

The Development and Validation of a Teacher Belief Survey for the Constructivist Classroom

International Journal of Educational
Reform
00(0) 1–25
© The Author(s) 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1056787920939896
journals.sagepub.com/home/ref



Monika A. von Oppell¹ and Jill M. Aldridge¹ 

Abstract

The research reported in this article was part of a larger study which took place in Abu Dhabi, United Arab Emirates. The large-scale education reform, being carried out at the time of the study, required paradigm shifts in practice; from a traditional to a constructivist approach. The education reform posed on-going challenges and posed questions regarding the future impact for teachers, particularly with respect to their beliefs with respect to classroom practice. This article describes the development and validation of a survey to assess teachers' beliefs in this new context. The survey assesses teachers' beliefs about their role in the classroom and philosophy of teaching and learning and their classroom practice. The translation validity of the survey was supported by examining the content and face validity. Further, analysis of the data collected 182 Arab teachers was used to provide support for the reliability and validity of the newly developed Teacher Belief Survey in terms of factor structure, internal consistency reliability, discriminant and concurrent validity. This instrument has the potential to be useful for ascertaining teachers' professional development needs and for understanding the beliefs of student teachers. In regions of cross-cultural diversity the findings may assist in creating understanding and sensitivity of the cultural differences between people, their knowledge, perspectives and practices.

¹Curtin University, Perth, Australia

Corresponding Author:

Jill M. Aldridge, Curtin University, GPO Box U1984, Perth, Western Australia 6845, Australia.
Email: J.Aldridge@curtin.edu.au

Keywords

Teacher beliefs, constructivist paradigm, traditional teaching, survey, pedagogy, reform, teacher change

It is widely accepted that teachers are important agents in shaping and bringing about change and innovation in education practices, however, reform initiatives have often failed because the need for teacher learning and development in line with the reform objectives was not recognised (Lieberman & Pointer Mace, 2010; Van et al., 2007). Because teachers filter, interpret or reject new information through their beliefs (Nespor, 1987; Pajares, 1992; Van et al., 2007), reform has little chance of success without their supporting beliefs (Mitchell, 2005). These personal beliefs are powerful and resistant to change, driving the teacher's instructional choices, actions, classroom management practices, and the translation of the curriculum (Luft & Roehrig, 2007; Önen, 2011; Pajares, 1992; Shinde & Karekatti, 2012; Splitter, 2010). It is these personal beliefs that are particularly challenged during any form of education change.

Given the importance of teachers' beliefs, it would seem logical, prior to any implementation of education reform, to ascertain what teachers believe with respect to their role and pedagogical practice. An understanding of the content and the structure of teachers' beliefs may contribute to the success of curriculum innovation projects (Van et al., 2007). This article describes the development, translation and validation of a survey that was developed to ascertain middle and high school teachers' beliefs about teaching and learning and their role as the teacher in a constructivist classroom.

Background

Teacher Beliefs and Education Reform

A *belief* is defined as “a firm opinion; an acceptance of a fact, statement” (Metcalf, 2008, p. 80) while an *opinion* as, “a belief or assessment based on grounds short of proof; a view held as possible” (Metcalf, 2008, p. 573). *Proof* is regarded as the “facts, evidence, argument etc. establishing or helping to establish a fact” (Metcalf, 2008, p. 655). These definitions help to clarify the concept of *teacher beliefs* as being personal mental constructions of practice developed by individuals through observation, immersion and experience (Luft & Roehrig, 2007; Pajares, 1992), and thus, govern many aspects of a teacher's decision making. The formation of beliefs relies “more heavily on affective and evaluative components than knowledge systems” (Abelson, 1979) and operates “independently of other forms of cognition typically associated with knowledge systems (Nespor, 1987, p. 13)”, often resulting from critical episodes, such as an experience or an influential teacher that served as both inspiration and as a template for teaching experience (Nespor, 1987). A robust episode would evoke strong emotional memories influencing an individual's beliefs

while “experiences devoid of emotional impact are likely to be weakly engaging and soon forgotten” (Gardner, 2000, p. 77). Beliefs are not necessarily logical and neither are any two people likely to hold exactly the same beliefs. There is no common source for these beliefs, as they are “a product of their upbringing, a reflection of their life experiences, a result of socialisation processes in schools” (Raths, 2001, p. 2).

By the time that a student leaves high school, he or she has been exposed to many hours of classroom teaching and many teaching and learning experiences. These experiences form the foundation of strong and important teaching and learning beliefs within the individual that are very real for each individual. These epistemological and pedagogical beliefs influence a teachers preferred style of pedagogy and the way they act in professional contexts (Borg, 2006; Ruitenberg, 2011; Splitter, 2010). Epistemological beliefs, the beliefs that teachers hold about the nature of knowledge and knowing and how knowledge is constructed, justified and stored (Fives & Buehl, 2008) and, in the case of teaching, these are the “the highly personal ways in which a teacher understands classrooms, students, the nature of learning, the teacher’s role in the classroom and the goals of education” (Kagan, 1990, p. 423). Pedagogical beliefs, on the other hand, refer to teachers’ preferred way of teaching and have been found to predict the practices used by a teacher and the way that the classroom is organised (Wong et al., 2009). So for example, teachers who hold a more traditional view (e.g., a transmission approach) will be likely to use more teacher centred, content-oriented approaches (Chai, 2010). All teachers operate using a personal theory of teaching, or a set of beliefs about how a subject is learned and how it should be taught (Mitchell, 2005).

Research indicates that teachers have limited success in redesigning curriculum materials to become more constructivist in their approach (Roehrig et al., 2007), showing a tendency to dilute the intentions of the reform and change the activities to match their familiar traditional objectives. While small changes might be observed in classroom practice, their practice often remains strongly influenced by traditional beliefs. However, where teachers experienced positive outcomes from using a new teaching method, they tended to be more motivated to continue to use the strategies (Meirink et al., 2009; Wheatley, 2005). However, teachers tend to be atheoretical and inconsistent in their beliefs and practice, often being guided by what they felt was pragmatic (Snider & Roehl, 2007). Teachers who reported intentions to change were mostly unlikely to do so, nor did they change their beliefs about teaching, while those who had reported new insights might be more disposed to change their beliefs.

Teachers will fall back into old patterns in order to survive in the classroom, because they can be overwhelmed with procedural issues and classroom management. Teaching involves many quick decisions and a reliance on impulses and intuition due to the large variety of personal contacts a teacher makes every day. This allows for little time for reflection before action and so becomes a direct manifestation of personal belief systems. (Mitchell, 2005).

Traditional and Constructivist Education Philosophies and Pedagogy

To appreciate the changes demanded of the teachers, who prior to the reform, had taught for many years in the traditional manner, an understanding of the traditional and constructivist philosophies to education is essential. This was the starting point and formed the foundation for the construction of the new teacher belief survey.

With the dawn of the ‘information era’ in the 1970s a shift occurred in Western education systems classroom pedagogy from “*what teachers do* to an *outcomes-focus on what students achieve* with greater emphasis on catering for individual student differences” (Aldridge & Fraser, 2008). Prior to this Western Education was dominated by traditional or behaviourist learning theories.

