabulary Items:The followings are their reflections about vocabulary teaching:

- I realized that by playing games my student could memorize vocabulary items more easily.

- I should have used some flash cards to give the meaning of vocabulary items.
- I need to make lessons more challenging by using harder vocabulary items.
- In "the muddiest point" my student wanted me to teach new vocabulary items in context and choose frequently used ones.
- Most of them think they should give some real world activities after introducing new vocabulary items.
- I should revise all the vocabulary items before starting a new lesson.

3.Teaching Grammar:

- I had some difficulties in teaching regular/irregular verbs in the simple past tense so I should learn how to teach them more effectively.
- Activities were too mechanical .I should develop my student´s creative thinking ability.
- I decided to teach grammatical structures in a text to make lessons more meaningful.
- I used inductive teaching in which the student found out the rules in the examples, which was very enjoyable for the student.
- After my student´s suggestion in the "Suggestion Box", I taught rules first and then examples, which was what my student wanted.
- As a result of "Suggestion Box", I first gave lots of examples and then grammar rules, which worked best for my student.
- I should have taught more simply and provided my student with more examples.
- I realized that when I compared two tenses, the student got them better and from this time onwards I have decided to use this technique.
- After trying to teach two tenses in one lesson and after my student´s getting bored and losing concentration, I have learned that I must teach one subject in one lesson.
- I have found out that a ten-year old child doesn´t learn in the same way as adults do.Children don´t need a lot of grammar rules but need to be active during the lesson.

4.Time Management:

- Most of them informed that their time management should have been better and they should have organized lessons more carefully.They couldn´t apply their lesson plans properly, and one class hour wasn´t enough for the lessons they prepared.
- During my 3rd lesson, I observed that I had some problems with time management while doing the activities.
- I need to develop my time management skills
- After my lessons I have realized that I should use my time more effectively.

5.Creating a Fun and Warm Atmosphere and Using Interesting Topics:

- I should have played the games in the middle of the lesson to motivate students rather than at the end of the lesson.
- As a result of the student´s CATs result, I have found out that I have to find more interesting texts.

Most of them have found out that if students are interested in the topic, they want to join in the discussion so they have decided to choose topics attracting students´ attention.

- I need to use fun to keep my student alert.

- That my student enjoys the lesson is the most important thing for me, which also helped my student to enhance her self-esteem.

Most of them have realized that after 20 minutes students get bored so in order to make lessons more enjoyable they should use a variety of activities.

- I realized that my student lost concentration after a while so I decided to choose more appealing topics for my student.
- In order to get the student´s attention and to make the lesson more enjoyable, I have discovered that I should use pictures, videos, colorful cards,etc.
- As a result of "Suggestion Box" I have learned that the reading topic wasn´t interesting for the student so I started to ask what topics he liked.
- Using dialogues made the lesson more attractive and the student was more active and competent in the lesson.

6.Exercises:

- I should prepare more speaking and vocabulary activities
- I should have prepared a worksheet before the lesson.
- I should have prepared more examples and exercices to make the subject clear.
- I have found out that the student wants to use various kinds of drills, not the same kinds.

7.Using Videos,Pictures and Other Visual Aids:

- According to "Memory Matrix" results, I should use different materials such as maps, pictures, the internet,etc. to make the student understand more.
- In my 3rd lesson I used colorful charts and pictures, which was highly effective in the student learning.
- I used songs and in my opinion songs are invaluable sources of learning and memorizing something.
- I decided to use videos more frequently as a result of "Suggestion Box".
- Using coloured pencils is important if you are teaching small children.

8.Being a Model and Having Responsibility:

In general, they informed that their students take them as a model, which makes them feel confident and they feel their responsibility and influence on their students.

- As a result of "Chain Notes"I have learned that my student wants to learn more about the language, and I think, I must be a guide for him to develop his English.
- I have understood that becoming a teacher requires responsibility.
- I´m afraid of teaching something wrong and this feeling helps me to improve myself.
- I have really understood that my dearest wish is to become a teacher.
- How difficult it is to fix pronunciation errors. I have realized that I should be a perfect model for pronunciation because the student imitates my pronunciation.

9.Assigning Homework and Revising:

- After seeing that the student could remember 3 words out of 14,I decided to assign homework to make the student study.
- I should have checked the assignment .
- After discovering the student didn´t revise, I decided to give homework.

- I have realized the importance of revision of the previous lesson before beginning a new one.

10.Students´ Level and Pace:

- I assumed that the student has understood everything and never forgets them but in the worksheet I have noticed the student´s mistakes and understood that I should take my student´s level more into consideration.
- I should have planned my lesson according to the student´s pace.
- I couldn´t decide whether the exercises were appropriate for my student´s level or not.
- Trying to decide my student´s level was difficult for me.

11.Assuming Students Know A Lot:

- I spoke as if the student knew every word I uttered.
- I should never assume that the student knows a lot of English.
- I shouldn´t assume that the student already knows about the topic.

12.Teaching Style:

- All of them agree that lessons are getting much better day by day, which strenghtens their self-confidence and self-esteem.They have also decided to change their teaching styles as a result of CATs results.
- I have experienced that I can teach English and my student has learned something from me.
- After my lessons I have realized that teaching isn´t as easy as I thought and I have some problems with pronunciation.
- I think there is a long way to take to develop my teaching techniques and communication ways.
- After my 3rd lesson I felt to be more successful because my student and I got used to each other´s learning and teaching styles.
- I have realized that my teaching skills have been improving day by day.
- After the 4th lesson,I have realized that I should always think how I could teach differently.
- I need to develop my teaching strategies and to be always energetic and relaxed.

13.Feeling Successful:

- After seeing that my student can prepare questions by using his knowledge of the Simple Past Tense, I felt successful.
- After "Application Cards" technique I saw that my student can express his ideas in real-life situations, which made me feel successful.
- As a result of "Application Cards" I have seen that the student has learned the structure, which made me happy.
- I tried to teach the subject by using different techniques because I didnt want a teacher-centered lesson and I think that I am successful at achieving it.

14.Using the Target Language In the Classroom:

- When the lesson proceeds, I avoided using Turkish, which, I believe, will help to develop my student´s English.
- I used both Turkish and English to explain the topic.
- While explaining the meaning of new vocabulary items,I used simple English and I think the target language must be used in the classroom.
- I noticed that when my student asked the meaning of a new word,I said it directly in Turkish.I should have explained them by giving examples in English.

15.Being Patient:

- In my 3rd lesson I found out that I interfered too much when my student made a mistake, but later I made her find the mistake by herself.
- I must be more patient with the student´s mistakes.
- While the student was speaking, I shouldn´t have interrupted because she couldn´t remember what she was going to say.
- I need to give more time to my student to do the activities and need to learn to be more patient.
- I have found out that I must teach patiently and slowly.

16.Using Body Language:

- I used my body language and facial expressions,which my student liked a lot.The atmosphere was sincere.
- I used my body language in an exaggerated way,which facilitated my student´s understanding.

17.Preparation Before the Lesson:

- I tried to have my first lesson without preparation and had some difficultles in finding examples while explaining grammar.
- I didn´t find my 1st lesson so beneficial because I wasn´t fully prepared for it.

18.Student´s Health Problems and Emotional Conditions:

- In my 4th lesson I couldn´t stick to my lesson plan due to my student´s tiredness and illness and understood that sometimes I had to change my plans and had to be flexible.
- I have learned that health problems can distract students´ concentration even if I am ready to teach.

Discussion

This study attemted to investigate that the inclusion of learners´ opinions through the CATs and the use of diary keeping as a reflection technique in the 3rd class students of English Language Teaching Department in Buca Faculty of Education will greatly help teachers-in-preparation to understand and analyze their teching practice, teaching styles, some problems they face with while teaching and their students „ ideas about the effectiveness of teaching and learning process.

After the five-week period of time ,teachers-in-preparations´ diary entries about CATs results and teaching and learning process were gathered under 18 main headings.About time management,for example, most of them stated that they should have organized their lessons more carefully. About using interesting topics most of them have found out that if students are interested in the topic, they want to join in the lesson so the have decided to select topics getting students´ attention. Moreover they have realized that after twenty minutes students get bored so they should use a different variety of activities to make lessons more enjoyable.They also stated that their students´ taking them as a model makes them feel confident. Lastly, as a result of CATs they have decided to change their teaching styles.

After the study completed, teachers-in-preparations stated that they found their students´ CATs results very valuable to develop their way of teaching and students´ learning. In the same way, keeping a diary helped them to have an objective look at their own teaching practice.

Conclusion

It can be stated that the opportunity teachers-in-preparation get to access the information about the learning process, their own teaching styles, teaching materials and activities they use and the importance of affective factors in teaching a foreign language through CATs and their own diary results will enable them to plan more effective lessons and modify their teaching according to learners´ needs and feedback.

It is hoped that when these trainee teachers become real classroom teachers, they will understand the importance of learners´ being involved in the teaching/ learning process and using diaries to reflect on their own teaching, and through which they will make necessary changes and improve themselves as teachers to bring about more effective student learning because teaching and learning is an on going process.

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COMPANY TRAINING FROM THE EFFICIENCY AND EFFECTIVENESS POINT OF VIEW

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Abstract

The paper concentrates on the topic of efficiency and effectiveness of company training. This work has set research goals that were solved using the interrogation method, questionnaire technique and free interview. Goal No. 1 was to investigate the situation in the company training from the motivation aspect and stimulating education system requirements. Goal No. 2 was to determine the use of educational methods, forms of training from the point of view of their efficiency. Goal No. 3 was to investigate into the attitude toward company training evaluation and exploitation of the individual levels of educational process efficiency evaluation. As a resource for the training efficiency evaluation the authors used Kirkpatrick's 4-level Learning Evaluation Model extended with the ROI method. The research group consisted of a) HR managers / managers from the SME sectors, b) participants of these companies' training programmes. The most important requirements for an efficient stimulating educational system involve the conformity with the needs and goals of the company, linking with the performance system and accord with the needs of an individual. The research has shown that in certain educational methods and forms there occurs conformity between the frequency of their usage in practice and apprehension of their efficiency, e.g. the controlled discussion method and the direct group education form. In others, such as the practical example method and individual consultation form, their usage in practice is minimal, but there is a high apprehension rate of their efficiency. The efficiency evaluation is implemented mostly only on the 1st and 2nd level (the reaction level and learning level). However, in a responsible approach to the efficient use of financial means invested into the training process also a shift of evaluation on the 3rd and 4th level (transfer to the work-place level and business result level) and ROI are necessary.

