ROMA TRE
UNIVERSITÀ DEGLI STUDI

TEORIA E RICERCA EDUCATIVA E SOCIALE
SEZIONE PEDAGOGIA

SCUOLA DOTTORALE / DOTTORATO DI RICERCA IN

XXVII

CICLO DEL CORSO DI DOTTORATO

TEACHERS BELIEFS ABOUT TEACHING, LEARNING AND USE OF CRITICAL THINKING IN PRIMARY CLASSROOM: THE ROLE OF TEACHER SENSE OF EFFICACY

Titolo della tesi

SUSANNA MASSA
Nome e Cognome del dottorando — firma

PAOLA PERUCCHINI
Docente Guida/Tutor Prof. — firma

G. ALESSANDRINI
Coordinatore: Prof. — firma

Acknowledgements

I wish to thank my tutor, Professor Paola Perucchini, for her great patience, interest, and support throughout my studies at Roma Tre University. Special thanks to Dr. Giovanni Maria Vecchio for explaining the details of statistical analysis. I would like to acknowledge the Institute of Education in London for the period of study that I spent there. Thanks to my husband Satish, my son Giulio, my niece Sofia, to all my family (including in-laws), and friends who encouraged me a lot during this experience.

Introduction

During the past three decades research on teachers' beliefs has grown rapidly and this line of research has generated a considerable area of inquiry on the nature of teaching. Research aims to describe teachers' beliefs and to understand how they are linked to teachers' practices and influence students behaviour and achievements.

Pajares (1992) cites several sources in support of the assumption that beliefs are one of the best indicators of the decisions individuals make throughout their lives and he suggested a strong relationship between teachers' educational beliefs and their planning, instructional decisions, and classroom practices.

In recent years the teaching of thinking skills and, in particular, of critical thinking has become a central focus of education too. For example, Ball (1989) documented the emergence in OECD (Organisation for Economic Co-operation and Development) countries of policies, programs and projects designed to develop higher level competencies e.g. related to creativity, initiative, problem solving and flexibility. The term critical thinking can be found in educational policy documents which underlines the inclusion of critical thinking skills in curricula and academic education systems. Critical thinking has been an important issue for many years.

It is generally agreed that by learning only a content-based curriculum, children cannot become better thinkers able to give reasons for their conclusions, to think flexibly and creatively, to solve problems and make good decisions. The concept of critical thinking may be one of the most significant trends in education relative to the dynamic relationship between how teachers teach and how students learn (Mason, 2010). Critical thinking, as the ability to involve in meaningful, self-regulatory judgement, is generally recognized as an essential skill and most educators would agree that learning to think critically is one of the most desiderable goals of formal schooling. Despite the controversy over a unified definition for critical thinking, there is a general consensus that critical thinking can be influential in almost every discipline and occupation, with abilities such as problem-solving and decision-making. Dewey (1933) stated that the central purpose of education is learning to think. This means not only thinking about important problems concerning disciplinary areas but thinking about the political, ethical and social challenges in everyday life. In particular, critical thinking skills have also gained attention in research related to student attitudes and achievement, and a diverse body of educational research reported the importance of promoting higher-order thinking skills and the positive influence of critical thinking on learners' achievement (e.g Davidson & Dunham, 1997; MacBride & Bonnette, 1995).

Despite the general agreement regarding the importance of teaching students to think critically, there are very few studies about the beliefs of teachers on critical thinking activities (e.g. Raudenbush et al. 1993; Zohar et al., 2001; Torff, 2005, 2006, 2008; Torff and

Warburton, 2005). This present study would contribute towards filling the lack of knowledge in the Italian context, and to investigate primary school teachers' beliefs about critical thinking activities in relation to different population of pupils.

The first chapter of this thesis is dedicated to a literature review in the field of teachers' beliefs, critical thinking and teachers' sense of self-efficacy.

Chapter number two contains a study about the development of a first instrument to investigate primary teachers' beliefs about the use of critical thinking in classrooms with different populations of pupils: The Critical Thinking Beliefs Appraisal for Primary School Teacher (CTBA-P). This chapter also includes an analysis of data from the administration of the new instrument to a sample of Italian primary school teachers, and a comparison of teachers' beliefs about low and high critical thinking activities for low and high advantage pupils.

Chapter number three is dedicated to investigating the relationship between primary school teachers' beliefs about classroom use of critical-thinking activities, and their beliefs about teaching and learning, and sense of self-efficacy. Comparisons among teachers will be examined to demonstrate or otherwise the influence of beliefs about teaching and learning, and self-efficacy on beliefs about the use of critical thinking in the sample of teachers.

I. Teachers' beliefs and critical thinking perspectives. A review of the literature

1. Exploring the construct of teachers' beliefs

Research on teachers' beliefs spans more than 60 years (Oliver, 1953) and concerns theoretical perspective, research methodologies and identification of specific beliefs about topics. As Fives and Buehl wrote, despite the published empirical research on teachers' beliefs including more than 700 articles, there is a lack of cohesion and clear definitions (2012).