The term *traditional* refers to a pedagogy of teacher control and student compliance. For centuries, memorisation and repetition has become synonymous with education and to do so perfectly would indicate an excellent student. Traditional teaching and learning has been referred to in a number of ways, including: the behaviourist method (Benjamin, 2003); subject matter-oriented education beliefs (Meirink et al., 2009; Van et al., 2007); transmission model beliefs (Chai, 2010); teacher-centred beliefs (Alger, 2009); and empiricist or logical positivist beliefs (Tsai, 2002). This philosophy holds that “children are empty vessels which the teacher needs to fill up” (Adams, 2006) and is characterised by the teacher determining the desired behaviour, measuring the behaviour in the students, rewarding positive behaviour and punishing negative behaviour (Jensen, 1996).

Five epistemological beliefs, which fit well with a more traditional approach to teaching, identified by Schommer (1990) are: authority-, quick-, certain-, simple- and innate-knowledge. Authority knowledge, assumes that knowledge is provided by an authority figure and is not open for questioning. Such knowledge is not associated with any deep learning, being largely a replication of memorised content (Ozkal et al., 2009). Quick knowledge is the belief that learning occurs in a short time or not at all. Students either get it or they don’t and consequently, there is no need for monitoring for understanding, thus students are likely to have a poor understanding (Ozkal et al., 2009). Certain knowledge is a belief that knowledge is fixed and unchanging negating any notion of multiple perspectives or the possibility of many answers or solutions. Simple knowledge is the belief that knowledge consists only of facts that are supported by a traditional textbook curriculum. Those who believed that knowledge is handed down by authorities, fixed and innate, certain and unchanging, adopted a surface rather than a deep approach to learning, while those who “believed that learning needs effort and understanding were more likely to employ deep approaches while studying” (Ozkal et al., p. 73). [Thus, based on these dimensions, teachers who believe that a subject consists of facts that need to be learnt and memorised were more likely to use the traditional approach to teaching (Kang & Wallace, 2005).

The pedagogy of the traditional approach is a didactic teacher-centred one where the teacher instructs students, whose job it is to listen, attend to the teacher and memorise the given facts (Al-Shammari et al., 2008; Boghossian, 2006; Tsai, 2002). The

emphasis is on the authority of the teacher (Kaymakamoglu, 2018). In the traditional approach, stakes are high for good memory and recall (Adams, 2006). While this method often results in students achieving high test scores, this is generally achieved without a corresponding improvement in conceptual understanding, which is often observed to have decreased (Shepard, 2000) so that students' "performance is but a surface manifestation of *possible* underlying competencies" (Adams, 2006). The test scores are poor reflections of students' real cognitive strengths, their understanding, or their ability to use or to transfer the information.

In contrast to the traditional approach, today's education calls for the skills to critically evaluate knowledge, to be creative in using and transferring the knowledge into new contexts, and to be effective problem solvers and decision makers (Gardner, 2000; Howard & Fogarty, 2004; Lewis, 2009; Swartz et al., 2010). During the late 1970s the constructivist theory of learning began to replace behaviourist theories in the Western world (Kotzee, *Seven posers in the constructivist classroom.*, 2010) with a thrust towards the implementation of pedagogy to support a constructivist view of learning (; Kirkgöz, 2008; Lim & Chan, 2007).

The constructivist philosophy of learning is built on the premise that the individual constructs understanding within their own mind (Adams, 2006; Boghossian, 2006) and that knowledge comes through meaningful experiences and interactions with others and not from someone else (Lattuca, 2006; Powell & Kalina, 2009; Vygotsky, 1962). Thus, student and teacher are active partners in the learning process and co-constructors of knowledge (Adams, 2006; Al Hamdani, 2014). There is an implied assumption that both the student and the teacher are willing to engage and participate and understand their roles in the learning process. These roles are different to those required in the traditional approach (where students are seen as passive receptors). In the process of learning, students construct understanding and produce a product whereby their mastery of the desired outcomes may be demonstrated and measured. The teacher's role was in creating opportunities to trigger students' thinking and to make the process of knowledge construction a more deliberate and conscious one (von Glasersfeld, 2001).

While the term *constructivist theory* is often used in the literature to imply a pedagogical practice, it is worth noting that constructivism is "an epistemological theory (a theory of what knowledge is) and not a pedagogical theory" (Kotzee, 2010, p. 177). There is no prescription as to how students should be taught; however, terms such as student-centred learning, active learning and collaborative learning are used almost synonymously with constructivism. These terms are used as a means of informing and directing the pedagogical approach that should be followed. The constructivist approach has been referred to using a number of terms, all of which tend to describe the pedagogical approach, that is, a student-oriented approach (Dunn & Rakes, 2011; Meirink et al., 2009), a progressive approach (Meirink et al., 2009), an inquiry-based approach (Roehrig et al., 2007), and a relativistic approach (Chai, 2010). In the constructivist classroom the teacher's role is one of guiding, coaching and stimulation, where the teacher is referred to as a facilitator (Richardson, 2003).

Thus, constructivist theorists and practitioners imply constructivist pedagogy from the theory.

Development of the Instrument

The new instrument was developed to provide a means of determining teachers' beliefs about their role in the classroom and pedagogical practice as well as a tool for self-reflection. The development of the survey followed a four stage approach.

The first stage involved the identification and development of salient scales related to teachers' beliefs about their roles and classroom practice. This stage consisted of two steps: first, an extensive review of literature and research into teachers' beliefs and practices and traditional and constructivist pedagogies was made. Key components of teacher beliefs and traditional/constructivist were identified. Second, based on the review of literature, scales (or dimensions) considered important were identified and defined. This helped to ensure content validity by ensuring the scales were based on a sound theoretical framework.

The second stage involved writing items for each of the scales and involved three steps. First, items from previously developed instruments were reviewed and, where appropriate, adapted. Second, where necessary, additional items were written for each scale. Third, once the items for each scale had been written, an expert panel assessed the items for each scale for comprehensibility, clarity, accuracy and relevance to each scale. This was done through round-table discussions where comments were noted and items refined and re-assessed. At this point the expert panel was also asked to suggest additional items where they felt that items did not adequately address the construct, were unsuitable or were not sufficiently comprehensive. Based on these reviews the scales and items were revised.

This research was conducted in Abu Dhabi during the implementation of education reform, thus a third step involved the translation of the TBS into Arabic because many Arab teachers and students in Abu Dhabi had a limited understanding of English. To overcome any literal translations and to ensure equivalence in the Arabic versions, a process of back translation, as recommended by Ercikan (1998) and Warwick and Osherson (1973), was used. This process enabled a comparison of the English and Arabic versions to ensure that they were consistent both in meaning and intent.

The layout of TBS in the final version involved a dual-language English and Arabic format, in which the Arabic translations were placed directly next to or below the English statements. This layout allowed respondents familiar with both languages to judge the translation for themselves (Yin, 2011), allowed the same document to be used for both the English and the Arabic respondents and reduced the risk of the intended meaning of the items being compromised (Dirani & Kuchinke, 2011). Dual-language layouts have been used successfully in past research in the UAE (Afari et al., 2013) and in South Africa (Aldridge et al., 2006).

The newly developed instrument was field tested to examine the face validity, readability and comprehensibility of the items. A pilot study was made to ensure that they closely resembled the larger survey sample that was to follow and allowed us to examine technical aspects of administration.