Key Words

Company training, effectiveness, efficiency, responsibility, management, evaluation

Introduction

The effectiveness of a training process can be measured from several specific views and from its content. There are various theories and ways of classification according to different criteria. However, the most commonly used way is measuring the effectiveness in relation to an individual (i.e. course participant) and in relation to the organization ordering the course. Another one is measuring the pedagogical effectiveness (in which the area of objectives and results to be achieved by training is stressed) and measuring the economic effectiveness (the main focus being the field of financial and economic resources invested in the training and consequently its quantifiable benefit for the company). Training evaluation is defined as a systematic collection of information of descriptive and judgemental nature that is needed to produce effective decisions related to the selection, adoption, value, and modification of training intervention (Goldstein, 2002). Participant evaluations of tuition must to be reliable, valid, and accurate because they are often used for summarising evaluation decisions of high value about instructors, for example: promotion, tenure, and merit pay. These evaluations should therefore adequately assess the instruction efficiency and should not be biased by factors outside the control of the instructor. In general, participant evaluations of tuition are considered valid, reliable, and useful means for the evaluating of instructional effectiveness. (Marsh, Roche, 2000; Theall, Franklin, 2001). Some of these variables include content area, motivation of the participants, personality of the instructor, type of requirements demands put on the course, and method of presentation of the course. (Kelly, Ponton, Rovai, 2007). But evaluation has often been overlooked or not realised in its full extent. (Wang, Wilcox, 2006). One of the more common tools used often to evaluate training interventions is a survey (Bennett et al, 2003). Surveys can prove effective tools for data-capturing of potential results of training evaluation, such as acquired declarative knowledge, affective reactions of the participants, and their perceptions of the overall utility of the training. (Stoughton, 2011).

For the purpose of measuring the effectiveness and efficiency of the educational process within workplace training, it is possible to use many models which differ in their attitude to measuring the given effectiveness, one of them being The Workplace Training Evaluation (which includes the rules and techniques for measuring effectiveness of an educational process not only for teachers, but also for personnel officers and HR managers), the author of which is L. Rae (1999). The model of J. Sullivan (2008), defines five categories including several indicators. The categories are as follows: 1. „before the training“, 2. „at the end of the training“, 3. „postponed influence (outside workplace)“, 4. „the change in behaviour in workplace“, 5. “the change in work performance in workplace“. The DMADDI method (Define, Measure, Analyze, Design, Develop, Implement), published by K. A. Islam (2006) presents the maximization of business attitude to the creation of training programmes.

Kirkpatrick’s Four Levels of Evaluation is among the most frequently used models for effectiveness assessment. This model, in which training is assessed regardless of its form, methods and techniques applied in education, although used for several decades, has well stood the test of time. According to this model, the whole process starts with the connection between business and training, when the basis of all training is the use of a market opportunity, solution of a business problem and the development of human capital in order to achieve company’s goals. In 2009, the Kirpatrick‘s model was updated in relation to the preparation (analysis) before the actual start

of the training process with the following change of procedure – the preparation stage starts from level 4th with a clear definition of success (link to level 4th) and subsequently key behaviour (i.e. specific behaviour supporting the achievement of previously set objectives) and factors of success (i.e. processes and activities done by others, such as software programmes, teachers, coaches, other training participants etc.) (link to level 3rd). The aim of these factors is to encourage course participants to implement the gained knowledge and skills. This is followed by paying attention to competences, i.e. required knowledge, skills and behaviour necessary for the implementation of newly gained knowledge and skills (link to level 2nd). In the last stage the focus is the conditions (participant's preparedness, company culture, motivating and stimulating programmes etc.) under which the training will be delivered (link to level 1st) (Kirkpatrick, J. D., Kirkpatrick, W. K., 2010). When the plan for all four levels is set, the actual preparation of the training programme able to meet all the objectives and to achieve the results in adequate quality can follow. In order to guarantee sufficient efficiency of the training process, it is important that the course designers (in cooperation with a person in charge of training in the company) establish the tools and methods for assessing and measuring all the four levels.

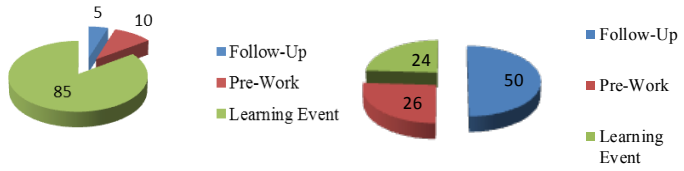

Figure 1: Typical Learning Investment (%)
Figure 2: Contribution to Learning Effectiveness (%)

The Figure 1 and Figure 2 show a situation presented in training - the time spent by developing training programmes and activities related to them and, on the other hand, which activities actually contribute to learning effectiveness of a given training. The data was collected by Dr. Brent Peterson from Columbia University in 2004 (Kirkpatrick, 2006). Although they do not present Czech workplace training conditions, it is possible to find similarities with the situation in the Czech Republic. Most time is dedicated to designing the structure of the training, its preparation and subsequent delivery despite the fact that this part can ensure the required effectiveness only to a very limited degree. Insufficient time is dedicated to the area, which seems to be crucial in achieving effective results, i.e. the area of behaviour and results (level 3rd – transfer to the work-place level and level 4th – business results level).

In the training process managers of individual levels of management play an important role. At the beginning, managers in most companies identify partial or complex educational needs, based on e.g. regular appraisals (which are mostly done every 6 months and less often every 3 months or once a year), or on discovering a certain deficiency (e.g. worse pro-client attitude, lower results of sales representatives etc.). This initial impulse to the need to run training comes either from the employees or their line managers. Afterwards, following the organization structure of a company, the suggestion goes through the approval process in which the final decision is usually made by the HR manager and personnel officer while assessing the needs, budget possibilities, as well as team and company goals and priorities for the given period.

The basic inputs for the identification of a deficiency, development needs and possibilities are individual needs (work performance and competence evaluation) and company needs

(business strategies with their aims and ways of achieving them). An example of the subjective methods of development needs identification is autofeedback (with these varieties: continuous key decisions analysis, retrospective feedback), the objective methods of identification include development needs identification by a superior (ideally following the can - knows - can do - wants pattern), Development Centre, development plan or 360° feedback. Benchmarking, Force Field Analysis and Development Centre are used for the purpose of company deficiencies and needs identification (Hroník, 2007).

Managerial work has certain characteristics, where directly related or related in a certain manner to the training are especially: *Conflict of the objectives* – the goals toward which the manager is heading in his direction tend to have a conflicting element in certain cases. The requirement of a maximum profit is not in accord with the requirement of an employee's maximum wage, at the same time the economic and educational objectives stand in opposition etc. The task of the manager is to find and ensure the balance of all objectives. *Responsibility for the results* – within the scope of his activities, the manager is not only responsible for the results of his work, but at the same time also for the results of work if his subordinates. It is necessary that he manages to find in time and at the same time promptly correct the errors in the process, or possibly eliminate their repetition in the future. He is responsible both for the success of the work entrusted to him and for the possible consequences of errors of his subordinates (Tureckiová, 2007). *Working with a risk* – the manager's work takes place in an uncertain and turbulent environment. The conditions of decision-making often change and what applied a short time ago need not necessarily apply now. The workload of situations that are unpredictable, and therefore cannot be included in the planning, always brings a certain part of the risk and uncertainty that the manager must hypothetically take into account and be ready for it, i.e. be able to adapt quickly and react flexibly. *Working through other people* – managerial work takes place in cooperation and through not only subordinates, but at the same time with equally or higher ranked colleagues, clients, suppliers etc. Success of the managerial work depends on the art of dealing with people, predict, create groundwork for decision-making and quality communication. This way the importance of teamwork significantly increases (Urban, 2003). *Determination of employees' needs* – knowledge of the employees' working objectives, their ambitions, sensitive work with the individual employees' personality types, determination of the individual needs related to their working rank and needs for training leading to an increase of their working competences. The true benefit not only to the individual, but also his company may be brought only by quality training. But how to define the quality of an educational product? Education has many different aspects, which can be evaluated and which at the same time have a different level of significance to their recipients (Müller, Myllyntaus, 2008). One of the many quality definitions says that both the creators and consumers of training and other services of an educational institution pronounce their ideas and expectations that should be fulfilled. If it is possible to prove in a suitably elected period of time that the expectations have been fulfilled, it is possible to speak about the achievement of quality adequate to it. The quality of education relates to the quality of the studies, to the quality of the whole educational process (Witzany, 2002).

Reaction measures and training motivation are the two areas that need to be further developed and researched. (Alvarez, Salas, 2004). Motivation has unsubstitutable influence upon the

efficiency of the implemented company training and upon the preferred ways of tuition.

Type of motivation to learning	Contents	Preferred kind of learning
Cognitive motivation	Learning new knowledge.	Concentration on new information, news.
Adaptation motivation	Being part of a certain group, cope with expectations set onto the given role by others.	Group learning, team collaboration with reception and confirmation of participants.
Motivation to assert oneself	Reaching a distinction, respect and performance deserving admiration.	Practice courses, contests, anything increasing effectiveness.
Motivation through self-affirmation	Discovery, specification of self-apprehension, self-acceptance and realization of one's capacities.	"Experience" and self-examination courses. Inter-connection of professional and personal development.
Existential motivation	Realization of transcendence. Having impersonal motivation and knowing "why".	Need to inter-connect the personal and corporate visions, learning in context.

Table 1: Relation between motivation to learning and preferred ways of learning (Hroník, 2007)

Material and Methods

For the purposes of this research investigation, also the area of soft skills and hard skills was included in the research study.

Within the scope of the questionnaire and consequently implemented interviews, the state of efficiency evaluation on the platform of Kirkpatrick's 4-level model was determined.

Level 4 - RESULTS	Key Question: Did the participant achieve the desired outcomes of the programme of learning? Data Sources: participants/employer/advisor surveys, focus groups, interview, previous data, concrete indicators. Timing: Usually done 3 months – 2 years after learning experience.
Level 3 - BEHAVIOUR	Key Question: Are the newly acquired skills, knowledge, or attitude being used by the learner after learning event is completed? Data Sources: Level 2 re-assessment, participants/employer/advisor surveys, focus groups, interview, previous data. Timing: Usually done 1 month – 3 months after learning.
Level 2 - LEARNING	Key Question: Did the participant achieve the desired learning objective(s)? Data Sources: tests, assignments, discussions Timing: Usually done immediately or soon after learning.
Level 1 - REACTION	Key Question: What was the participant reaction to the learning environment? Data Sources: participant surveys, focus groups, interviews, previous data. Timing: Usually done immediately or soon after the learning event(s).