The first two reviews about research on teachers' beliefs (Kagan, 1992; Pajares, 1992) offer a valuable analysis of the rapidly growing research literature on the topic. Kagan in 1992 asserted that most teachers' professional knowledge can be defined more accurately than belief, as knowledge is generally regarded as something which has been affirmed as true on the basis of objective proof or consensus of opinion. She reviewed 25 studies of teachers' beliefs and showed that most beliefs were stable and resistant to change, because the beliefs were mostly tacit and were primarily influenced by three contexts: the students, the content, and their experientially derived personal beliefs. Pajares (1992) attributed the confusion in the proliferation of psychological constructs to the lack of a clear distinction between knowledge and beliefs. In his review, he examines the meaning prominent researchers give to beliefs and how this meaning differs from that of knowledge. Belief is an individual's judgement of the truth or falsity of a proposition that can only be inferred from a collective understanding of what human beings say, intend, and do and cannot be directly observed or measured (Pajares, 1992). In contrast, knowledge has been characterized as having a truth component that can be externally verified or confirmed using procedures accepted by the larger community as appropriate for evaluating and judging the validity of a claim, in accordance with Richardson (1996).

In addition, Pajares (1992) asserted that the investigation of teachers' beliefs is a necessary and valuable avenue of educational inquiry but, this avenue continues to remain lightly travelled. Researchers who have wandered into it have found exploring the nature of beliefs a rewarding enterprise, and their findings suggest a strong relationship between teachers' educational beliefs and their planning, instructional decisions, and classroom practices.

Recently Fives and Buehl (2012) engaged a third exhaustive review of the published literature until August 2009. They found more than 745 articles, of which 627 were adequate on the criteria established (i.e peer reviewed, empirical, written in English). In addition, they coded approximately 300 articles to identify the themes in the research and organized them into seven general topics: beliefs about development, diversity, knowledge (including subject

area, pedagogy, and pedagogical content knowledge), self, schools, vested parties, and teacher preparation. The authors identified two alternative approaches to explain what teachers' beliefs are. The first originates from a descriptive perspective and names the various topics on which teachers hold beliefs. The second attempts to define the underlying construct of teachers' beliefs and identify the characteristics used to distinguish it.

In the first approach, the topics of teachers' beliefs were: beliefs about self, context or environment, content or knowledge, specific teaching practices, teaching approach, and students. For example teachers' beliefs about teaching were split into two areas. The first area was teachers' beliefs about specific teaching practices, which included beliefs about topics such as cooperative learning, teaching science, or the use of inquiry strategies. The second area of teaching beliefs refers to teachers' beliefs about a holistic approach to teaching such as constructivism, transmission, or developmentally appropriate practices.

Defining teachers' beliefs is the second approach that these authors use to explain what teachers' beliefs are. Fives and Buehl (2012) disagree with the authors that affirmed the difficulty in defining teachers' beliefs (e.g. Johnson, 1994, Pajares, 1992) because in their opinion what is difficult is getting authors to consistently define and use terms within and across fields that examine these constructs. They offer specific examples of how teachers' beliefs have been defined and where these definitions fall along the identified characteristics. Characteristics prevalent in definitions of teachers' beliefs include their implicit and explicit nature, stability over time, situated or generalized nature, relation to knowledge, and existence as individual proposition or larger system.

Regarding the implicit and explicit nature, the distinction was based on the theoretical conceptualization of beliefs as understandings of which individuals are conscious (explicit) or unaware (implicit or tacit). For example, when a teacher's beliefs are implicit (e.g. Kagan, 1992; Osisioma & Moscovici, 2008), it is considered that beliefs guide the teacher's behaviour without their awareness. Implicit beliefs are beyond the control of the teacher (Nespor, 1987) and cannot be influenced by personal reflective practice. An approach to understanding implicit teachers' beliefs is to examine teachers' enacted beliefs through analysis of actual teacher actions, planned actions, or dialogues, but the researchers' biases and perspectives may influence the beliefs assigned to research participants. The other perspective considered beliefs explicit to the teacher (e.g. Rimm-Kaufman, Storm, Sawyer, Pianta & La Paro, 2006). If beliefs are explicit, researchers can ask teachers what their beliefs are and use those responses as the unit of analysis. Studies of teachers' espoused beliefs have used interview protocols (e.g. Byran, 2003) or questionnaires (e.g. Tschannen-Moran & Woolfolk-Hoy, 2001; Fives and Buehl, 2008). The risk using these techniques could be that teachers give the desired answer and may not differentiate across beliefs or not share the same language as the researchers or are aware of what they believe.

Fives and Buehl (2012) affirmed more realistic that teachers hold both implicit and explicit beliefs that influence their teaching practice, and when we attempt to access teachers' implicit beliefs these conceptions become explicit in the process.

Beliefs are viewed as stable or as dynamic. Both views are supported by research evidence and many researchers have described beliefs as relatively stable and resistant to change and in contrast others have found that teachers' beliefs do change over time (e.g. beliefs about classroom practices, management, and children [La Paro, Siepak, & Scott-Little, 2009]). Fives and Buehl (2012) suggested it is necessary to understand which teachers' beliefs may be more open to change and what factors, including teaching experiences, may contribute to change. They argue that for teachers' beliefs to be a viable construct for research, intervention, or practice, some degree of plasticity is needed that will allow beliefs to change with experience and interactions in professional communities, but some degree of consistency is also necessary. It seems evident that specific beliefs may be considered on a continuum with long-held, deeply integrated beliefs at the stable end and new, more isolated beliefs at the unstable end.