At the end of this stage, the TBS consisted of five scales: the role of the teacher; teacher's philosophy of learning and knowledge acquisition in the classroom; pedagogy – choice of delivery; collaboration; physical environment; and assessment (a description for each is provided below). The number of items in each scale varied from nine to thirteen, each of which were responded to using a five-point frequency response format of Almost Never, Seldom, Sometimes, Often and Almost Always.

Participants

Selection of Schools

Careful selection of the schools that were to be involved in the pilot study was done to ensure that they closely resembled the larger survey sample that was to follow. Two Cycle 2¹ ADEC schools (in which the new curriculum was being implemented) were selected, one all-boy and one all-girl. Twenty teachers from each of the two schools were invited to participate in the pilot study (40 in total); of these, 22 volunteered, 12 from the all-male school and 10 from the all-girl school. None of the teachers involved in the pilot study took part in the large-scale survey.

For the large-scale survey, the selection of the schools from which the participants were drawn involved purposeful sampling (Berg, 2009; Merriam, 2009; Yin, 2011). The criteria being: a government school; staffed mainly by Arab teachers (as it was these schools that were undergoing the education reform); had been participating in the education reform for five years; the schools be located in the emirate of Abu Dhabi (the island, the city and mainland); equal gender representation (five schools were all-boy schools (three Cycle² 2 schools and two common³ schools) and four were all-girl schools (all Cycle 2 schools). A total of nine schools were selected.

Selection of Teachers

From each of the nine schools, 30 teachers were randomly selected by the school principal, providing a total of 270 teachers. A total of 220 surveys were returned, of which 198 (approximately 73%) were usable. This large sample ensured that the sample included teachers who taught a range of subject areas as well as a range of age groups and teaching experience.

Of the 198 usable surveys, 82% of the teachers were from Arabic-speaking countries and 18% from Western nations. Of the teachers who were from Arabic speaking countries, 54% were from Jordan, Egypt, Tunisia and Syria and 28% were UAE nationals. Of the 198 teachers, exactly 50% were men and 50% were women (i.e., 99

of each gender). This large-scale sample ($N = 198$) was used for the validation of the teacher survey.

The age of the participants ranged from 25 to 60 years. In Abu Dhabi, when teachers reach 60 years of age they are retired and repatriated. There were, therefore, no teachers over 60 years of age.

Results

Content Validity of the TBS

The first step, in terms of developing the survey, was to ensure that the constructs of the survey were based on sound theoretical underpinnings, thus enhancing the content validity. This section provides a justification for the inclusion of each scale based on research and theorising, these being: the role of the teacher in the classroom; teacher's philosophy of learning and knowledge acquisition; pedagogical approaches (choice of delivery); the importance of collaboration and social interaction; the physical classroom environment; and the role of assessment in teaching and learning.

Role of the Teacher. In a traditional classroom, students tend to be passive recipients in a process in which the teacher controls discipline, is viewed as the source of information and an autocratic decision maker where teachers rely on textbooks and expect students to memorise content (Lattuca, 2006; Richardson, 2003; Stoffels, 2005). Traditional teachers control the student progress and delivery of the syllabus, usually through the use of a textbook (Boghossian, 2006; Richardson, 2003). In contrast, a constructivist-oriented teacher is expected to provide opportunities for students through suitable learning activities targeting specific learning outcomes, to be autonomous and to negotiate their understandings with other students (Taylor, 1990). The role of the constructivist-oriented teacher has been described as a coach or facilitator of learning, where the locus of control lies with the student (Adams, 2006; Boghossian, 2006; Richardson, 2003).

The difference in the role of the teacher in these two paradigms is most marked with respect to the involvement and activity of students and teacher. The scale named *role of the teacher* was developed to assess the beliefs that teachers have of their role in the classroom with specific reference to their beliefs about authority and control.

Teachers' Philosophy of Learning and Knowledge Acquisition. The traditional view posits that knowledge, in the form of facts, is imparted by the teacher to the student who is expected to accept, memorise and replicate, unquestioningly, when required (Boghossian, 2006; Lattuca, 2006; Rink, 2001). In contrast, the constructivist stand views knowledge as being constructed through active student participation, involving facilitation and guidance by teachers (Boghossian, 2006; Richardson, 2003).

Research demonstrates that the beliefs a teacher holds about how students learn and what constitutes knowledge guide his/her instructional choices and actions (Luft &

Roehrig, 2007; Önen, 2011; Shinde & Karekatti, 2012; Splitter, 2010), (epistemological beliefs about the nature of knowledge and how it is constructed and stored) will affect their teaching mode. Given the different views of how knowledge is either constructed by the learner or consists of facts that need to be memorised, this scale, *teachers' philosophy of learning and knowledge acquisition*, was developed to assess the teachers' views about how students learn and acquire knowledge.

Pedagogy - Choice of Delivery. This scale provides an indication of the classroom practices that the teachers view as best for promoting learning. Traditional teaching holds that learning occurs when learners are passive and provided with facts to memorise. In this sense, student participation is not considered to be necessary and is not encouraged (Boghossian, 2006) with “virtually no space for dialectic interplay between student and teacher” (Boghossian, 2006). Any interaction between the student and the teacher is seen as a “ping-pong style classroom discussion where a student's response is directed to the teacher who then directs a question to another student” (Lieberman & Pointer Mace, 2010). This pedagogy has a strong “reliance on commercially prepared instructional materials such as textbooks” (Stoffels, 2005, p. 534). As such, traditional teaching tends to be largely textbook and lecture driven (Al-Shammari et al., 2008).

In contrast, constructivist pedagogy relies upon and expects the active participation of students, where they “are given the opportunity to use their developed ideas in a variety of situations, both familiar and novel” (Davson-Galle, 2000, p.206). The scale, *pedagogy — choice of delivery*, was developed to assess teachers' choice of pedagogy and the strategies and practices that they incorporate in their teaching as an indication of whether they tended to be more traditional or constructivist in their pedagogical beliefs.

Collaboration. There is a distinct difference between the philosophy of traditional teachers and those who are more constructivist with respect to the use of collaborative activities in the classroom. A constructivist viewpoint holds that learning is socially constructed, while the traditional view is that learning involves individual memorisation of factual information (during which students are more likely to sit alone and work individually; Lieberman & Pointer Mace, 2010; Richardson, 2003). For constructivists, social interaction and social contexts are regarded as critical in shaping an individual's learning and, as such, learning is mediated by peers, teachers and adults (Lattuca, 2006; Rink, 2001).

The scale, *collaboration*, sought to assess the extent to which teachers' believed that collaborative activities are important for student learning.

Physical Environment. Teachers working from a more traditional paradigm are likely to view stimulating classroom walls or notice boards as a distraction to teaching and learning. In a traditional classroom students generally sit in rows, separate from one another. Review of the literature indicated that the physical environment of the traditional classroom is given scant description. In a constructivist-oriented classroom,

however, it is considered important to create a rich and stimulating classroom environment that promotes experimentation and dialogue (Adams, 2006) and where students' tables are arranged in groups to facilitate discussion and collaborative activities.

The contrasting approaches to the classroom environment between traditional and constructivist teachers were used to provide an indication of a teacher's beliefs. This scale was developed to assess the teacher's belief as to the use of the *physical environment* (the walls and desk arrangements) for teaching and learning.