Table 2: The Kirpatrick´s model (Wolf, P., Hill, A., Evers, F., 2006)

Due to the fact that the aforementioned model does not evaluate the financial assets gained from the implemented training, this "weakness" was removed by J. J. Philips by adding the 5th level,

on which the ROI (Return of Investment) method is applied, while the efficiency is evaluated on this level from the economic point-of-view. ROI = ((Total earnings – Costs) / Costs)*100 (Chapmann, 2009).

Objective and methodology of Part One of the research, characteristics of the research group and specifications of its selection

Objective No. 1 was to determine the situation in the company training from the point of view of motivation and requirements put on the stimulating educational system.

After obtaining the primary data for the purposes of this research investigation, the interrogation method was chosen - the self-constructed questionnaire technique using closed and semi-closed questions. To obtain further primary data, the free interview technique was used. The reason for the choosing of this exploration technique was the complementation of the necessary information to the problem under research.

The companies were chosen for the basic group from the accessible database of 890 organizations (SME) operating in the territory of the Czech Republic, creating a set of 296 organizations (including, according to the company category, 176 medium-sized, 120 small) through a systematic random selection. Questionnaires were sent to the chosen companies, while 157 filled-in questionnaires were returned. The return rate therefore amounted to 53%. During the processing it was necessary to discard 6 questionnaires due to their being incomplete. Therefore a total of 151 (SME: 87 medium-sized, 64 small) filled-in questionnaires were included in the research investigation. The collection of empirical data, continuous analysis and subsequent evaluation of the findings was implemented from 6/2011 to 10/2011.

The research group consisted (one respondent for each company, questionnaire – part I.) of 151 respondents, these being either personnel officers or HR managers or managers on the middle and higher level of company management from the SME (small and medium-sized companies) sector.

Objective and methodology of Part Two of the research, characteristics of the research group and specifications of its selection

Objective No. 2 was to determine the use of educational methods, forms of education from the point of their efficiency in company training.

To obtain primary data for the purposes of this research investigation, the interrogation method was chosen - the self-constructed questionnaire technique using closed and semi-closed questions, further also the free interview technique.

Data for the topic of educational methods representation were obtained from the personnel clerks or HR managers of the given companies.

Data for the topic of perception of the educational methods and forms in companies were obtained always from two persons in each company. One was a "superior" and the other a participant of the training (questionnaire – part II.). In the "superior" set there featured both direct superiors of the training participants, i.e. managers on all management levels, but also HR managers and personnel clerks, if the participant was a top manager. The reason why only HR managers and personnel clerks were not chosen, but other managers as well, was that the efficiency and effectiveness of the realized training can only be maximally perceived from the point of a direct superior of the training

participant as he has the possibility to evaluate the impact "at close range" and in an everyday contact.

The sets prevented the cross effect or duplicity in responses upon the given topic from different positions (categories) by eliminating the respondent, if he ticked the "Participant" category, not being able to respond in the "Superior" category.

The research group consisted of 151 personnel clerks, HR managers and managers on the middle and higher management level of the companies and 151 training participants. The process of questionnaire distribution, their return rate, empirical data collection schedule, analyses and subsequent evaluation is equal to the 1st part of the research.

Objective and methodology of Part Three of the research, characteristics of the research group and specifications of its selection

Objective No. 3 was to determine the attitude toward the evaluation of company training in companies and the usage of the individual levels of evaluation of the educational process efficiency.

To obtain primary data for the purposes of this research investigation, the interrogation method was chosen - the self-constructed questionnaire technique using closed and semi-closed questions, further also the free interview technique.

The research group was equal to that from the first part of the research. The process of questionnaire distribution, their return rate, empirical data collection schedule, analyses and subsequent evaluation is equal to the 1st part of the research.

Results

The companies that prove a sufficient level of responsibility and approach education as an investment for the given company, but also for the individual, have incorporated a system in their practice, which is immediately of significantly influence the individuals' attitude toward education and its subsequent maximum use for the company in accord with the company strategy. The importance of the requirements that should be considered in the creation of an efficient stimulating training system is the following (Figure 3): the accord with the needs and objectives of the company (stated by 94% of the respondents), further it is the correlation with the performance system (89%) and accord with the needs of an individual (82%). Smaller importance is predicated to a permanent experience exchange and knowledge among managers on the leading positions and key employees (76%), then to the provision of training to only a "selected group" of individuals (68%), which ensures its higher efficiency (i.e. not on an overall basis), and its adaptation to the capacities of the company (57%) and the individual (52%).

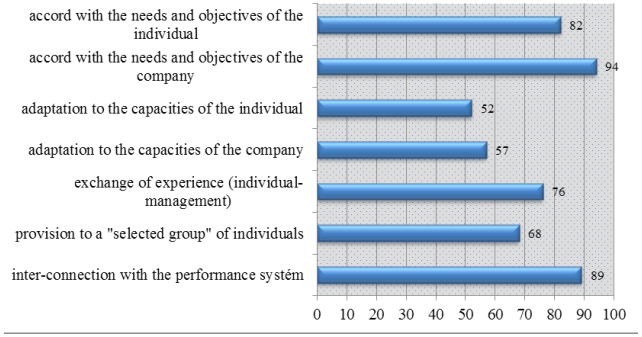

Figure 3: Requirements for the stimulating education system in companies (%)

The following Figure 4 shows a survey of representation and usage of educational methods within the scope of internal company training.

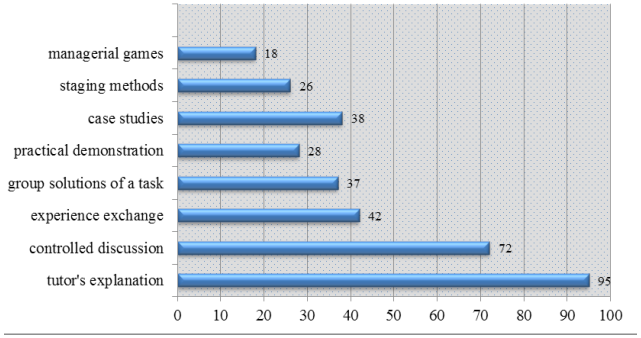

Figure 4: Representation of educational methods in company training (%)

To increase training efficiency and subsequent maximum use in its implementation in practice, various methods are used, which are applied in specific combinations within the scope of individual training seminars, modules etc. Their combination is determined not only by the choice of the lecturer of the relevant training, but also by the essence of the given training. That means: if it is a lecture, seminar, workshop, training etc.

The tutor's explanation is one of the most frequently used training methods (stated 95% of the respondents). It concerns mainly to the theoretical commentary of the lecturer with respect to the genesis of development and knowledge in the relevant area, supported by scientific findings and experience with the application in other organizations of similar orientation. Another very often used method in company training is a controlled discussion (72%), i.e. mutual exchange of knowledge and opinions on a solution of problems according to the recommended methodology under the lecturer's tuition. Exchange of experience (42%) among the participants-participants and participants-lecturer take place especially with the aid of brainstorming and exchange of experience with its results. In group solutions of a task (37%) the participants in smaller groups solve tasks, which are subsequently presented and feedback is mutually exchanged among the groups, which is complemented with the lecturer's experience. The practical demonstration (28%) uses a presentation of the application of theoretical findings in practice with the citation of pros and cons, both in the course of implementation and in the full functionality of the given methodology. Within the scope of case studies (which are used in the practice of the company training in 38%) specific problems are solved by the participants using the presented methodology and theory discussed. Participants of the training are involved in the whole evaluation, give each other feedback and together they formulate the optimum solution. The lecturer functions in the role of an anchorman, at the same time providing feedback in the course of the session and then at its very end. Other interactive methods used within the scope of the company education are staging methods (26%), in which the participants play roles in defined topics and the attitude and approach to the topics of the individual participants are then evaluated in the groups and at the same time their learning ability is evaluated, and furthermore there are management games (18%) where the participants get involved in the pre-defined situations and take up fictitious managerial roles and responding responsibilities.

The data of the following figure will get us acquainted with the way the individual educational methods are perceived from

the point of their effectiveness, both from the perspective of the training participants and of the direct superiors of the training participants (in case of a participant – top manager then from the point of view of the company's HR manager).

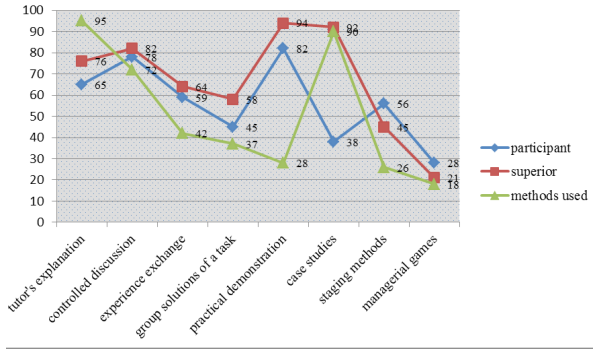

Figure 5: Efficiency of educational methods in company training (%)

As the Figure 5 shows, the participants consider the case study (92%) the most efficient educational method, then to an almost equal extent the practical demonstration (82%) and the controlled discussion (78%). In the practical demonstration and case study we can see a significant imbalance in the minimal usage of these educational methods in training (in the practical demonstration 28% and in the case study 38%) in relation toward their efficiency rate, which is awarded to them by the training participants as well as their superiors (in the practical demonstration 94%, in the case study 90%). The apprehension of efficiency in the individual educational methods is in a relative accord between the training participants and their superiors. Management games were seen as less efficient methods (participants: 28%, superiors: 21%). The experience exchange (participants: 59%, superiors: 64%), staging methods (participants: 56%, superiors: 45%) and group solutions of a task (participants: 45%, superiors: 58%) ended up on the middle level.

From the point of company training, it is also interesting to see the comparison of the most often educational forms as well as the evaluation of their efficiency by the training participants and direct superiors of these participants, or by HR managers (Figure 6). Most often represented, with the whole 100%, is the direct group tuition, it means that in the companies of all investigated respondents this form of education is being realised. At the same time, it efficiency rate is seen very high by both the participants (where 91% respondents put is as highly effective) and the superiors (95% respondents). The second most often used form is the direct group consultations (40%), the efficiency of which is indicated by 65% of the participants and 71% of the superiors. E-learning is used in company training only in 22%, and its efficiency is seen on a rather low level, i.e. by 15% of the training participants and 10% of their superiors. A significant disproportion can be recorded in the direct individual consultation (used in 15%, but its efficiency is appreciated by 95% of the participants and 89% superiors), and the electronic individual consultation (used by 10%, efficiency in participants 74%, in superiors 65%).