Another issue in defining teachers' beliefs pertains to whether they are viewed as situated in contexts or generalizable across situations. The research in this area focuses on the degree to which teachers' beliefs vary or remain consistent across different contexts or settings. Fives and Buehl (2012) suggest resolving the tension between the context-dependent and context-independent views of beliefs, by recognizing that beliefs vary in their level of specificity. Teachers hold both general and specific beliefs about a variety of topics. For example, researchers on teachers' efficacy have pressed the issue of specified level in measuring belief, resulting in greater clarity in the ways in which teachers' sense of efficacy beliefs are assessed and discussed (Tschannen-Moran & Woolfolk-Hoy, 2001).

Finally, beliefs are best understood as integrated systems. Pajares (1992) affirmed that belief substructures, such as educational beliefs, must be understood in terms of their connections not only to each other but also to other, perhaps more central, beliefs in the system. Despite the widespread agreement that teachers' beliefs exist in a system, few empirical investigations have examined beliefs as complex systems. Two exceptions come from the field of science education (Bryan, 2003; Mansour, 2008) and examine belief systems from a constructivist perspective. Byran (2003) examined the belief system of a prospective elementary teacher about science teaching and learning as she developed professional knowledge within the context of reflective science teacher education. From an analysis of interviews, observations, and written documents, a profile of this teacher's beliefs was constructed that consisted of three foundational and three dualistic beliefs. Her foundational beliefs concerned: the value of science and science teaching, the nature of scientific concepts and goals of science instruction, and control in the science classroom. That teacher held dualistic beliefs about how children learn science, the science students' role, and the science teacher's role. Her dualistic beliefs formed two contradictory nests of

beliefs. One nest, grounded in lifelong science learner experiences, reflected a didactic teaching orientation and predominantly guided her practice. The second nest, not well grounded in experience, embraced a hands-on approach and predominantly guided her vision of practice. The findings accentuate the complexity and nestedness of teachers' belief systems and underscore the significance of identifying prospective teachers' beliefs, espoused and enacted, for designing teacher preparation programs.

Regarding the functions of teachers' beliefs, the authors (Fives and Buehl, 2012) identify three functions that beliefs serve relating to action: filters for interpretation, frames for defining problems, and guides or standards for action.

As a filter, beliefs are related to practice by the manner in which they influence human perception and the interpretation of information and experience. A study of kindergarten teachers' beliefs about developmentally appropriate or inappropriate practices (Lee, Baik, & Charlesworth, 2006) offers an example of the filtering role of beliefs. These researchers surveyed 242 teachers to identify those holding developmentally appropriate or developmentally inappropriate beliefs. Teachers in each of six groups (40 in each) were randomly assigned either to receive inservice training on the use of scaffolding or to serve as control group members. Before the training, no difference was observed in the two groups' use of scaffolding in observations of their interactions with little students. After the training, the developmentally appropriate teachers used scaffolding more than those with developmentally inappropriate beliefs. This suggests that the developmentally appropriate beliefs were more adaptive for teachers learning this new teaching practice, presumably because it was congruent with their existing beliefs.

The framing role of beliefs is reflected in the ways in which beliefs are used to define or frame a problem or task. An example of how beliefs serve as a framing device is seen in a study of preservice teachers' beliefs about knowledge and learning in an early literacy course (Yadaw & Koehler, 2007). Participants were asked to review videotaped cases, select clips as examples of good reading instruction, and describe the events in the selected clips noting why each was an example of good instruction. Two participants with different beliefs about knowledge and learning selected different video clips and discussed each in very different terms. The preservice teacher with the more simplistic view of knowledge focused on how the teacher in the video pointed out mistakes and corrected students' errors without citing explanation as an example of good instruction. In contrast, the preservice teacher with a more integrated view of knowledge focused on how the teacher discussed the students' work instead of just giving the correct answers. This finding suggests that individual beliefs help teachers to choose the best approach in teaching (i.e. to correct mistakes or to discuss deeper aspects of the students' work and help the student to develop an understanding of the writing process).

Finally beliefs guide action. For example, teachers' sense of efficacy beliefs are viewed as motivational constructs that influence or guide the goals teachers set, their effort toward

meeting those goals, their perseverance in the face of challenges, and how they feel while engaged in the task (Bandura, 1997). These behaviours then influence the quality of teachers' practices.