Assessment. The role of assessment is regarded quite differently in the two education philosophies (traditional and constructivist). A traditional view of assessment is the degree of replication the student can provide of the memorised facts (Adams, 2006; Boghossian, 2006; Yurdabakan, 2011). Correct solutions are recorded and valued, but the perceived incorrect ones are often discounted, with no discussion with students or acceptance of alternate ideas (Taylor, 1990). In this paradigm, assessment is *of* learning and success is synonymous with good grades (Adams, 2006).

Conversely, the constructivist approach views assessment as being not only *of* learning, but also *for* and *as* learning (Mishra, 2014). As such, a teacher working from a constructivist paradigm will use assessment as a diagnostic tool in order to design appropriate activities to further guide the students (Lattuca, 2006). Within the constructivist paradigm, assessment, is regarded as an active process of uncovering and acknowledging shared understanding rather than a measure of repetitive accuracy during which the emphasis is on assessment *for* learning and assessment *as* learning (Adams, 2006; Mishra, 2014). In this regard, the emphasis of assessment is on the learner rather than the performance.

The *assessment* scale was developed to assess teachers' beliefs as to whether the role of assessment in teaching and learning is to encourage memorisation or to inform teaching and learning.

Expert Review Panel. The content validity of the items within each of the scales was further checked through intensive consultation with expert panel members throughout the development phase. This panel helped to examine the accuracy of the scales and their items in relation to the theory, the descriptions of the scales, the readability, comprehension and understanding of the items.

Description of the Initial Version of the Teacher Beliefs Survey (TBS)

The six scales, described above, formed the survey that was named the Teacher Beliefs Survey (TBS). There was a total of 63 items, with 11 items each for the role of the teacher scale and philosophy of learning and knowledge acquisition scale, 13 items for the pedagogy – choice of delivery scale, 10 items for the collaboration scale, and nine items each for the physical environment and assessment scales. Table 1 provides a scale description and sample item for each scale.

Table 1. Description and Sample Items for Each Teacher Beliefs Survey Scale.

Scale Name	No of Items	Description	Sample Item
Role of the teacher	11	To assess the beliefs teachers have of the expectations of them in their classrooms.	As the teacher it is my role to deliver factual information to students.
Teacher's philosophy of learning	11	To assess the teachers' philosophy as to what constitutes learning and how students acquire knowledge.	Students learn best when they all complete the same worksheet.
Pedagogy – choice of delivery	13	To assess teacher beliefs of delivery of teaching and learning in the classroom.	My lessons involve students working on different activities at the same time.
Collaboration	10	To assess the extent to which teachers believe collaborative activities constitute learning or whether learning is an individual activity only.	In my lessons students collaborate to decide how a task should be approached.
Physical environment	9	To assess the teachers' beliefs as to the importance of the classroom environment with respect to teaching and learning.	In my classroom all the students have the opportunity to display their work.
Assessment	9	To assess the teachers' beliefs with respect to the role that assessment plays in teaching and learning.	I use quizzes and tests to establish students' achievement levels.

The items in each scale were arranged in groups with a contextual cue provided to increase reliability. Items were responded to by teachers using a five-point frequency-type scale of almost never, seldom, sometimes, mostly, almost always.

Face Validity of the TBS

Once the TBS was developed and translated, it was pilot tested with 22 teachers to establish face validity (whether the items of a scale reflect clearly the theoretical constructs; Trochim & Donnelly, 2006). Forty teachers were invited to participate in the pilot study; 22 of whom accepted. The aims of the pilot study were to: expose any Arabic/English translation issues which would affect the participants' interpretation of the item; any problems that may arise with participants' interpretation of the items; examine aspects of the layout or instructions that may be problematic; and establish the time taken to complete a questionnaire.

The pilot test involved teachers responding to the survey and completing a feedback sheet that was used to comment on individual items and to provide suggestions to the researcher. All of the responses that were recorded on the feedback sheets were positive with respect to the English-Arabic translations. One participant responded that the dual layout English-Arabic "using Arabic side-by-side to English had made it clear and the translation is accurate" (Pilot Teacher S9).

Interviews with four pilot study participants indicated that, generally, teachers understood the items and interpreted them in ways that were similar to the researcher's intent. For two of the items (Item 62 and 28), however, respondents were unclear about the intent of the item. For these items, the Arabic translation was amended so that they were clearer.

Criterion Validity of the TBS

Once changes were made to the problematic items, the survey was administered to the main sample ($N = 198$). Analysis of the data were used to provide support for the criterion-related validity of the TBS, including the: factor structure; internal consistency reliability; discriminant validity; and concurrent.

Factor Sstructure of the TBS. Principle axis factor analysis with varimax rotation, using SPSS version 24, was used to check the structure of the 63 item, six scale TBS (Table 2). Prior to checking the data The two criteria used for retaining any item were that it must have a factor loading of at least 0.40 on its own scale, and less than 0.40 on any of the other scales (Pituch & Stevens, 2016). During the factor analysis, one of the scales, assessment, was omitted, as the items did not meet the criteria (this scale also had an eigenvalue of less than 1 and, therefore did not meet the Kaiser criterion,

Table 2. Factor Loadings for the Teaching Belief Survey.

Item No	Factor Loading				
	Role of the teacher	Philosophy of learning	Pedagogy or choice of delivery	Collaboration	Physical environment
2	0.60				
3	0.53				
8	0.65				
9	0.51				
10	0.55				
11	0.46				
12	0.43	0.53			
13		0.54			
16		0.55			
18		0.63			
19		0.73			
20		0.64			
23			0.58		
24			0.66		
26			0.41		
28			0.48		
29			0.42		
31			0.48		
36				0.76	
38				0.69	
39				0.48	
40				0.69	
42				0.52	
43				0.62	
45				0.69	
46					0.66
47					0.75
48					0.70
49					0.66
53					0.58
54					0.45
% Variance	5.67	6.40	4.92	29.30	1.34
Eigenvalue	1.76	1.98	1.52	9.08	3.21

Note. Factor loadings smaller than 0.40 have been omitted

N = 198 teachers in 9 schools

(Kaiser, 1960). A further 23 items also did not meet the criteria and were omitted from further analysis.

Based on the Kaiser criterion, the eigenvalues for the five remaining scales, which ranged from 1.52 to 9.08, were acceptable. This five scale solution explained a total of 56.63% of the variance, with the percentage of variance, recorded at the bottom of Table 1, ranging from 1.34 %, for physical environment to 29.30% for collaboration. The remaining 31 items, with the exception of one, had a factor loading of at least 0.40 on their own scale (with the lowest loading being .41) and less than 0.40 on the other scales. The exception, Item 12 (for the philosophy of learning scale), loaded both on its own scale, teacher's philosophy of learning, and the role of the teacher scale. This item was retained as its removal was found to weaken the scale overall. The results of this factor analysis support the use of five scales, with factor loadings suggesting that the items in each scale are highly interrelated to other items in the same scale.

Internal Consistency Reliability of the TBS

It is important that items within a scale assess the same construct. A widely used method for assessing the reliability of questionnaires is the alpha coefficient (Cronbach, 1951), used to measure the internal consistency or reliability of a scale. Alpha coefficients range in value from 0 (inconsistent) to 1 (perfectly consistent), and can be used to describe the reliability of factors extracted from questionnaires that involve rating scales. The higher the coefficient, the more reliable the generated scale is, and it is widely accepted that an alpha coefficient of 0.60 is acceptable (Cohen et al., 2011).