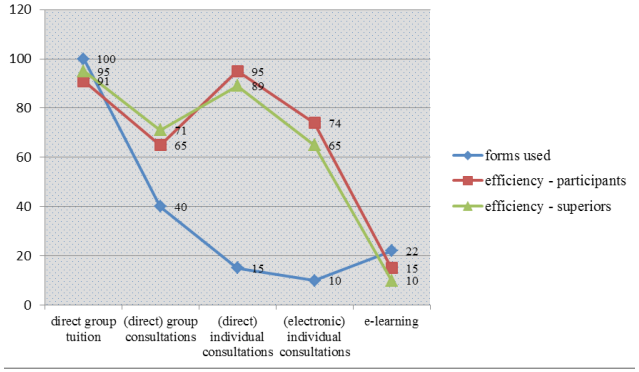

Figure 6: Education forms their efficiency evaluation used (%)

In another figure (Figure 7) there are results recorded from the area of approach and attitude in the companies toward the evaluation of the education realised. In a majority of the companies, the training evaluation is carried out. But it is only on the 1st level, i.e. reaction (71%), less so on the 2nd level – learning (32%). Minimal attention is paid to the 3rd level – behaviour (10%) and 4th level – results (7%). Only in 5% the financial benefits are compared with the costs invested, i.e. ROI (Return of Investment). The evaluation in carried out in 9% of the companies and in 20% of the companies not, but they are considering introducing the training events evaluation.

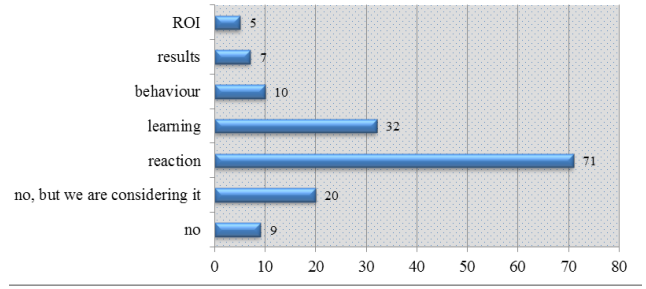

Figure 7: Attitudes toward evaluation of training in companies (%)

Discussion

To secure the efficiency of the company training it is necessary to implement important requirements in the stimulating training system, which will be especially the accord with the needs and objectives of the company, inter-connection with the performance system and accord with the needs of an individual.

Training fulfils also its unsubstitutable function in the motivation area. However it requires a sensitive attitude of the HR manager or manager of the individual teams in the sense of sufficient communication and clarification of the reasons for the implementation of a long-term educational programme, project or short-term courses, and the expected benefits both for the company, team/department, and the individual as such. In this point there dwells the essential meaning which influences not only how actively or passively an individual will approach the training, but also how the newly acquired knowledge will subsequently applied in practice, i.e. the exploitability rate of the investment into the training in the direct operation of the company. If an individual correctly understands the significance and justness of the education, he will adopt an attitude toward

the educational process with a necessary and desirable level of self-motivation.

In the companies where training is approached systematically and strategically (i.e. in accord and with the aim to reach the marked objectives on the level of functional strategies issuing from the corporate strategy), the training is perceived by the individuals as a means for the reaching of their goals, development of abilities, professional growth and improvement of working performance. Therefore, his feeling of solidarity is supported, as well as the feeling of importance within the company, his loyalty is incited and his highest need of self-realization satisfied (Maslow's hierarchy of needs, Maslow 2011). According to Drucker (2008) only a company, which follows the way of increasing innovation and productivity of all its key resources, is capable of succeeding in the hard competitive environment. And it is exactly the educated, efficient and capable who are motivated, but mainly self-motivated, to identify their goals with the corporate goals play a decisive role in every company. Therefore it is highly important to set the company motivation policy correctly and use suitably educational means for the sustenance and development of the human potential. An obvious necessity is, especially in key employees, the sufficient knowledge of their capacities, abilities, ambition, means for the fulfilling of their self-realization and talent development. This is ensured e.g. by means of the regular evaluation interviews, providing feedback etc. Within the scope of the research investigation there resulted from the interviews that some companies use sophisticated metrics and investigation with which they are able to identify the objective state of working satisfaction, motivation and loyalty of their employees. That is e.g. the TRI*M ™ system the results of which can be: TRI*M index (satisfaction and motivation rate), TRI*M grid (analysis of strengths and weaknesses) and TRI*M typology (classification of employees). Satisfied and motivated employees represent an essential element for the satisfaction and loyalty of customers, and those represent the potential for the acceleration of revenues and profit of the company.

Within the scope of the results of the partial outputs of the research investigation we could get acquainted with the perception of efficiency of the individual educational methods that are used in company training, and at the same time also with the perception of efficiency of the educational forms. Within the scope of the realized interviews, there resulted what was in fact perceived as "efficient" by the individual participants and their superiors. That means especially a clear impact of the newly acquired knowledge and skills on the participants' practice providing that certain types of training (especially in the soft skills area) era expected to be almost immediately reflected in the change of attitude, behaviour, ways of communication etc., in certain types of training (especially in the hard skills area) it is accepted that efficiency of the training manifests itself only with a certain time gap. Another efficiency criterion stated was: contents of training in accord with the participants' needs; correctly chosen methods and forms ensuring a maximum absorption of the training supplied; active attitude and mutual interaction between the participants and the tutor as well as among the participants. Through the questionnaire research it was verified that in some training methods and forms there occurs conformity between the occurrence of their usage in practice and perception of their efficiency ("+" controlled discussion ((i.e. high amount of application in practice and high apprehension of efficiency)), "-" management games ((i.e. low amount of practice and low apprehension of efficiency)); "+" direct group training, "-" e-learning). Misbalance, on the

contrary, occurred in the case of the practical demonstration method and case study and the form of direct individual consultation and electronic individual consultation, which are used in practice to a lower scale, but the rate of their efficiency perception is relatively high.

The attitude toward evaluation clearly shows that after the implementation of a company training the competent persons responsible for education, i.e. mainly HR managers of personnel clerks, realise mostly evaluation on the 1st and 2nd level of Kirkpatrick's model. On the 1st level (stated 71% of respondents) there is the realization of the reaction, response of the participants to the training obtained, their satisfaction with the education. It is carried out immediately after the completion of the training, either by the lecturers themselves, who pass the evaluation over (often with their own comments) to the persons in the company who are responsible for education. at the same time, this record serves for the evaluation of the lecturer's performance in the objective seminar, relevance of the contents, validity of the chosen methods and forms of tuition, tempo etc., both for himself and for the training institution where he is a member of the lecturing staff. The filled in questionnaires further serve both for the needs of the commissioner on different management levels in relation toward the participants and for the needs of the supplier for a possible modification of the training and securing of maximum quality of the services provided. Sometimes the setting of a so-called consultation system is used in practice, in which there occur possible modifications of the training content structure in the course of the project, namely on the basis of a prompt evaluation of feedback in the form of the aforementioned questionnaires. Criteria are acquired from this 1st evaluation level (reaction level), which are e.g.: relevance, contribution, professional attractiveness etc. On this evaluation level, however, the company receives, said in a simplified manner, only the information if the participants liked the given training and how much, but not with respect to its efficiency. But the justness of the evaluation of the 1st level dwells on the acquisition of feedback for the following measures in the relation to an increase of the training programme's quality.

On the 2nd level of Kirkpatrick's model (learning level) the evaluation is realised in 32% of the respondents. It concerns to the verification of the extent to which the training participants gained the necessary and expected knowledge and skills, or possibly attitudes thanks to the participation in the given training. This evaluation takes place in the cooperation of the persons with the training participants' direct superior who is capable of determine and define what is the key knowledge and skills important ant in relation to the team and corporate objective. As results from the realised interviews, the evaluation of the rate and scope of the knowledge and skills acquired takes place by way of tests and quizzes. In a smaller extent then, individual or group presentation of the problem solved is presented, or a demonstration of conduct (e.g. communication with a customer, sales skills etc.). The evaluation may take place both on the formal level, informative on the lecturer's side; there are also (in fact to a minimal extent) used form of self-evaluation and group or team evaluation. In practice the usage of a form of not only the single shot test became useful, but also variants of a "pre-test and re-test", when the identification of knowledge is effectuated at the beginning of the course and then in approximately 3 – 7 days (to measure long-term memory). The tests (occupations, specific, professional, didactic etc.) tend to be written, but according to preferences of the commissioner, tests in electronic form are also used.

On the next level, i.e. 3rd – (behaviour, transfer to the work-place level) there already occurs evaluation of the effect of the training, i.e. what values and specific real results were reached in the company by the implementation. Yet this effectiveness and efficiency evaluation level is only used in practice by only 10% of the respondents. But it is a fundamental area in which the evaluation concerns to what new work habits have been reached, in what way the working competence of the training participant has increased, to what extent the contents of the training are used, how the changes are demonstrated directly in the workplace. As shown in the performed research, by means of the interview technique, the companies who implement this evaluation level use especially the focus groups technique (goal-oriented discussion groups), individual structured interviews and observations. Another applied technique, but only to a minimal extent, is the behavioural interview.

Although the 4th level of evaluation is very important in relation to the detection of the true effect of the educational process on the company from the point of increase of results or e.g. improvement of organizational processes, this evaluation is brought into effect only in a narrow number of cases (7%). Nevertheless, it is here where the companies can ascertain whether the training, which the y organised for their management or staff, brought the necessary productivity, efficiency and therefore also a higher profit rate. The companies that carry out the evaluation on this 4th level gain two basic categories of data – hard data (which is for instance a number of sold products, services, number of products manufactured, time necessary to produce a certain component, etc.) and at the same time soft data (internal company communication of higher quality, decrease of absence rate, increase of loyalty, etc.)

ROI – Return of Investment is evaluated only in v 5%. This number is alarming, especially at the time when must companies, due to the impact of the economic recession, still very sensitively select into what, why and with what objectives and expectations their financial means will be invested. In the Czech practice the ROI method has not found its place yet and the companies are mostly satisfied with a "mere" filling-in of questionnaires after the termination of the event, which is something little demanding of time and energy. The reason can be, rather than a certain amount of conservatism, the way of financial resources. Due to a high support of education in the EU, the companies have a possibility to draw financial means from the European social fund by way of subsidy from the individual operational programmes (Human resources and employment OP, Education for competitiveness OP etc.). Within the scope of the monitoring reports requirements therefore only questionnaires are filled in involving satisfaction with the training, its contents, instructor's presentation, enrichment with new knowledge etc. From the financial point of view, for the purposes of the monitoring reports, the approved amounts spent in the individual sections are observed, not the return of investment. And due to the fact that these means are not spent by the company directly, it is not possible to expect a higher initiative in relation to the evaluation of return of investment in education.