2. Teachers' beliefs and the relationship with teachers' practices

One line of research on teachers' beliefs stems from the possible relationship between teachers' beliefs and practice (Calderhead, 1996; Pajares, 1992; Richardson, 1996; Woolfolk-Hoy, Davis, & Pape, 2006), and there are different perspectives on how teachers' beliefs and practices may relate to each other. Beliefs are often identified as precursors to behaviour (Pajares, 1992) and support for this view has been ascertained by identifying teachers' beliefs through surveys, interviews, or other evidence (e.g. written reflections, statements during professional development) and then examining them in relation to reported or observed practices. When teachers' beliefs are correlated with, aligned to, or reflected in their practice, various researchers have concluded that teachers' beliefs influence their practices. For example, Wilkins (2008) verified this for 481 inservice elementary teachers' level of mathematical content knowledge, attitudes toward mathematics, beliefs about the effectiveness of inquiry-based instruction, and use of inquiry-based instruction. Upper elementary teachers tend to have greater content knowledge and more positive attitudes towards mathematics than primary teachers (teachers that are teaching in the lower classroom). Both these groups of teachers have the same beliefs about effective instruction, but primary level elementary teachers were found to use inquiry-based instruction more frequently than upper elementary teachers. Content knowledge was found to be negatively related to beliefs in the effectiveness of inquiry-based instruction and use of inquiry-based instruction in their classroom. Teachers with more positive attitudes towards mathematics were more likely to believe in the effectiveness of inquiry-based instruction and use it more frequently with students. Authors of this study found that teachers' beliefs (e.g. teachers' self-efficacy beliefs) were a strong direct predictor of inquiry instructional practices. Song and Looi (2012) conducted case studies of two teachers with markedly different beliefs about student learning, identified through interviews and videotaped professional development sessions, as they implemented the same lesson plan on fractions and division. Based on a moment by moment analysis of instructional practices, classroom interactions, and student learning, the authors concluded that teachers with innovation-oriented beliefs implement patterns of inquiry-principle-based practices that in turn support meaningful student-inquiry learning.

An alternative to the argument that beliefs are precursors to practice is the position that teachers' beliefs are shaped by engaging in specific actions and practices (Guskey, 1986). Support for this connection between beliefs and practices is seen most readily in studies on the effects of professional development on practicing teachers' beliefs and the effects of field experiences on preservice teachers' beliefs. Changes in beliefs have been identified after experiences in which practicing or preservice teachers engaged in specific classroom practices. The influence of teachers engaging in specific practices on their beliefs is often

seen in the context of teachers' teaching self-efficacy beliefs or other ability-related beliefs (e.g. capability beliefs). As theorized by Bandura (1997), individuals gain information about their capability to perform a task by personally engaging in it. However, for teaching self-efficacy beliefs to increase it is important that individuals experience success. Thus, the level of support that teachers receive during the experience may determine whether self-efficacy beliefs will increase, decrease, or remain unchanged (i.e. Lumpe, Czerniak, Haney, & Beltyukova, 2012; Tschannen-Moran & McMaster, 2009; Yilmaz & Cavas, 2008). In their quasi-experimental study, Tschannen-Moran and McMaster (2009) found that some teachers who received professional development without follow-up coaching (i.e. additional support and greater potential to experience success) decreased in their sense of self-efficacy. Additionally, Lumpe et al. (2012) found that elementary teachers increased in their science teaching self-efficacy after participating in a professional development program that included 80 hours of summer professional development, bi-weekly visits and coaching with a trained support teacher throughout the academic year, and participation in a lesson study in which each teacher reflected on the strengths and weaknesses of a lesson they wrote. These findings indicate that engaging in specific teaching practices can increase teachers' sense of efficacy beliefs when they experience success with those teaching practices.

There is also evidence that engaging in specific practices can change other teacher beliefs, e.g. beliefs about inclusion (Swain, Nordness, & Leader-Janssen, 2012); beliefs about classroom management (Yilmaz & Cavas, 2008) and beliefs about inquiry (Rushton et al., 2011). For instance, Swain et al. (2012) found that there were increases in preservice teachers' beliefs about the inclusion of students with special needs after they completed an introductory special education class that included a 20 hour field component in which the preservice teachers observed and worked with students with disabilities. Similarly, Rushton et al. (2011) found that high school chemistry teachers were more likely to endorse inquiry views of science teaching after participating in professional development that included a two-week summer institute and support throughout the academic year. In contrast, Yilmaz and Cavas (2008) found that after participating in a teaching practicum, preservice teachers became more controlling with respect to their beliefs about managing students and less controlling with respect to managing instruction. Together these findings demonstrate how engaging in specific practices may influence the beliefs that teachers hold.

Considering these findings, researchers affirmed that there is a reciprocal but complex relationship between teachers' beliefs and practices (Basturkemen, 2012; Mansour, 2009). Beliefs and practices influence one another (Richardson, 1996; Thomposon, 1992) and the strength of this relationship may vary across individuals and contexts as well as the type of beliefs and practices being assessed.

Longitudinal studies of preservice and practicing teachers' beliefs and practices provide evidence of the reciprocal and dialectical relations between beliefs and practices (e.g. Mouza, 2009; Turner, Reynolds, 2001). Kang (2008) examined how preservice secondary

science teachers translated their personal epistemologies and science teaching goals into specific actions during a science methods course that included a six-hour a week field experience in which the preservice teachers observed and taught science lessons. Although 48% of the 23 preservice teachers in the sample kept their initial personal epistemologies and science teaching goals and enacted these beliefs in their teaching (suggesting that for those teachers beliefs influence practice), 30% of participants engaged in practices that were different from their initial beliefs. Specifically, five preservice teachers enacted more sophisticated practices (e.g. engaging in inquiry-based activities and asking thought-provoking questions) than their beliefs would have suggested in an effort to 'try out' the methods advocated in their science methods classes. After being successful in these practices, these preservice teachers experienced a shift in their personal epistemologies and teaching goals. Five other preservice teachers in the study were not satisfied when their teaching action did not reflect their beliefs, including three who developed more sophisticated views of science and teaching after engaging in the field experience. These individuals left the course planning to try alternative teaching practices in the future.