For the revised 31-item version of the TBS, the internal consistency reliability was generated for each scale. The scale reliability estimates, reported in Table 3, ranged

Table 3. Internal Consistency Reliability (Cronbach Alpha Coefficient), Discriminant Validity (Mean Correlation with Other Scales), Ability to Differentiate Between the Beliefs of Western and Arabic Teachers (ANOVA Results) for the TBS.

Scale	No of Items	Alpha Reliability	Mean Correlation	ANOVA Eta ²
Role of the Teacher	6	0.76	0.39	0.04**
Philosophy of Learning	6	0.78	0.29	0.16**
Choice of Delivery	6	0.71	0.38	0.03**
Collaboration	7	0.83	0.44	0.07**
Physical Environment	6	0.73	0.36	0.14**

Note. The sample consisted of 198 teachers (178 Arab Teachers and 20 Western Teachers) in 9 schools.

** $p < .01$ * $p < .05$

The eta² statistic (which is the ratio of 'between' to 'total' sums of squares) represents the proportion of variance explained by class membership.

from 0.71 to 0.83 for the five TBS scales. The relatively high alpha reliability for each scale (the lowest of which was 0.71 for the choice of delivery scale) suggest that the items in a scale assessed a common concept and meet the conventionally accepted cut-off point of 0.70 for satisfactory internal consistency. These were considered, therefore, to be acceptable.

Discriminant Validity of the TBS

The discriminant validity was used to examine the extent to which the five scales are unique in the dimension that they covers (i.e., the concept is unrelated and not included in another scale in the instrument). The mean magnitude of the correlation of the raw scores on a scale with those for other scales of the TBS was used as a convenient index of the discriminant validity. Table 3 reports that the mean correlation of a scale with the other scales varied between 0.29 and 0.44. These mean correlations indicate that for all of the scales, the degree of overlap meets the generally accepted criteria of less than 0.8.

Concurrent Validity: Ability to Differentiate Between Western and Arabic Teachers

Concurrent validity was used to ensure that the TBS can distinguish between groups that it should theoretically be able to distinguish between. A feature of the study was that Western teachers in Abu Dhabi were more than likely to have been exposed to constructivist philosophy of teaching in their pre-service education, while most Arab teachers had not had pre-service training in education and were therefore unlikely to have been exposed to constructivist philosophy. It was hypothesised that the scales of the TBS would be able to distinguish between these two groups. A one-way analysis of variance (ANOVA) was used to examine whether the TBS scales could differentiate between Western and Arab teachers. The results of the ANOVA, reported in Table 3, indicate that all five TBS scales could differentiate with statistical significance ($p < 0.01$) between groups, thereby satisfying the criteria for the concurrent validity of the TBS.

Teachers' Beliefs

To provide an overview of the teachers' responses to the TBS, descriptive statistics, including the average item mean and average item standard deviation, were calculated. These results allowed comparison of scores between scales with different numbers of items. Given that two of the scales, the role of the teacher and the philosophy of learning, assessed more traditional views, the scores for these scales were reversed to provide a more meaningful comparison with the other scales. Table 4 reports the average item mean and average item standard deviation for the 182 Arab teachers

To provide information about the distribution of teachers' responses to the scales in the TBS, a box plot was generated using SPSS version 20 (Figure 1). In each case, the

Table 4. Average Item Mean, Average and Item Standard Deviation for the Teacher Belief Survey.

Scale	Average Item Mean	Average Item Standard Deviation
Role of the Teacher	1.72	0.56
Philosophy of Learning	2.97	0.74
Choice of Delivery	3.29	0.60
Collaboration	3.64	0.69
Physical Environment	3.67	0.75

* $p < .05$ ** $p < .01$. $N = 182$ teachers.

length of the box represents 50 per cent of the cases, and the line across the inside of the box represents the median value. The ‘whiskers’, protruding above and below the box, go out to the smallest and largest values for each scale and each represents 25% of teacher responses. An inspection of the variability in scores provides a visual image of the different responses. The lower end of the scale (almost never) is indicative of a

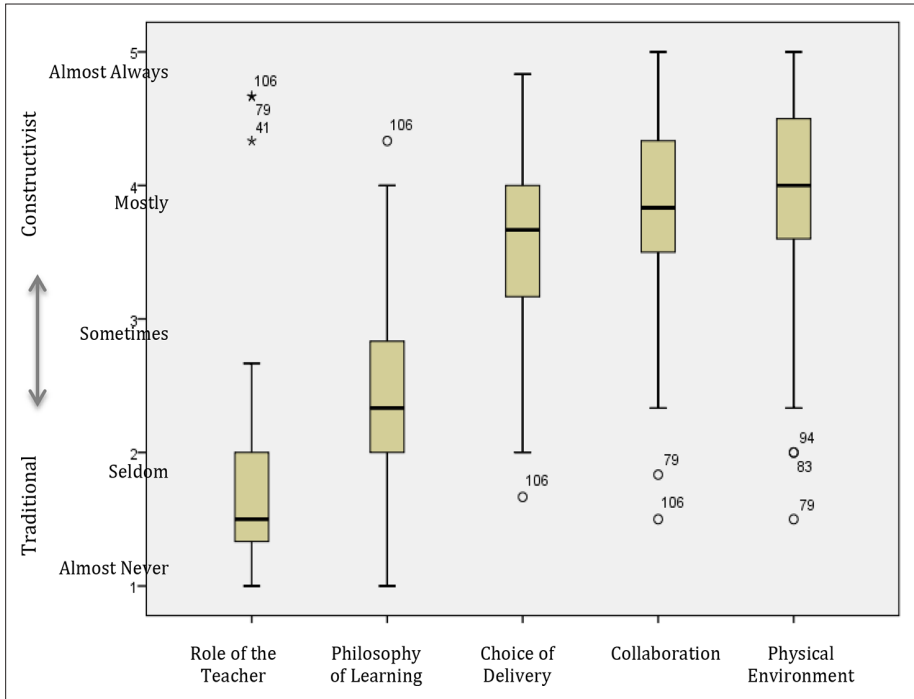


Figure 1. Variation in Responses to TBS scales ($N = 182$).

more traditional classroom whereas the higher end of the scale (almost always) is indicative of a more constructivist-oriented classroom.

The results, reported in Table 4, indicate that, of the five scales, the role of the teacher scale ($M = 1.72$, $\sigma = .56$) and philosophy of learning scale ($M = 2.94$, $\sigma = .74$) indicating that teachers' beliefs about these two scales were the least constructivist for the five scales. The majority of the responses, as shown in Figure 1, for the role of the teacher scale were between 1 (almost never) and 2 (seldom), indicating that the teachers viewed their role to be more traditional than constructivist in nature. This scale had the smallest range of responses when compared to the other scales. Teachers' responses to the philosophy of learning scale, which assessed their views about knowledge acquisition, suggested slightly more constructivist beliefs than the previous scale; however, the average item mean, suggested that many of the teachers did not consider learning in constructivist terms. This scale had the largest range of responses from teachers ranging from mostly to almost never. Both this scale and the role of teacher scale, reported more traditional results than the remaining three scales.