From the point of view of the training programme efficiency, it is possible to see also the advantages and disadvantages resting in the composition of the group, i.e. if it is a homogenous or heterogeneous composition of participants from the point of view of their ranking and management level. In the homogenous composition, the advantages are seen in the fact that the group knows its own problems and therefore it is capable of going

into detail in the given area; further, that the group is capable of a "quality" communication – when the fact that they are on an equal ranking level is a prediction operator for the willingness to share more openly and communicate the given problem. The disadvantage then dwells in the single-sided view of things. If the training takes place in a heterogeneous group of participants, advantages can be seen in the sharing of experience and view of the given problem from different angles; furthermore, that the prediction of "learning" the quality cooperation and understanding of specific problems of "the other party". The disadvantages dwell in the fact that the participants sometimes are not "able" and willing to communicate and discuss openly.

Conclusion

The presented paper solves a problem of effectiveness and efficiency of training in companies. The research has shown what important elements can be used in the motivating and stimulating programmes to increase the training efficiency, furthermore also the perception of effectiveness of the individual training methods and forms of education in comparison with their application in practice, and also what the situation is regarding the evaluation of training efficiency in companies. One of the basic company tasks is the valorisation of the entrusted property and creation of conditions for the return of investment. The return of investment is also one of the key characteristics of the economic behaviour of the organization. Employee training is always an investment from the company's point of view. It is an investment of time and consequently always a financial investment too. This investment must have its return rate and efficiency. The responsibility of companies rests in an efficient treatment of financial means invested into the educational process. Therefore it shows indispensable that the practice in companies when only the first two levels are evaluated (i.e. the reaction level and learning level) moved two levels higher and the transfer to the work-place level, business result level and ROI were evaluated too. The measuring of the return of investment and efficiency of training is therefore not only useful, but it is also a direct prerequisite. It is a prerequisite of creation of training plans, conceiving of educational strategies or composition of specific educational programmes. Through education it is possible to gain a number of benefits, the most significant ones involving a higher performance rate, productivity and competences of the employee, more efficient team work, adaptability and readiness of the company for changes, improvement of the internal company communication, increase of competitiveness through a more effective involvement of the employees, quality relations with customers/clients and a more efficient reaching of goals set by the company strategy. If the training is approached with regard to the needs of the individuals and the company at the same time, it is a significant motivating and indispensable tool in the human resources management in accordance with the set company objectives of both short-term and long-term nature.

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MENTAL SHIFT TOWARDS SYSTEMS THINKING SKILLS IN COMPUTER SCIENCE

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Abstract

When seeking solutions to current problems in the field of computer science – and other fields – we encounter situations where traditional approaches no longer bring the desired results. Our cognitive skills also limit the implementation of reliable mental simulation within the basic set of relations. The world around us is becoming more complex and mutually interdependent, and this is reflected in the demands on computer support. Thus, in today's education and science in the field of computer science and all other disciplines and areas of life need to address the issue of the paradigm shift, which is generally accepted by experts. The goal of the paper is to present the systems thinking that facilitates and extends the understanding of the world through relations and linkages. Moreover, the paper introduces the essence of systems thinking and the possibilities to achieve mental a shift toward systems thinking skills. At the same time, the link between systems thinking and functional literacy is presented.

We adopted the "Bathtub Test" from the variety of systems thinking tests that allow people to assess the understanding of basic systemic concepts, in order to assess the level of systems thinking. University students (potential information managers) were the examined subjects of the examination of systems thinking that was conducted over a longer time period and whose aim was to determine the status of systems thinking. . The paper demonstrates that some pedagogical concepts and activities, in our case the subject of System Dynamics that leads to the appropriate integration of systems thinking in education. There is some evidence that basic knowledge of system dynamics and systems thinking principles will affect students, and their thinking will contribute to an improved approach to solving problems of computer science both in theory and practice.

Key Words

Paradigm, systems thinking, information manager, bathtub test, system dynamics, functional literacy

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Introduction

Today's world is automatically drawn together in the pursuit of information society, knowledge society or e-society, among others, but also in the experienced changes of the social paradigm that affects all disciplines and areas of life.

The aim of this paper is to contribute to the expert multidisciplinary discussion and provide some impulses for reflections on the question whether it is already time to shift the paradigm in education and science, while emphasizing the area of information technology education. Our feeling is that the so-called hard science, particularly natural sciences, is profoundly changing its approach to knowledge and understanding of objective reality. We want to highlight the need to respond to the changing situation of today's world in social science disciplines as well, especially in computer science. We focus on the need for global thinking necessary for understanding today's problems. To achieve this goal we are transforming the current framework of thinking into a systems thinking framework. We would like to put forth the general principles on which the ability of systems thinking is based, with options to achieve a mental shift towards systems thinking skills.

Various approaches are used for education in the field of informatics (see Turcani, M., Kapusta, J., 2008). Our research question that is answered in the paper deals with the degree of systems thinking of future information managers (currently students). Information management is shown by Doucek and Novotny (2007) as activities focused on managing of all information assets used by an enterprise. We performed a long-term research; its aim was to determine the overall status of systems thinking of the students (potential information managers) and to find out whether it is possible to positively influence their abilities. Measuring systems thinking skills of the students is included in the objectives of the System Dynamics course at the University of Economics in Prague (VSE). These tests are presented to students in two stages: at the beginning of the semester, before any systems thinking and any system dynamics principles were discussed, and then at the end of the semester after completing the System Dynamics course. Thus we administered the tasks twice, and compared the outcomes to test the hypothesis that following a course on system dynamics would improve the basic system thinking skills of our students.

Our research was carried out in last five years, between 2007 and 2011 (Exnarova, Dalihod and Mildeova, 2011). As regards the target group of students involved in research: study participants were 386 undergraduate students[1] with specialization Information Management in the University of Economics, Prague, enrolled on an System Dynamics course (almost in seven study semester). Approximately a quarter of them were female and three-fourths of them were male.

This study that is based on our original research on the grounds of testing. The paper summarizes and enlarges results of long time systematic work of the author's collective. Classical methods of research are applied, including induction and deduction; survey and basic statistical analysis of collected data and information (advanced statistical techniques weren't applied); the Synected Gordon method for comparing domestic and international results; synthesis towards a generalization of results and contribution to pedagogical process. Thus, both empirical and theoretical approaches are applied during the paper's evolution.

The globally well-known and widely used bathtub test ("Bathtub Dynamics") (Sweeney and Sterman, 2000) was chosen

1 This number is relatively height in comparison with similar researches by using the Bathtub test abroad.

as the basic method of research. The name Bathtub Test comes not just from the title of one of the tasks, but it originates from the basic principle of systems thinking and system dynamics, which is the resolution of stocks and flows. Stocks and flows serve as a basis for dynamic systems. The Bathtub Test and within mostly The task of flow of money within the framework of the Bathtub Test the knowledge of these flows and stocks on a number of queries over the given time interval, which are known as inflows and outflows. These skills, called "graphical integration" are fundamental for understanding dynamics complexity systems.

This test contains 5 tasks, which evaluate the learner's inclination toward systems thinking, as well as the ability to obtain necessary information from the graphic display, to derive the necessary information from the available data, and to solve the problem of missing information, and above all the ability to understand stocks and flows. The request on each parts of the systems thinking is matched with the necessary degree of functional literacy in the tasks.

Material and Methods

The paper is based on the need to change the traditional paradigm in education and science. The term "paradigm" is defined as an idea, attitude or opinion about the issue, and the way of solution, which is generally accepted by experts (Ulicna and Kacin, 2003). A paradigm is related to our mental models and determines how people understand the outside world. A paradigm shift is a complex process that is extremely individual and cannot be achieved by mere external action. If any individual wants to solve complex tasks successfully, they need to work on their long-term perception of the world and correct their mental models (Vojtko, 2005).

Inherently, systems thinking is a paradigm, a worldview, a shared world view and set of methods, models, skills, attitudes, and values. At the same time, a paradigm of systems thinking is influenced by the overall paradigm of society (Rosicky, 2010).

The paradigm of systems thinking is based on the following principle: each of the causes is associated both with its effect and with each other in the causal loop feedback. It leads not only to understanding systems as a whole but also to a significant shift in world view (Mildeova and Vojtko, 2006). Richmond (1993) defines systems thinking as an art and the science as a tool to formulate reliable conclusions about the behavior of the system based on deep understanding of its basic structure.

According to Richmond (1993) Systems thinking involves three basic skills:

- Cause Thinking
- Closed-loop Thinking
- Operational Thinking

Cause Thinking is based on the belief that the problem that occurs in the system is caused by the system structure. Problematic behavior (behavior that causes problems and does not reflect the expected state) is more often (and incorrectly) assigned to external factors.

Closed-loop Thinking represents the second part of systems thinking; structure is the cause of its behavior and structure is determined by behavior. Causality is not unidirectional, quite on the contrary.

There is an important finding of systems thinking closely related to the two skills described above: the behavior of some structures is constantly repeating. These repeating structures - system archetypes (generic structures, archetypes of behavior) make the study of complex social systems easier, and provide

a key to the understanding of the structures (Nemcova, Mildeova, 2009).

Operational Thinking completes the process of thinking, it is comprised of stocks and flows, which are arranged through feedbacks. Flows and stocks are the basis for dynamic systems.

Systems Thinking x System Dynamics

Uninitiated observers are not able to distinguish the important from the unimportant; therefore, they consider everything they see and perceive it as important. Necessarily, this results in information overload and mismanagement of mental problems. In Richmond (1993) is recommended as a way to identify relevant information and bring it to our mental capabilities by using various simulation tools. This brings us to the discipline of System Dynamics.

Systems thinking as a way of thinking is the foundation of the discipline called System dynamics, a methodology designed to address the real system problems. System dynamics is based on modelling (see Burianova, 2008).

The official website of The System Dynamics Society, an international organization devoted to encouraging the development and use of system dynamics around the world defines the relationship of systems thinking to system dynamics is defined as follows: "Systems thinking looks at exactly the same kind of systems from the same perspective. It constructs the same causal loop diagrams, but it rarely takes the additional steps of constructing and testing a computer simulation model, and testing alternative policies in the model"[2].

The basic aim of using and teaching systems thinking and system dynamics is to improve understanding of dynamic complexity and the ability to recognize stocks, flows, time delays, and feedback relationships and also to identify patterns of dynamic behavior of a system (Pala and Vennix, 2005).