In a four year case study of an elementary teacher that spanned her last year of teacher preparation through to her first three years of teaching, Georgiadou-Kabouridis and Potari (2009) documented how the teacher's initial beliefs about teaching elementary students the concept of number were challenged, and ultimately modified, during her student teaching and first year teaching experiences. The changes in her beliefs influenced future teaching decisions and prompted her to seek out additional opportunities to develop her mathematics teaching. Such findings show how engaging in practices informs teachers' beliefs which then affect subsequent actions.

It is also important to note that there was never a perfect correspondence between beliefs and practices. Lim and Chai (2008) conclude teachers' beliefs and practices were misaligned based on five out of six teachers expressing a constructivist orientation but implementing lessons that were predominately traditional. However, 80% of lessons had some constructivist elements. In their study, one teacher expressed a more traditional view of teaching and implemented more traditional lessons i.e. beliefs are aligned for some teachers, but mismatched for others.

The teacher's level of development and expertise is one factor that may contribute to the congruence of beliefs. Ertmer et al. (2012) examined the beliefs and technology integration practices of 12 secondary school teachers recognized for their award-winning technology practices. For 11 of 12 teachers, their espoused beliefs about teaching and technology were evident in their practices assessed from documents available on the teachers' websites. The authors characterized the one teacher whose beliefs and practices did not align as being 'in transition'. This teacher expressed student-centred beliefs but her use of technology was predominately skill-based. However, there was evidence that the teacher was beginning to use technology to make instruction more student-centred.

In his review of literature, Pajares (1992) determined that preservice teachers often enter the field of education because of positive past school experiences. This means that they may not look at how the field of education could be changed or improved, but rather why it should stay the same. Pajares stated that “most preservice teachers have an unrealistic optimism and a self-serving bias that account for their believing that the attributes most important for successful teaching are the ones they perceive as their own” (p. 323). Often preservice teachers fall victim to what Lortie (1975) called the apprenticeship of observation; preservice teachers believe that they should teach as they were taught. Those who were taught through a constructivist instructional model will believe that using a constructivist instructional model is the best way to teach, while those who were taught with a traditional instructional model will prefer to teach with a traditional instructional model. One of the major challenges of teacher education programs is encouraging preservice teachers to teach in ways which are new to them (Harkness, 2009; Richardson, 2003).

Preservice teachers whose past experiences in the classroom were based on a traditional instructional model may have difficulty learning to implement a constructivist instructional model (Harkness, 2009). Although well-applied constructivism can have great benefits in terms of student learning (Ball & Bass, 2000), there are very real risks when it is not practiced effectively, such as confusing students and creating misconceptions (Sert, 2008). Constructivist teachers not only have to be experts in the content knowledge themselves, but also have a good idea of how much their students know about the content. In addition, they have to be willing to learn from their students; that is, they have to be able to take the answers of their students seriously and be willing to fully explore where the ideas behind the answers came from. The professional practice of taking the time to listen to and learn from students can be difficult to perform, especially for preservice and new inservice teachers (Harkness, 2009; Richardson, 2003).

This difficulty was further demonstrated in a year-long multi-case study looking into the beliefs and practices of six preservice teachers. Ogan-Bekiroglu and Akkok (2009) attempted to judge whether the preservice teachers who held constructivist teaching beliefs were putting these beliefs into practice in the classroom. Six participants were interviewed regarding their beliefs within the following categories: classroom environment; teaching activities and assessment; the teacher’s role in the classroom; and instructional goals. Following the interviews, participants were observed in teaching situations to assess whether their actions lined up with their interview responses within the aforementioned categories. The authors of this study classified the preservice teachers’ beliefs and practices as constructivist, traditional and transitional (i.e. a mix of both constructivist and traditional). The preservice teacher identified as having transitional beliefs displayed the greatest inconsistency between her beliefs and practices. This study also suggests that when teachers’ beliefs are in flux, they may not necessarily align with observed practice. Additionally, in a review of 17 studies examining language teachers’ beliefs and practices,

Basturkmen (2012) found that beliefs and practices were more consistent for experienced teachers than less experienced teachers.

Fives and Buehl (2012) view beliefs as precursors to action and consider changes in teachers' beliefs necessary for effective change in teaching practices. They argue that it is not a matter of whether beliefs and practice are congruent or not, but rather the degree of congruence or incongruence between beliefs and practice. It could be more useful to consider why beliefs and practices are not consistent because the apparent lack of relationship may be attributable to various factors working individually or in tandem. If beliefs serve different functions (i.e. filter, frames or guides), the reasons for the lack of congruence between teacher beliefs and practices may be related to the role a particular belief plays in a teacher's cognition and decision making. Even though a teacher may hold and express a particular belief, other beliefs may impinge on the actual practice that is carried out. Various internal (e.g. knowledge, value) and external (e.g. classroom context, administrative expectations, policy demands) factors may support or hinder the enactment of a belief, contributing to the apparent lack of relationship between teachers' beliefs and practices.