Interestingly, for the remaining three scales, which were related to teachers' beliefs about how they implemented constructivist practices in their classes, teachers scored higher (choice of delivery, $M = 3.29$, $\sigma = .60$, collaboration, $M = 3.64$, $\sigma = .60$, physical environment $M = 3.67$, $\sigma = .70$). These results indicated that, despite the more traditional beliefs reported in terms of their role in the classroom and their philosophy of learning, teachers believed that they were implementing more constructivist strategies. These results are discussed in the next section.

Discussion and Conclusion

Limitations

There are several limitations of this study that should be acknowledged prior to discussing the results. First, the sample included on 198 teachers in nine schools in Abu Dhabi. Whilst every attempt was made to ensure that the participants selected for the sample was representative of teachers in the emirate of Abu Dhabi, this may not be the case because they were all teachers of English. It is possible, therefore, that teachers of other subjects may respond to items in the survey differently. Second, although every attempt was made to ensure that the school sample was representative of schools within the city of Abu Dhabi, the sample may not be a true representation of schools in the wider regions of the Emirate. Third, the collection of data were restricted to Cycle 2 and Cycle 3 schools, and may not be a reflection of other education levels in the Emirate. Given these limitations, generalisation of the results to other levels of education and the teachers of other subjects should be done with caution. Further, it is recommended that future studies include a wider sample of teachers and schools.

Development of the TBS

The research objective was to develop and validate an instrument that could be used to examine teachers' beliefs about teaching, their role as the teacher and their classroom practice. Given that our review of literature indicated that there was no established surveys that specifically sought to measure teachers beliefs about the philosophy of teaching and their classroom practice in terms of whether it was more traditional or constructivist, the development of this survey makes available a tool that is rich in possibilities for future research as well as providing informing professional development of teachers during system-wide reform.

An important finding of this study is that teachers' beliefs about their teaching and constructivist practices can be reliably measured using a range of constructs. In developing this survey, the multidimensional nature of teachers' beliefs is acknowledged (Chan et al., 2007; Hermans et al., 2008; Zhang & Liu, 2014). With this in mind, two scales were delineated to capture teachers' beliefs about their role as a teacher and their philosophy of teaching and learning – both of which have been identified as important constructs that differentiate between constructivist and traditional teaching. A further, three constructs were identified to examine teachers' beliefs about the extent to which teachers were implementing constructivist practices in their classrooms. Importantly, the five scales all were shown to measure distinct aspects of teachers' beliefs, an important attribute of a survey. Further, the degree of internal consistency was high, indicating that the items in each scale assessed a similar construct. Overall, the evidence provided to support the reliability and validity met the criteria for a sound survey outlined by Trochim and Donnelly (2006). Given that research related to teachers' beliefs has, according to Hachfeld et al. (2011), been "hampered by the lack of instruments assessing these beliefs in an education context", the development of such an instrument is timely. Further, the dual language version of the TBS makes it available for use in other settings.

Teachers Beliefs About Constructivism

Our findings suggest that the teachers' beliefs (in terms of the role as a teacher and the philosophy of teaching and learning), despite being exposed to the reform for six years, remained largely traditional. This finding, whilst disappointing, was not surprising given that much past research indicates that teachers' beliefs are difficult to change (Feyzioğlu, 2012). Given that teachers beliefs play an important role in the decisions that they make (Busch, 2010) and that teachers' beliefs is an interactive process, mediated through collaboration and self-reflection (Lebak, 2015), this instrument could provide teachers with a starting point upon which they could clarify their own beliefs and practices.

Teachers' Beliefs About Their Practice

The results of our study revealed that, despite the teachers' traditional beliefs about teaching and learning and their role in the classroom, they viewed their practice to be

largely in keeping with constructivist practice. Whilst appearing anomalous (when compared to the teachers' beliefs about teaching and learning), this finding corroborates past studies that indicates that teachers have difficulty implementing their beliefs into practice (Kaymakamoglu, 2018; Lebak, 2015; Savasci et al., 2012). Further, researchers have suggested that teachers believed themselves to be implementing the reform requirements when, in fact, they were not (see for example, research by Kaymakamoglu, 2018). It is suggested, therefore, that future research involve the use of observations to verify whether this is the case. Once ascertained, the challenge then, is for professional development providers to better understand the mismatch between teachers' beliefs and their perceived classroom practice and why these exist. As such, the instrument may be used to help determine teacher professional development requirements with respect to constructivist knowledge and classroom practice.

Implications for Future Research

The development of a valid and reliable tool to examine teachers' beliefs is an important first step in carrying out further research that examines how these beliefs impact reform efforts, not only in Abu Dhabi but in countries around the world. Although it is widely recognised that changing teachers' beliefs (and their practice) is key to the success of reform efforts, there is limited consensus on how to bring this about. The development of this measure will allow research that examine how teachers' beliefs about constructivism is similar to or different from their practice of constructivism in the classroom and which change comes first. Although we began the process of investigating this in the current study, we acknowledge that larger samples of teachers are needed so that confirmatory factor analysis can be used to examine the reliability of the survey.

The instrument may prove to be a useful tool for future research, for others wishing to examine both the professional development needs for teachers and in preparation for teacher training and whether the quality of the professional development makes a difference to changes in teacher belief and practice (McChesney & Aldridge, 2019). And, finally, given that past research has found that contextual factors are likely to influence teachers' beliefs, such as policies and school culture (e.g., Kaymakamoglu, 2018; Hamilton, 2018; Waters & Vilches, 2008), this instrument could be used to further research to determine whether teachers' beliefs differ between schools that differ in terms of the school cultures.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The research reported in this article was supported by an

Australian Government Research Training Programme Scholarship and a Curtin University PhD Completion Scholarship.

ORCID ID

Jill M. Aldridge  <https://orcid.org/0000-0003-0742-0473>

Notes

1. Cycle 2 equates to grades 6 to 9 or Middle school in the Western context
2. The term Cycle is used to denote the grade levels of the school; i.e. Cycle 1 = grades 1–5; Cycle 2 = grades 6–9; Cycle 3 = grades 10–12.
3. The term Common school refers to a school that consists of Cycle 1 and Cycle 2, or Cycle 1, 2, 3, or Cycles 2 and 3.

References

- Abelson, R. P. (1979). Differences between belief systems and knowledge systems. *Cognitive Science*, 3(4), 355–366. https://doi.org/10.1207/s15516709cog0304_4
- Adams, P. (2006). Exploring social constructivism: Theories and practicalities. *Education*, 34(3), 243–257.
- Afari, E., Aldridge, J. M., Fraser, B. J., & Khine, M. S. (2013). Students' perceptions of the learning environment and attitudes in game-based mathematics classrooms. *Learning Environments Research*, 16(1), 131–150. <https://doi.org/10.1007/s10984-012-9122-6>
- Aldridge, J. M., & Fraser, B. J. (2008). *Outcomes-focused learning environments: Determinants and effects*. Sense Publishers.
- Aldridge, J. M., Laugksch, R. C., Scopa, M. A., & Fraser, B. J. (2006). Development and validation of an instrument to monitor the implementation of outcomes-based learning environments in science classrooms in South Africa. *International Journal of Science Education*, 28(1), 45–70. <https://doi.org/10.1080/09500690500239987>
- Alger, C. L. (2009). Secondary teachers' conceptual metaphors of teaching and learning: Changes over the career span. *Teaching and Teacher Education*, 25(5), 743–751. <https://doi.org/10.1016/j.tate.2008.10.004>
- Al Hamdani, D. S. (2014). A constructivist approach to a mobile learning environment. *International journal of computer applications*, 93(4), 41–46.
- Al-Shammari, Z., Al-Sharoufi, H., & Yawkey, T. D. (2008). The effectiveness of direct instruction in teaching English in elementary public education schools in Kuwait: A research case study. *Education*, 129(1), 80–90.
- Benjamin, J. (2003). Revision and validation of the revised Teacher Beliefs Survey. *Annual Meeting of the American Educational research Association*, Chicago, IL.
- Berg, L. (2009). *Qualitative research methods for the social sciences*. Allyn & Bacon.
- Boghossian, P. (2006). Behaviorism, constructivism, and socratic pedagogy. *Educational Philosophy and Theory*, 38(6), 713–722. <https://doi.org/10.1111/j.1469-5812.2006.00226.x>
- Borg, S. (2006). *Teacher cognition and language education*. Continuum.