The main purpose of the course System Dynamics at the University of Economics in Prague is to develop systems thinking and understanding of dynamic behavior of a system for students as future managers and give information about PC support for this process. The course acquaints students with principles of system dynamics methodology that would contribute to systems thinking development and understanding of dynamic behavior of a system. Training of learned skills and team cooperation is practiced by projects, in which are interactive learning environment simulated economic processes. See the course syllabus below:

1. Basic principles of system dynamics methodology, terminology of this discipline,
2. Complex social systems and their behavior, presentation of detail and dynamic complexity, delay, feedbacks, nonlinearity, modes of politics,
3. Mental models and learning, limits of mental models and possibilities for overcoming them by computer simulation, paradigm shift, critical systems thinking and its components, causal loops,
4. Systems archetypes – Drifting goals, Limits to success, Shifting the burden,
5. Main elements of models in simulation software Powersim,
6. Generic systems structures – positive feedback, negative feedback, oscillation, S-curve, overshoot and collapse,
7. Static and dynamic equilibrium, chaos, graphical integration,
8. Modeling of a material and an information delay,

2 http://www.albany.edu/cpr/sds/

representation of nonlinear relations,

9. Models' testing – testing of time horizon, borders, structures, extreme conditions, sensitivity analyze,
10. Way to transformation of a model into a business flight simulator,
11. Project of team creation of system dynamics models:
    - team putting together – appellation, assignment of specializations and roles in teams,
    - work on a model of a firm (by specification of a problem)
    - definition of the project schedule with accent to "learning", and not "teaching",
    - presentation and defense of project results, evaluation of different strategies for problem solving,
    - description of expectation and hypotheses, description of using strategies during model building and lessons from results.

There are similar study programs at other universities. System dynamics can be studied around the world at both the undergraduate and graduate levels, and also in non-degree executive education programs (see http://systemdynamics.org/courses_in_sd.htm).

Bathtub test

The „Bathtub test" represents an important place among the tests of systems thinking that enable the evaluation of how people understand basic system concepts (Sweeney and Sterman, 2000, Sterman and Sweeney, 2002). As we showed, this test contains 5 tasks:

The first part of task 1 – **Department Store** task is focused on whether students are able to read the graph correctly. The next part examines their ability to integrate different pieces of information and tests the ability to understand stocks and flows (Sterman, 2000).

In task 2 - **Manufacturing Case** task students must imagine a production company. The task is to draw production behavior and to draw a graph of stock patterns (Sweeney and Sterman, 2000).

In task 3 - **Cash flows** the graph shows the hypothetical behavior of income and expenses. Based on this information, students are to draw the behavior of corporate accounts (Sweeney and Sterman, 2000).

In task 4 - **Bathtub** task students must look at the picture of a bathtub. Graph shows the hypothetical behavior of the inflow and outflow of the bathwater. Based on this information, students have to create a chart of the different volumes of water in the tub (Sweeney and Sterman, 2000).

The last test 5 - **Global Warming** works with the problem of global warming due to CO_2's function as a greenhouse gas that contributes to global warming. Students are asked to imagine a hypothetical situation in which the CO_2 emissions are suddenly reduced to zero, and to then draw the likely trajectory of CO_2 emissions and global mean temperature (Sterman and Sweeney, 2002).

Another concept used by the authors is functional literacy. Functional literacy creates knowledge, skills, and statements that are needed for the full involvement and participation of man in the society in which he lives. It is a mark of some kind of behavior, namely the ability to understand printed information and to use it to achieve people's individual goals, to develop

their skills and their potential. Functional literacy is shown by Palan (2004) as an ability, knowledge, and skills-set necessary to successfully carry out work - the function. Sometimes, functional literacy is defined as the ability to actively participate in today's world of information).

A generalization of the results

Upon successful completion of this course the course System Dynamics at the University of Economics in Prague, students are able to apply principles of system dynamics methodology and systems thinking skills towards understanding of dynamic behavior of a system. The development of systems thinking skills in the System Dynamics course has been designed via the three above described basic skills: Cause Thinking, Closed-loop Thinking, and Operational Thinking.

The Cause Thinking is aimed at new skill training with the use of case studies, and the case of the bathtub is one of them (see Figure 1). Students learn to abandon the traditional linear concept of cause and effect. System dynamics understands non-linearity as one of the major features of complex social systems. (The graphical solution has proven to be the most suitable).

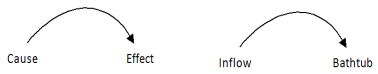

Figure 1: The Cause Thinking

The Closed-loop Thinking teaches students to organize the problem into a feedback loop. Powersim and Vensim software are used to practice this skill; students learn to create causal loop diagrams (see Figure 2). Another way in which we teach this skill is via archetypes system that helps students to understand a systems structure. At the beginning of the course students must learn the basic system archetypes. Later, students try to find some examples of these repeating structures in computer science practice. When they find these repeating structures they, are trying to find conclusions relevant for information management.

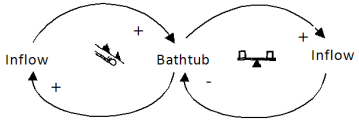

Figure 2: The Closed-loop Thinking

I**n the Operational Thinking students** learn how to model dynamics models in the Powersim and Vensim programs (see Figure 3). With the use of these models students learn System Dynamics and practice systems thinking.

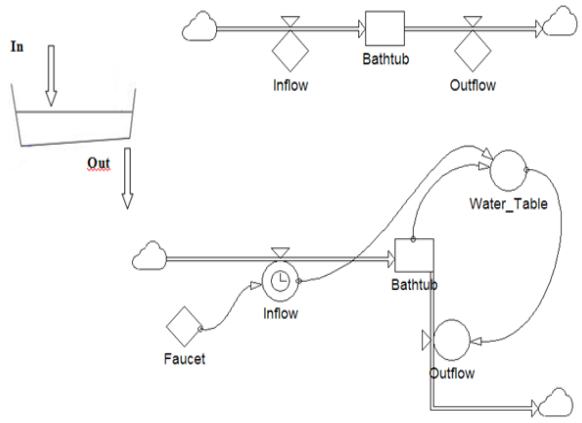

Figure 3: The Operational Thinking - from a single model to a more complex model

The reason why we use the "Bathtub Test" during the System Dynamics course is its popularity, all over the world.

The answers of the students from all tasks were coded using the criteria set by Sweeney and Sterman.

Our testing shows the existing problems in system thinking skills. In details:

The first part of **Task 1** do not produce many difficulties among students. The majority of our students gave the correct answer. This shows that almost all of them can read a graph correctly and the understanding of graphic-provided information is good. The questions of the second part are dependent on proper interpretation of the flows and stocks in the system (the ability of operational thinking), and these questions posed a challenge for students.

Even considering the subjective nature of students' assessment – an allowance of which should make **Task 2** relatively easy – correct solutions eluded students. Unexpectedly, most of the respondents drew the curve of production counter to the curve of stocks.

The function of cash flow and bath tests knowledge about flows and stocks. Across a time interval when inflow and outflow are known, is requested in **Task 3**. This ability, called "graphical integration", is the basis for understanding complex dynamics systems. The results show that only half of those surveyed correctly identify the growth in the account balance, fewer students are able to place maximum and minimum in good times and draw a relationship between net flux and the account balance in the different intervals. On the other hand, most respondents correctly plot a continuous curve of the account balance.

In **Task 4**, the abilities to decipher required information from a graph and to integrate deciphered information (in this task, that of inflow versus outflow) are tested, as is the general functional literacy of students. Unlike the previous test, students do not have great difficulties with this task, and the success rate is relatively high.

The global warming task in **Task 5** proves to be the most difficult part of the test. It requires of students skills in systems thinking, in combining information obtained from read texts, and in understanding and graphically expressing solutions. The success of solving this task is relatively small. These results shed light on students' common misunderstanding of the assignment, as many respondents expect an upward trend in

CO_2 emissions even while it should be clear that these emissions are zero.

There are no single correct solutions in some tasks, but the shapes of curves must respect certain boundaries and rules. See frequent mistakes in Task 3 shown in the picture (see Figure 4).

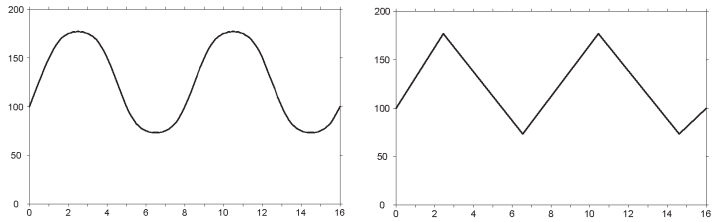

Figure 4: Correct solution (in left) and incorrect solution (in right) in Task 3

Discussion

When we compare the beginning results to the results at the end of the semester, we can see an improvement in results. The percentage of correct answers in the post-course increased and a shift from classical thinking to systems thinking can be seen. It is possible to see an enormous improvement in task 3, although students' understanding of stock and flow concepts could be even better. The general performance after the System Dynamics course is higher and can be attributed to the education they received in system dynamics principles as are stocks-flows, feedback, time delays, structure-behavior relationship, and, of course, modeling. It is only in task 5 that students show only minimal improvement over the course of the semester. We can interpret this as another attempt toward other approaches to thinking which continuously changed during the semester; however, significant improvement is not achieved. And also, as pointed (Pala and Vennix, 2005), this task requires making inferences for a second-order system and problems of doing so is reflected in the results.

Regarding statistical significance and the population sample on which the research was conducted: the test is comprised of university students who represent a more-educated segment of society. We can only assume what the situation is for the population at large.

A comparison to previous researches

Various persons (researchers and teachers) used the tasks from Bathtub test at different levels (Kainz, Ossimitz, Sterman, Fisher, Heinbokel, Potash, Kubanek, Lyneis, Quaden, Ticotsky, Zaraza, Pala, Ö., Vennix, Kasperidus, H.D., Langfelder, H., Biber) before we do. Their results showed the lack of performance of the students and the systematic errors in their understanding of basic building blocks of complex systems: poor understanding of the relationship between flow and its associated stock, poor understanding of the fundamental principles such as conservation of materials, and the inability to correctly identify the behavior of a system (Pala and Vennix, 2005) and (Kasperidus, Langfelder and Biber, 2006).

The comparison of our results of testing with those in literature (Sweeney and Sterman, 2000) shows similar average performance between others (MIT) and our university. Even though the mistakes made by our students and other students (the MIT students) differ. When we compare international studies (Sweeney and Sterman, 2000) and (Pala and Vennix, 2005), the education and skills of our students are about of the same level, but this does not mean that they are at an acceptable level. It is necessary to remember that a statistically-valid

comparison with international results cannot be completed due to a lack of knowledge of the demographic characteristics, field of study, and the students' particular level of prior education, which undoubtedly affects the ability of systems thinking.

Conclusions

Computer science is a field that affects the economy as a whole as well as individual personal lives. In this context, the paper focuses on the need for change in thinking in order to understand today's global problems, which are reflected in computer science.