3. Teachers' beliefs about teaching and learning

Beliefs about teaching and learning may be the forefront of teachers' work and influence their classroom decisions and behaviours (e.g. Fives & Buehl, 2012; Pajares, 1992). In particular, beliefs about teaching (e.g., how it should be done, what methods are most effective, who is responsible for it, etc.) should guide the classroom-level decision of teachers.

From this perspective, Tadich, Deed, Campbell, and Prain's investigated (2007) how beliefs about teaching and learning are relevant in teachers' practice, i.e. all activities associated with teaching, including but not limited to lesson planning, assessment activities, instruction and interactions with students, parents and colleagues. They described a case study in which 24 eighth grade teachers in Australia believed it was their responsibility as the teacher to elicit and maintain student engagement. Thus, they believed that teaching included engaging students and identified a series of specific instructional strategies (e.g., task choice, novel teaching approaches) to facilitate this goal. While the teachers perceived some constraints in their ability to fully implement such practices, they did attempt to be less directive and give students more choices in the classroom. Furthermore, Tadich et al. (2007) suggested that these teachers were questioning a more traditional teacher-centred approach. Such attempts at change in practice could not begin without teachers believing that engagement is part of teaching and that routes to engagement included varied instructional approaches and student choice. This investigation offers descriptive insight into the practice of teachers and their need to balance and weigh beliefs about learning (what students need to learn, in this case engagement) and beliefs about teaching (how teachers design and implement instruction and assessment).

There are few studies that directly focused on teachers' beliefs about learning (Chan, 2011; Brownlee & Chak, 2007). Chan (2011) used the term *conception* to refer to beliefs about learning and examined conceptions of learning from a perspective that delineated two broad categories of learning: quantitative and qualitative. Quantitative learning referred to a more shallow measure of how much knowledge is acquired and reproduced while qualitative learning is a deeper conception regarding a change in one's views and understanding through learning. Chan (2011) examined the epistemological beliefs and learning conceptions of 231 preservice teacher education students in Hong Kong using a questionnaire consisting of two scales: Epistemological Beliefs Scale (EBS) (Chan and Elliott 2002) and Conceptions of Learning Inventory (COLI) (Purdie and Hattie 2002).

Beliefs were measured by responses to 45 items that fell along 9 separate dimensions of learning. For example, learning could be viewed as something that I am able to use in daily life, or as a degree of understanding (i.e. learning making sense out of new information and ways of doing things) (Chan, 2011). Overall, mean scores of the dimensions representing

qualitative views of learning were higher than scores categorized as quantitative. Chan (2011) concluded that these teacher education students were more likely to adopt a qualitative rather a quantitative conception of learning. In this investigation, conceptions of learning were treated as dependent variables in a structural equation model whereas epistemological beliefs about the nature of knowledge were found to predict conceptions of learning. These findings suggest that teachers and teacher educators help learners explore their epistemological beliefs so that conceptions of learning might be addressed. The assumption is that conceptions of learning as understanding, rather than as remembering or increasing knowledge, are more desirable. This perspective is acceptable in general but it should probably consider the empirical ramifications of particular beliefs given the socio-political contexts of teachers' professional lives.

For example a traditional, teacher-centred model of instruction was found to be prevalent among a team of four eighth grade mathematics teachers in a suburban middle school in Florida (Gill & Hoffman, 2009). These findings were based on an analysis of teacher discourse during their shared planning time. Common traditionalist beliefs held by the teachers included the importance of problem solving only after teaching the rules (e.g. algorithms, procedures); the use of extrinsic rewards to increase student learning; textbooks as the primary source of information; and the belief that students' intellectual ability is limited, stable and innate.

Snider and Roehl (2007) investigated beliefs about constructivist and explicit teaching practices as they analyzed the survey responses of 344 teachers from kindergarten through to grade 12. The results indicated that one-quarter to one-third of these teachers agreed with statements consistent with constructivism even though these same teachers also espoused support for explicit instruction. The majority of the teachers, however, were inconsistent or undecided about their pedagogical beliefs.

4. Teachers' self efficacy

In 1977, Bandura introduced the construct of self-efficacy as belief in one's capabilities to organize and execute the courses of action required to produce given attainments. People have little incentive to act if they believe that the task in their hands exceeds their capabilities, but they undertake and perform activities if they believe that their actions can produce the desired outcomes. Self-efficacy beliefs also determine how long individuals will persevere and how resilient they will be in the face of difficulties and how much effort they will expend on an activity. Individuals with a high self-efficacy perception expect to succeed and will persevere in an activity until it is completed. On the contrary, individuals with low self-efficacy perception anticipate failure and are less likely to persist doing challenging activities. The higher the sense of efficacy, the greater the persistence, and resilience (Bandura, 1977; Pajares, 2002).