- Busch, D. (2010). Pre-service teacher beliefs about language learning: The second language acquisition course as an agent for change. *Language Teaching Research*, 14(3), 318–337. <https://doi.org/10.1177/1362168810365239>
- Chai, C. S. (2010). Teachers' epistemic beliefs and their pedagogical beliefs: A qualitative case study among Singaporean teachers in the context of ICT-supported reforms. *The Turkish online Journal of Educational Technology*, 9(4), 128–139.
- Chan, K., Tan, J., & Khoo, A. (2007). Pre-service teachers' conceptions about teaching and learning: A closer look at Singapore cultural context. *Asia-Pacific Journal of Teacher Education*, 35(2), 181–195. <https://doi.org/10.1080/13598660701268593>
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed). Routledge.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334.
- Davson-Galle, P. (2000). Contra garrisonian social constructivism. *Science and Education*, 9(6), 611–614. <https://doi.org/10.1023/A:1008785506665>
- Dirani, K. M., & Kuchinke, K. P. (2011). Job satisfaction and organizational commitment: Validating the Arabic satisfaction and commitment questionnaire (ASCQ), testing the correlations, and investigating the effects of demographic variables in the Lebanese banking sector. *The International Journal of Human Resource Management*, 22(5), 1180–1202. <https://doi.org/10.1080/09585192.2011.556801>
- Dunn, K. E., & Rakes, G. C. (2011). Teaching teachers: An investigation of beliefs in teacher education students. *Learning Environments Research*, 14(1), 39–58. <https://doi.org/10.1007/s10984-011-9083-1>
- Ercikan, K. (1998). Translation effects in international assessments. *International Journal of Educational Research*, 29(6), 543–553. [https://doi.org/10.1016/S0883-0355\(98\)00047-0](https://doi.org/10.1016/S0883-0355(98)00047-0)
- Feyzioğlu, E. Y. (2012). Science teachers' beliefs as barriers to implementation of constructivist-based education reform. *Journal of Baltic Science Education*, 11(4), 302–317.
- Fives, H., & Buehl, M. M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology*, 33(2), 134–176. <https://doi.org/10.1016/j.cedpsych.2008.01.001>
- Gardner, H. (2000). *The disciplined mind*. Penguin Books.
- Hachfeld, A., Hahn, A., Schroeder, S., Anders, Y., Stanat, P., & Kunter, M. (2011). Assessing teachers' multicultural and egalitarian beliefs: The teacher cultural beliefs scale. *Teaching and Teacher Education*, 27(6), 986–996. <https://doi.org/10.1016/j.tate.2011.04.006>
- Hamilton, M. (2018). Pedagogical transitions among science teachers: How does context intersect with teacher beliefs? *Teachers and Teaching: Theory and Practice*, 24(2), 151–165. <https://doi.org/10.1080/13540602.2017.1367658>
- Hermans, R., van Braak, J., & Van Keer, H. (2008). Development of the beliefs about primary education scale: Distinguishing a developmental and transmissive dimension. *Teaching and Teacher Education*, 24(1), 127–139. <https://doi.org/10.1016/j.tate.2006.11.007>
- Howard, D. L., & Fogarty, R. (Eds.). (2004). *The middle years: The essential teaching repertoire*. Hawker Brownlow.
- Jensen, E. (1996). *Brain-based learning*. Turning Point Publishing.

- Kagan, D. M. (1990). Ways of evaluating teacher cognition: Inferences concerning the Goldilocks principle. *Review of Educational Research*, 60(3), 419–469. <https://doi.org/10.3102/00346543060003419>
- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20(1), 141–151.
- Kang, N. H., & Wallace, C. S. (2005). Secondary science teachers' use of laboratory activities: Linking epistemological beliefs, goals, and practices. *Science Education*, 89(1), 140–165. <https://doi.org/10.1002/sce.20013>
- Kaymakamoglu, S. E. (2018). Teachers' beliefs, perceived practice and actual classroom practice in relation to traditional (teacher-centered) and constructivist (learner-centered) teaching (note 1). *Journal of Education and Learning*, 7(1), 29–37. <https://doi.org/10.5539/jel.v7n1p29>
- Kotzee, B. (2010). Seven posers in the constructivist classroom. *London Review of Education*, 8(2), 177–187. <https://doi.org/10.1080/14748460.2010.487340>
- Kırkgöz, Y. (2008). A case study of teachers' implementation of curriculum innovation in English language teaching in Turkish primary education. *Teaching and Teacher Education*, 24(7), 1859–1875. <https://doi.org/10.1016/j.tate.2008.02.007>
- Lattuca, L. R. (2006). The constructivist pedagogy we're looking for. *Journalism & Mass Communication Educator*, Winter, (4) 354–358.
- Lebak, K. (2015). Unpacking the complex relationship between beliefs, practice, and change related to inquiry-based instruction of one science teacher. *Journal of Science Teacher Education*, 26(8), 695–713. <https://doi.org/10.1007/s10972-015-9445-0>
- Lewis, K. (2009). Schools and their students need to know how to think. *The National*, 16.
- Lieberman, A., & Pointer Mace, D. (2010). Making practice public: Teacher learning in the 21st century. *Journal of Teacher Education*, 61(1-2), 77–88. <https://doi.org/10.1177/0022487109347319>
- Lim, C. P., & Chan, B. C. (2007). microLESSONS in teacher education: Examining pre-service teachers' pedagogical beliefs. *Computers & Education*, 48(3), 474–494. <https://doi.org/10.1016/j.compedu.2005.03.005>
- Luft, J. A., & Roehrig, G. H. (2007). Capturing science teachers' epistemological beliefs: The development of the teacher beliefs interview. *Electronic Journal of Science Education*, 11(2), 38–62.
- McChesney, K., & Aldridge, J. M. (2019). What gets in the way? A new conceptual model for the trajectory from teacher professional development to impact. *Professional Development in Education*, 12(1), 1–19. <https://doi.org/10.1080/19415257.2019.1667412>
- Meirink, J. A., Meijer, P. C., Verloop, N., & Bergen, T. C. M. (2009). Understanding teacher learning in secondary education: The relations of teacher activities to changed beliefs about teaching and learning. *Teaching and Teacher Education*, 25(1), 89–100. <https://doi.org/10.1016/j.tate.2008.07.003>
- Merriam, S. B. (2009). *Qualitative Research: A guide to design and implementation* (3rd ed.). Wiley.
- Metcalfe, J. (Ed.). (2008). *Revised & Updated Illustrated Oxford Dictionary*. Oxford University Press.