Through the results based on authors' systematic data collection and measurement (for five years) we try to highlight the inadequate human mental simulation ability and the fact that the mental models that we create do not capture reality as it actually works. As a guide to improve our cognitive abilities we recommend systems thinking, which we consider as a means of understanding the world and its relations and links. Systems thinking is described in the paper as a discipline that can be used to better describe reality – to construct models of reality, estimate systems behavior, and overcome the limitations contained in mental models.

Systems thinking skills grant an important advantage to those who can handle the ability to qualitatively improved their knowledge through increasingly efficient perception of the world around them. However, one problem still remains => How do we obtain these skills?

Test results verifying the ability of systems thinking bring relatively consistent findings, and they show that human understanding does not accept the systems concept. The student performances were week and indicated systematic errors in understanding of the building blocks of complex systems. Our examination with the use of the Bathtub Test confirmed that students with systems thinking abilities were more successful in this test than students without these skills. Our experience in the System Dynamics courses leads to the conclusion that with the simulation of the System Dynamic model, students can better understand dynamic characteristics including feedback effects. Thanks to the simulation carried out in the mentioned courses, students learn to better understand the long term problems and short term problems and improve their systems thinking skills. It is a change in the style of teaching and learning tools and the paradigm of thinking. The analogous change in our thinking corresponds to the endorsed paradigm shift. This paradigm shift offers a very systematic way of thinking; a new quality emerges in synergic effect of modern systems theory and cybernetics of second order.

Understanding the text, the inclusion of general knowledge, and a systematic view of reality are still big problems for our students in the Information management specialization. As it is, after academically studying systems, these problems are reduced. We suggest that the basic information about system dynamics and systems thinking principles will affect students' thinking and will bring about better solutions to the above-mentioned problems. It is not possible to teach students to think entirely differently in just 3 months. In that short time, however, you can provide basic information and options. This training should be longer-term in nature and much deeper in coverage than is the current model in the Czech school system.

At the very end it must be acknowledged that systems thinking can not be a panacea for the problems that brings the current state of computer science. It does not provide specific procedures and instructions how to solve problems. But it provides a set of

methods and perspectives that can computer science support. Using systems thinking increases the likelihood that our interventions in the system will produce the desired results. In systems thinking we can see a way of thinking and learning.

Last but not least, it must be acknowledged that systems thinking can not be a panacea for all problems that the current state of computer science brings. It does not provide specific procedures and instructions how to solve problems. But it provides a set of methods and perspectives that computer science can support. The use of systems thinking increases the likelihood that our interventions in the system will produce the desired results. We can see a way of thinking and learning in systems thinking.

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EVALUATION OF RESULTS IN CHOSEN SUBJECTS AND ANALYSIS OF THE MOTIVATION OF DISTANCE STUDENTS

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Abstract

The university studies of adult people in the combined or distance form of study denote many differences in comparison with the regular studies. Very important question is if the results of the distance students are on the same level as those of regular students. The Czech University of Life Sciences in Prague has steadily high number of combined students in tutorial centres outside Prague. The contribution is based on an inquiry survey among the students of tutorial centres. Another data source is the official database of the university. The level of satisfaction of students was compared with their results and a negative dependency was found. We also investigated the relation between socio demographic characteristics and the motivation and attitude to the study. We found dependencies in two questions. Finally, we compared the results of the students from the tutorial centres and regular students and have not found remarkable differences. The good (not worse) results of students from the centres of distance studies can be explained by more intensive motivation which implies more intensive and more responsible preparation for exams. For the statistical analysis we used the software SPSS, version 18.

Key Words

Course assessment, subjective and objective evaluation, distance students, inquiry survey, statistical analysis, categorical data

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Introduction

The article follows from the work of authors which was published as a contribution of the conference ERIES 2011. The contribution was extended by further dissemination of the introductory part of the question form. This part is concerned with the motivation of the adult students for further studies and improvement of their education level.

The Czech University of Life Sciences in Prague has 26 317 students in regular and combined form of study during the academic year 2010/2011 (Faculty of Economics and Management 13 132 students in regular and combined form of study). Major part of the combined students is in the tutorial centres out of the Prague. The number of these students is steadily high, with growing tendency in particular places. The continuous interest of adult students inspired the authors for seek for the motivation for further education in the combined form of study. The comparison of study results of regular and combined students is also included.

The quality of education at universities is traditionally evaluated by study results of students or graduates. Important information for graduates is the percentage of employed on appropriate posts.

The results of students can be measured not only by the examination grades but also by the subjective satisfaction of students. The evaluation by students represents important source of information for teachers and the universities' management. The feedback from students to teachers helps to improve the quality of education process. The source of students' estimations can be a survey.

The evaluation of teaching is provided in all developed countries. Regular enquiries take place regularly at universities in the US, Canada and Western Europe since the seventieth (Berk, 1979).

Distance learning is a new trend in education. One of the attractions of distance learning is its flexibility of instruction. Since students and instructors can be separated spatially and temporally from each other, students in a remote area and part-time students can all benefit from this spatial–temporal flexibility as well as a high degree of information sparing (Chang, 2002). New communication technology, such as the internet, has been widely introduced in order to reach those who are unable to enrol at conventional universities. By way of such technology, students are supposed to be able to study wherever and whenever they want, and thereby gain the flexibility necessary for conducting their studies (DePew, Lettner-Rust, 2009).

The learning management systems, e-learning courses and blended learning tools are often evaluated and the recognized effectiveness is very important for their improvement and development. E-Learning systems are multidisciplinary by nature. Many researchers from fields as computer science, information systems, psychology, education, and education technology, have been trying to evaluate e-learning systems (Eccles, 1991).

Generally, there are two main streams of assessment the e-learning systems: e-Learning system as a social entity; e-Learning system as a technical entity (Ozkan, Koseler, 2009).

The social issues often do not have proper importance. In web-based educational systems the structure of learning domain and content are usually presented in the static way, without taking into account the learners' goals, their experiences, their existing knowledge, their ability (known as insufficient flexibility), and without interactivity (means there is less opportunity for

receiving instant responses or feedbacks from the instructor when learners need support) (Baylari, Montazer, 2008).

The two main orientations can be specified in more groups. Ozkan, Koseler (2009) proposed an investigation based on six main entities, learners attitudes, instructor quality, system quality, information (content) quality, service quality, and supportive issues. The assessment of the e-learning system they made only using the students perceptions.

In our research we focused on the social issues and we tried to find relations between subjective views of students and their objective results.

We propose a pilot survey which is focused on the students from centres of distance studies (CDiS) of the Czech University of Life Sciences (CULS Prague), Faculty of Economics and Management (FEM). The students evaluated their courses from the point of view of the personal social profitability, as a support of their professional career and possible application in practice. Dependency between the subjective evaluation of the subject and the final grade was investigated. Also the results of distance students from the CDiS and regular students from Prague were compared. The analysis was based on comparison of average grades in several subjects. The results have been evaluated by the analysis of categorial data based on frequency distribution. The first part of the question form was afterwards distributed to another students of CULS Prague. The goal was to get bigger sample for dependency analysis. To the extended data file the analysis of categorial data (in the form of association and contingency tables) was applied.

Material and Methods

The target group of the survey consists of the students of the branch Operation and Administrative in the CDiS in Hradec Králové. The inquiry form has two parts. The first part contains questions necessary for getting identification data and questions focused on the reasons and motivation for study. In the second part the students evaluate several courses which they have attended and point out their final grade.

The distribution of the first part of the question form to another students brought large data file which enables more precise analysis. The information on the motivation for study is then of a higher quality. The question form was distributed among the students of the second and third year in the centre Hradec Králové.

For the analysis of the survey we use single dimensional and multiple dimensional analyses of categorical data. The basic analysis contains frequency distribution and calculations of describing characteristics. For searching for relations between two variables we use contingency tables.

For the tests in the contingency tables we use Chi square test to not reject the independence of variables. The construction of the measure of the intensity of relations used Pearson´s contingency coefficient (Cp). If the conditions for Chi square test are not fulfilled the Fisher exact test is applied. A single selection test on mean value μ proved if certain average grade of sample file of students is equal to certain value or not. This test enables us to prove the hypothesis that the average μ of the basic file is equal to certain constant value. The null hypothesis is: H_0: $\mu = \mu_0$. The decision is made using p-value (p) and significance level α . The statistically significant differences are proved when $p < \alpha$. For assessment if there is a dependency between subjective view of

the student and his or her final grade we use Pearson correlation coefficient (r). Due to a high number of courses included in the survey we decided to aggregate them into 3 subjects groups:

Group 1 (8 subjects): Mathematics I, Informatics I, Informatics II, Statistics I, Mathematical Methods, Economics I, Economics II, Cybernetics.

Group 2 (4 subjects): Basic phytotechnics, Special phytotechnics, Animal husbandry I, Animal husbandry II.

Group 3 (8 subjects): Science, philosophy and society, Foreign language I, Foreign language II, Psychology of personality and communication, Agriculture goods appraisement, Psychology and ethics of entrepreneurship, Basis of legal theories.

The relations between the subjective evaluation of students and the final grade have been investigated in a correlation matrix. The data from survey were analysed using the Statistical Package for the Social Sciences (SPSS), version 18. The significance level was set as $\alpha = 0{,}05$. The data come from a normal distribution.

Results and Discussion

Description of the pilot sample

A pilot study was applied to 40 undergraduate students (the total number of enrolled students in the class was 56), 2nd year, from the CDiS Hradec Králové, 85 % were females, 15 % males. The percentage of female students is typical for the CDiS. While there are approximately 60 % of female students in the regular form, the percentage in all CDiS is higher (Vydrová et. al., 2010). The most frequent age group was 28-37 (see Fig.1). 48 and more was only in one case and that´s why recoded for further analysis. This variable has been defined with only three categories: age groups 18-27, 28-37, 38 and more.

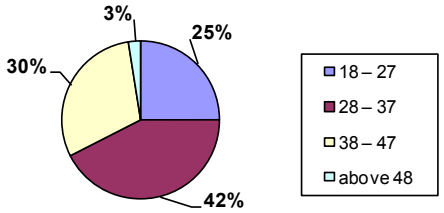

Figure 1: The age structure of survey responders

Another question focused the sector of employment. The highest number of responders (85 %) is now employed in the tertiary sector; mainly in services and state administration. 10 % are employed in the industrial sector and only 5 % works for the primary sector (agriculture, mining, etc.). The file distribution according the domicile is in the Table 1.