Applied to the context of education teacher efficacy has generally been defined as the extent to which teachers believe they can affect student learning (Dembo & Gibson, 1985). It reflects on what teachers will be able to do in a particular situation, not what they already accomplished, or why they accomplished it in the past (Hoy, 2004).

Tschannen-Moran et al. (1998) and Wheatley (2002) linked teacher self-efficacy more directly to a teacher's belief in his or her ability to influence student outcomes. So, teacher-efficacy relates to a context-specific assessment of one's ability to instruct students in a particular curriculum area or in a particular manner. Hence, teacher efficacy is a future oriented, task-specific judgement (Woolfolk Hoy et al., 2009). Teacher academic expectations are also future-oriented judgements, and may be curriculum-specific. Teacher expectations may be defined as the judgements teachers make about the amount of academic progress they believe students will make by the end of a specific time frame. When researchers are investigating teacher expectations these are often also related to a specific curriculum area such as reading (Rubie-Davies, 2007) or mathematics (Schullo & Alperson, 1998). Teacher expectations can be viewed as a dyadic relationship whereby teachers have differing expectations for each individual child in the classroom (often related to characteristics of the child, e.g., ethnicity, social class, gender, ability). This is the traditional view. However, expectations can also be viewed at the whole class level. From this perspective, some teachers have high expectations for all their students (high expectation teachers) while other teachers have low expectations for all students (low expectation teachers). This is not to say, the expectations are equally high (or low) for all students, but rather, controlling for student achievement at the beginning of the year, high expectation teachers expect all students to make substantial academic gains by the end of the year, while low expectation teachers do not anticipate that their students will make many gains (again controlling for prior achievement).

Rubie-Davies (2008a) investigated whole class teacher expectation effects on student achievement in reading and found that the beliefs of high and low expectation teachers were quite different. High expectation teachers believed that students should work in mixed and flexible ability groupings for reading, be given choices about the activities they completed, be exposed to challenging learning experiences and have clear learning goals. On the other hand, low expectation teachers believed that students learnt best in reading when they were grouped by ability and when the teacher planned quite distinct activities for high and low ability students. The low expectation teachers believed they should make the decisions about what students should learn, how, and with whom.

Gibson and Dembo (1984) in a classroom study of eight elementary teachers concluded that high and low efficacy teachers demonstrated differential patterns of behaviour in the classroom. While there was not a significant difference in teacher use of time between high efficacy and low efficacy teachers in the general categories of total academic and total non academic time, there were differences detected in subcategories of behaviour. Compared with the low efficacy teachers, the high efficacy teachers spent less time in small group discussions and more time monitoring and checking seatwork, in preparation or paperwork and in whole class instruction. High efficacy teachers also showed significantly more persistence than low efficacy teachers in leading students to correct responses and work longer with a student who is struggling.

Podell and Soodak (1993) found that greater efficacy also enables teachers to be less inclined to refer a difficult student to special education. They reported that low efficacy teachers were more likely than high efficacy teachers to refer students who were difficult to teach special services. This was particularly the case with students from low socioeconomic backgrounds.

According to Henson (2001) teachers' efficacy has been one of the few variables consistently related to positive teaching behaviour and student outcomes. Compared to teachers with lower self-efficacy beliefs, Goddard et al. (2004) reported that teachers with strong self-efficacy perceptions are more organised, better planned, student-centred and humanistic, and more receptive to student ideas (Anthony & Kritsonis, 2007). In this sense, teachers with limited classroom management skills and low rates of praise often have classrooms with higher rates of aggression, which in turn can maintain behavioural problems (Shernoff & Kratochwill, 2007). By contrast, teachers with a high sense of efficacy are less likely to criticise students following incorrect responses, more likely to persist with students in a failure situation, and more likely to divide a class for small group instruction as opposed to instructing the class as a whole. Those teachers are more likely to declare regular education as the appropriate placement for students with learning problems, behavioural problems, or both (Tschannen-Moran et al., 1998)

Associations have been found between teachers' self-efficacy beliefs and the observed practices of teachers. In one study by Anderman and colleagues (Anderman, Patrick,

Hruda, & Linnenbrink, 2002), teachers with low mastery beliefs were found to consider learning to be an individual process, best achieved by listening to the teacher and following instructions. Student interaction was not considered helpful for learning and students were not encouraged to collaborate or share answers. Students received recognition if they followed procedures and obeyed the teacher rather than through achieving success on tasks. In contrast, teachers high in mastery beliefs focused on understanding and improvement because mistakes were considered informative for learning. Conversations with students were supportive, constructive and focused on the next steps in learning. Students were encouraged to actively participate in class and to work together. Students received feedback in relation to the task rather than in relation to procedures. Thus it can be seen that teacher beliefs appear to influence teacher practice.

Teacher efficacy is also seen as a multidimensional construct, for example Ashton and Webb (1982) identifies two dimensions: teaching efficacy and personal efficacy. The first factor represents a teacher's sense of teaching efficacy or belief that teachers can overcome factors external to the teacher such as the background students. Individuals with strong teaching self-efficacy believe they are capable of positively influencing student performance. They choose challenging activities and try harder when confronted with obstacles such as student ability or a student's home environment. They are not easily distracted and take pride in their accomplishments when their work is completed (Ashton & Webb, 1986). They tend to believe that all students can learn if appropriate conditions for learning can be provided (Tschannen-Moran & Hoy, 2001).