- Mishra, S. (2014). Assessment of learners in a constructivist learning environment. *Gyanodaya*, 7(1), 35–43.
- Mitchell, E. W. (2005). *The influence of beliefs on the teaching practices of high school foreign language teachers*. 170. Hispanic literature and Linguistics. Massachusetts Amherst University.
- Nespor, J. (1985). The role of beliefs in the practice of teaching. *Journal of Curriculum Studies*, 19(4), 317–328. <https://doi.org/10.1080/0022027870190403>
- Önen, A. S. (2011). The effect of candidate teachers' educational and epistemological beliefs on professional attitudes. *Hacettepe Üniversitesi Eğitim Fakültesi Journal of Education*, 41, 293–301.
- Ozkal, K., Tekkaya, C., Cakiroglu, J., & Sungur, S. (2009). A conceptual model of relationships among constructivist learning environment perceptions, epistemological beliefs, and learning approaches. *Learning and Individual Differences*, 19(1), 71–79. <https://doi.org/10.1016/j.lindif.2008.05.005>
- Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62(3), 307–332. <https://doi.org/10.3102/00346543062003307>
- Pituch, K., & Stevens, J. (2016). *Applied multivariate statistics for the social sciences*. Routledge.
- Powell, K., & Kalina, C. J. (2009). Cognitive and social constructivism: Developing tools for an effective classroom. *Education*, 130(2), 241–250.
- Raths, J. (2001). *Teacher beliefs and teaching beliefs*. Lilian Katz. University of Delaware.
- Richardson, V. (2003). Constructivist pedagogy. *Teachers College Record*, 105(9), 1623–1640. <https://doi.org/10.1046/j.1467-9620.2003.00303.x>
- Rink, J. E. (2001). Investigating the assumptions of pedagogy. *Journal of Teaching in Physical Education*, 20(2), 112–128. <https://doi.org/10.1123/jtpe.20.2.112>
- Roehrig, G. H., Kruse, R. A., & Kern, A. (2007). Teacher and school characteristics and their influence on curriculum implementation. *Journal of Research in Science Teaching*, 44(7), 883–907. <https://doi.org/10.1002/tea.20180>
- Ruitenbergh, C. W. (2011). The trouble with dispositions: A critical examination of personal beliefs, professional commitments and actual conduct in teacher education. *Ethics and Education*, 6(1), 41–52. <https://doi.org/10.1080/17449642.2011.587347>
- Savasci, F., & Berlin, D. F. Donna, F. B. (2012). Science teacher beliefs and classroom practice related to constructivism in different school settings. *Journal of Science Teacher Education*, 23(1), 65–86. <https://doi.org/10.1007/s10972-011-9262-z>
- Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, 82(3), 498–504. <https://doi.org/10.1037/0022-0663.82.3.498>
- Shepard, L. A. (2000). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4–14. <https://doi.org/10.3102/0013189X029007004>
- Shinde, M. B., & Karekatti, T. (2012). Pre-service teachers' beliefs about teaching English to primary school children. *International Journal of Instruction*, 5(1), 69–86.
- Snider, V. E., & Roehl, R. (2007). Teachers' beliefs about pedagogy and related issues. *Psychology in the Schools*, 44(8), 873–886. <https://doi.org/10.1002/pits.20272>

- Splitter, L. J. (2010). Dispositions in education: Nonentities worth talking about. *Educational Theory*, 60(2), 203–230. <https://doi.org/10.1111/j.1741-5446.2010.00354.x>
- Stoffels, N. T. (2005). ‘Sir, on what page is the answer?’ Exploring teacher decision-making during complex curriculum change, with specific reference to the use of learner support material. *International Journal of Educational Development*, 25(5), 531–546. <https://doi.org/10.1016/j.ijedudev.2005.02.004>
- Swartz, R. J., Costa, A., Beyer, B., Reagan, R., & Kallick, B. (2010). *Thinking-based learning: Promoting quality student achievement in the 21st century*. Teachers’ College Press.
- Taylor, P. C. (1990). The influence of teacher beliefs on constructivist teaching practices. *American Educational Research Association*. Boston, 1–31.
- Trochim, W. M., & Donnelly, J. P. (2006). *The research methods knowledge base*. Atomic Dog.
- Tsai, C. C. (2002). Nested epistemologies: Science teachers’ beliefs of teaching, learning and science. *International Journal of Science Education*, 24(8), 771–783. <https://doi.org/10.1080/09500690110049132>
- Van Driel, J. H., Bulte, A. M. W., & Verloop, N. (2007). The relationships between teachers’ general beliefs about teaching and learning and their domain specific curricular beliefs. *Learning and Instruction*, 17(2), 156–171. <https://doi.org/10.1016/j.learninstruc.2007.01.010>
- von Glasersfeld, E. (2001). Radical constructivism and teaching. *Prospects*, 31(2), 161–173. <https://doi.org/10.1007/BF03220058>
- Vygotsky, L. S. (1962). *Thought and language*. MIT Press.
- Warwick, D. P., & Osherson, S. (1973). *Comparative analysis in the social sciences*. Englewood Cliffs. Prentice-Hall.
- Waters, A., & Vilches, M. (2008). Factors affecting ELT reforms: The case of the Philippines basic education curriculum. *RELJ Journal*, 39(1), 5–24.
- Wheatley, K. F. (2005). The case for reconceptualizing teacher efficacy research. *Teaching and Teacher Education*, 21(7), 747–766. <https://doi.org/10.1016/j.tate.2005.05.009>
- Wong, A. K., Chan, K. W., & Lai, P. Y. (2009). Revisiting the relationships of epistemic beliefs and conceptions about teaching and learning of pre-service teachers in Hong Kong. *The Asia-Pacific Education Researcher*, 18(1), 1–19. <https://doi.org/10.3860/taper.v18i1.1033>
- Yin, R. K. (2011). *Qualitative Research from Start to Finish*. The Guilford Press.
- Yurdabakan, I. (2011). The view of constructivist theory on assessment: Alternative assessment methods in education. *Egitim Bilimleri Fakultesi Dergisi*, 44(1), 51–77. https://doi.org/10.1501/Egifak_0000001215
- Zhang, F., & Liu, Y. (2014). A study of secondary school English teachers’ beliefs in the context of curriculum reform in China. *Language Teaching Research*, 18(2), 187–204. <https://doi.org/10.1177/1362168813505940>

Author Biographies

Monika von Oppell has been an educator for 45 years. She completed an MEd in Critical and Creative Thinking and Technology education at Johannesburg University and went on to join the Edward de Bono Foundation where she worked on Platinum mines teaching illiterate mineworkers Thinking skills and assisted in Corporate training in the use of Thinking Skills. She spent 5 years developing and implementing a

whole school thinking skills programme in Australia. In 2007 Monika moved to the UAE where she was involved in the implementation of an education reform programme assisting teaching in understanding the pedagogy associated with an outcomes-based programme.

Jill Aldridge is an associate professor at Curtin University. Her research interest lies in examining educational change at the macro- (system-wide reform) and micro- (school improvement and teacher change) levels. Her current work with NSI Partnerships, involves the use of student feedback to improve the school and classroom climate in over 300 schools and with more than 3000 teachers.