Intervals	Number	%	Cumulative %
Under 4 999 inhabitants	15	37.5	37.5
5 000 – 19 999 inhabitants	9	22.5	60.0
20 000 – 99 999 inhabitants	8	20.0	80.0
100 000 and more	8	20.0	100.0
Total	40	100.0	

Table 1: The size of place of living according to the number of inhabitants

The attitude towards the self study has been also investigated. Relatively high number (55 %) of students stated that they prepare continuously with the same intensity to each subject. The self study was reduced only to working on dated up tasks in 30 % and 12.5 % of respondents is working only to get though to go ahead to higher class. Only one respondent is working only in subjects which are interesting for him.

These results are very different from answers of regular students in an investigation made a couple years before by Poláčková, Jindrová (2010). The work only in the framework of compulsory task stated 62.3 % and 20 % of students work only in subjects which are interesting for them. 15 % spend only a minimal labour on self study and only 3.8 % is preparing from one lesson to another (i.e. each week).

These differences can be explained by higher motivation of the adult students. Quite often they have to reach the university degree to keep and/or improve their position at work. Successful termination of the university studies has a great importance for them not only in their professional development but also for their private social status. These might be the reasons for more intensive self study and higher responsibility.

Extended file with more respondents

Another group of combined students filled the first part of the question form. This part is concerned with the motivation for study and overall attitude. The part with concrete results of subject was left out. The question forms were filled in anonymous. In total 106 questionnaires were evaluated.

The gender differentiation of responders was: 33 % men, 67 % women. The age group 28-37 was the most frequent. Other age groups had 24,5 % (18 – 27 years), 29,2 % (38 – 47 years), 3,8 % (48 and more) (see Tab. 2). The group of students over 48 was the smallest.

Age group	Total percentage
18-27 years	24,5
28-37 years	42,5
38-47 years	29,2
48 and more	3,8

Table 2: Age structure of respondents

The distribution according the job sector of the responders' is following: 5.7 % work in the primary sector; 19.8% in the secondary sector and 74.5 % in the tertiary sector (most frequent answer).

It follows from the attitude to the study (see Tab. 3) that 59.4 % of respondents study continuously and evenly in all subjects.

What is your attitude to study?	Total percentage
I study continuously in all subjects evenly	59.4
I study continuously only in subjects which are interesting for me	6.6
I do some work only in projects or assigned tasks	22.6
I do minimum work necessary for passing to next year	11.3

Table 3: What is your attitude to study?

The motivation of students was investigated by following question. The question offered several statements and the answer could be chosen from: yes, I agree – I partly agree – I partly disagree – I disagree. The values in brackets correspond with data obtained in the pilot survey. For the statement *"motivation for the study in the CDiS is non-admission to the regular form of study"*:

- 63.2 % (77.5%) disagree or partly disagree,
- 18.9 % (7.5%) agree,
- 17.9 % (15%) partly agree.

The reverse frequency of answers was for the statement "*the university graduation is necessary for present work of the respondent":*

- 73.6 % (77%) agree or partly agree,
- 6.6 % (10%) partly disagree,
- 19.8 % (12.5%) disagree.

Getting better working place is a motivation for 84.9 % (90 %) of students. 15.1 % (10 %) disagree or partly disagree. The share of reaction to the claim "*I want to widen my knowledge*" was similar to the previous. 93.4 % (90 %) of respondents agree or partly agree.

The final two statements are connected with the social status and finding new friends and contacts. More than one half (62.3 % {55 %}) answered that "*they wish to improve their position in the view of their families and friends"*; disagree 28. 3 % (32.5 %). New friends of contacts wish to find 67.9 % (70 %) of students. This is not a motivation for 32.1 % (28 %).

The most remarkable difference between the pilot and extended survey is in the question "*motivation for the study in the CDiS is non-admission to the regular form of study"; in the answer* "agree" where the difference is more than 10%. The most similar answers are in the question "*I want to widen my knowledge*".

Dependency analysis: pilot study

In the analysis of dependencies of two variables we analyse the question in which we suppose some kind of logical consequence. We analysed the dependency between the attitudes towards the self study and the socio demographic signs. No dependencies were proved. It means that the gender (the same results in Vydrová et. al., 2010), place of living, age or employment do not have any remarkable influence to the attitude to study.

We investigated also the possible dependencies of motivation and gender, age and sector of employment. The only dependency was proved in relation of gender and motivation for study: "My goal is to get better working place" ($p < 0.021$). The dependency in this case was medium ($C_p = 0{,}477$). It follows from the contingency table that 50 % of female responders agree, 44.1 % agree partly and total 5.8 % disagree or partly disagree. For male responders, 66.7 % partly agree and disagree 33.3 %.

Dependency analysis: extended file

The first analysis dealt with dependency of the age and gender and the attitude to the study.

The dependency between the gender and the attitude was proved by Chi square test and the Pearson's contingency coefficient as existing with medium weight (Cp = 0.384). It follows from the contingency table the 70.4% of women study continuously in all subjects. The same attitude presented only 37.1% of men. Generally, the male students more frequently prefer some interesting subjects and work only on assessed tasks and projects. There is no proved relation between the gender and the attitude to the study.

Another question dealt with the motivation for study. The relations to the gender are in Tab. 4; the relations to the age are in Tab. 5. The statistical important dependency was proved only for the gender and motivation "*find new friends and contacts*" (Cp = 0.330) and between the age group and the reason "*not accepted for the regular form of study*" (Cp = 0.466). The younger respondents (18-27 years) had chosen the combined study prevailingly because they were not accepted for the regular studies. On the other hand the older age groups usually disagree with this reason. For further specification – see results of testing of contingency tables in Tab. 4 and Tab. 5.

What is your motivation for study?	Dependency on gender exists	p-value	Pearson's coefficient
I want to finish my study (has not been accepted to regular form, has not finished previous study).	no	$p < 0.667$	
The university graduation is necessary for keeping my job.	no	$p < 0.233$	
I want to get better job.	no	$p < 0.136$	
I want to extend my knowledge.	no	$p < 0.156$	
I want to improve my value for my family and friends	no	$p < 0.942$	
I want to find new friends and contacts.	yes	**$p < 0.005$**	0.330

Table 4: Summarizing table of dependencies between gender and motivation

What is your motivation for study?	Dependency on age exists	p-value	Pearson's coefficient
I want to finish my study (has not been accepted to regular form, has not finished previous study)	yes	$p < 0.001$	0.466
The university graduation is necessary for keeping my job.	no	$p < 0.141$	
I want to get better job	no	$p < 0.212$	
I want to extend my knowledge.	no	$p < 0.235$	
I want to improve my value for my family and friends	no	$p < 0.542$	
I want to find new friends and contacts	no	$p < 0.213$	

Table 5: Summarizing table of dependencies between age and motivation

Evaluation of grades

The exam is both written and oral. The examination questions are on the same level for regular and combined students. The grades are from 1 (the best) to 4 (the worst, not acceptable). Even though the number of contact lessons is different all students must cope with the same volume of topics and manage the exam on the same qualitative and quantitative level. The regular students have 12 lectures (1.5 hour each) and 12 seminars (1.5 hour each); totally 36 hours of contact learning. The combined students have an intensive tutorial in two days for one subject; totally 16 hours.

The results of comparison of the results of distance students from the tutorial centres and regular students from Prague are in the following text. The study plans and syllables are of course is approximately the same? We investigated the results of the same branch of study (Operation and Administrative). The comparison has been made using the average grades of the regular students (reference constant) for the group of subjects (three groups see above). Tab. 6 shows that there is no statistically important difference between the average grade of regular (all students, included, official data from study department of the FEM) and combined students – responders of the survey.

	Reference constant	Average grade in the CDiS	p-value
1. Group	2.03	2.80	$p < 0.867$
2. Group	1.80	2.53	$p < 0.981$
3. Group	1.56	2.09	$p < 0.896$

Table 6: Comparison of average grades in three groups of subjects

Because further on we work only with groups of subjects we search also for differences inside these groups. We compared

the results of single subjects (see table 7). It is possible to find subjects which have different grade than the average grade of the group of subjects.

Important differences between grades in subject and in group				No important differences			
Group	Subject	Ref. const.	p-value	Group	Subject	Ref. const.	p-value
1	Mathematics	2.000	$p < 0.001$	1	Cybernetics	2.180	$p = 0.173$
1	Informatics II	1.692	$p < 0.001$	3	Basis of legal theories	1.436	$p = 0.275$
3	Agriculture goods appraisement	1.079	$p < 0.001$	3	Psychology of personality	2.154	$p = 0.850$
3	Psychology and ethics	1.718	$p < 0.002$				

Table 7: Comparison of average grades of those subjects where the dependency between subjective evaluation and grade was proved

The table contains only the subjects where the dependency between evaluation by students and final grades is found. These subjects are in table 8.

The students´ evaluation came from the survey. The students had to evaluate each subject from their point of view (both the evaluation of the subject and the teacher). The normal distribution of data in this data set was proved.

Subject	r
Mathematics	-0.325
Informatics II	-0.439
Psychology of personality	-0.381
Agriculture goods appraisement	-0.331
Cybernetics	-0.447
Psychology and ethics	-0.393
Basis of legal theories	-0.561

Table 8: Correlation coefficients for chosen subjects

The final part of the analysis deals with the dependency between the subject evaluation and the final grade. Tab. 8 contains statistically important Pearson correlation coefficient in cases with at least medium dependency proved. The strongest dependency is for the subject "Basis of legal theories"; r = -0,561. The indirect correlation appears for all subjects what means indirect dependency, i.e. the grade is not in line with the subjective evaluation of the student. For example, the student was satisfied with the course but underestimated the preparation for the exam and the final grade is bad and vice versa.

Conclusion

The article represents a continuance of the authors work on investigation of the combined studies in the CDiS and follows already published works (e.g. Vydrová et. al., 2010), (Vostrá-Vydrová at. al., 2011).

Firstly, the data from the pilot survey were collected and analysed. For improving the quality and reliability of the obtained information the number of responders was extended. The second group of students filled only the first part of the question form dealing with the motivation for study. The analysis of the motivation is in the chapter "Results and Discussion".

The attitudes to the study and the motivation were investigated only for the combined students.

Some important dependencies between answer to these questions and the socio demographic characteristics of the responder were found.

The dependencies between characteristic age and gender and the motivation of study were found for questions:

- *I want to find new friends and contacts.* – Dependency on gender.
- *I want to finish my study (has not been accepted to regular form, has not finished previous study).* – Dependency on age.

The survey proved relations between subjective evaluation of particular course and the final grade. The relations were indirect, i.e. subjective satisfaction with the course leads to a worse final grade. The reason is probably in undervaluation of preparation for exam in those subjects that seem to be easy and understandable for the student.

In the comparison of regular and combined students, the differences were found in the average grades in particular subjects but no statistically important differences were proved in comparison of groups of subjects.

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