The second dimension, personal efficacy, is the belief of an individual teacher in their own personal capacity to deliver the necessary teaching behaviours to influence student learning. Research suggests that teachers' classroom management choices and instructional strategies, including the use of time and questioning techniques, are influenced by their own perceptions of their teaching competence (Gibson & Dembo, 1984). Teachers who tend to be preoccupied with their own inadequacies may doubt their ability to motivate certain students. Additionally, teachers with lower personal teaching self-efficacy will allow those students to ignore classroom rules and remain off-task during instruction. They will fail to encourage those students in the same way they encourage other students in the class. Teaching effectiveness drops as teachers worry about their personal competence (Ashton & Webb, 1986).

Tschannen-Moran and Woolfolk-Hoy (2001) for example combined elements from a number of different scales to capture three critical components of the teacher self-efficacy construct: instructional efficacy, engagement efficacy, and classroom management efficacy. Others (e.g., Skaalvik and Skaalvik 2007) have further differentiated this construct to include an even greater number of components such as instruction, adapting education to fit students, motivating students, keeping order and discipline, cooperating with colleagues and parents, and coping with changes and challenges.

Numerous positive outcomes have been associated with teachers' high sense of self-efficacy. Among these are student achievement (Anthony & Kritsonis, 2007), student motivation (Nolen et al., 2007), classroom management behaviour (Giallo & Little, 2003), responsibility for student learning (Darling-Hammond et al., 2002), trust and openness (Goddard et al., 2004) and job satisfaction (Caprara et al., 2006).

Self efficacy is considered as an important variable in research about goal attainment, academic achievement, professional development and teacher training, and research reports significant associations between self-efficacy and the cited variables (Pajares, 1996, 2002).

Regarding the topic of teacher self-efficacy towards the teaching of thinking skills there are only a few studies related to it. Self-efficacy towards teaching thinking skills, and the amount to which this self-efficacy is reflected in teaching performance, is related to the quality of the process by which young people acquire, understand, synthesize, apply and evaluate their own thinking skills. When the level of self-efficacy is low, the impact upon performance with respect to teaching thinking skills is most likely negative (Hampton, 1996). Teachers' self-efficacy beliefs are critical in the development of a young person's own self-efficacy towards thinking (Thomas & Walker, 1997).

For example Davies (2004) in his study administered a questionnaire to a random sample of 35 government high and central schools as well as semi-structured interviews with seven teachers from four different schools. Results show that the sense of personal efficacy covers both the learning area and the behavioural area. In addition this sample of teachers demonstrated a stronger sense of personal efficacy than of teaching efficacy and identified the powerful link between personal efficacy and higher order instructional emphasis. Teachers with a greater sense of personal efficacy placed a greater emphasis on higher order instructional objectives and outcomes than teachers with a lower sense of personal efficacy in similar contexts of the year level of the class and the nature of the class. Teachers who believed in the power of teaching to overcome the effects of such factors as the background of students and were confident in their own teaching abilities were more likely to have a greater academic focus in the classroom and give more emphasis to higher order instructional objectives and outcomes. This study found that it was teacher confidence in their own teaching abilities that mattered and not a general belief in the power of teaching. This finding supports other studies (Saklofske et al., 1988; Soodak and Podell, 1993) that have found that greater efficacy also enables teachers to be less inclined to refer a difficult student to special education, so teaching efficacy does not relate to teaching behaviours and outcomes but personal efficacy does.

5. Thinking skills and critical thinking

Introduction

In recent years there has been much interest in both the development of pupils' thinking skills on the one hand, and enquiry-based and self regulated learning on the other. The teaching of thinking skills is a mandatory element of the current National Curriculum in many countries in the world, and has become a relevant element in teachers' professional development and schools' policy and practice. As Fisher (2000) argues, a successful society will be one in which the capacity for lifelong learning of its citizens is most fully realized. If thinking is how we make sense of experience then being helped to think better will help children learn more from what they see, say and do.

There is no consensus as to what should be included in the category of thinking skills (Resnick, 1987) or higher order thinking skills (Cotton, 2003). A thinking skill is basically any cognitive process broken down into a set of explicit steps that are then used to guide thinking (Johnson, 2000b; Perkins, 1986). For example, making inferences is a cognitive process that is included in many curriculum standards and that helps one integrate observed clues with background knowledge in order to make an informed guess or prediction. Most authors assume that the term thinking skills includes higher level activities such as problem solving, decision making, critical thinking, logical reasoning and creative thinking (Nickerson, 1988). There are two types of thinking skills: creative and critical thinking skills (Shukor, 2001).

De Bono (2000) presents various arguments about why children should develop their thinking process and he argues that in a rapidly changing world we are finding that our thinking is inadequate to meet the demands put upon it. As Bentley (2000) highlights, if education is to meet the emerging challenges of the twenty-first century, educators must recognize that learning within the formal setting must connect with life after school. He elaborates about how over the last two decades, the ways people live, work and communicate have been transformed through information technologies. Innovative technology influences every sphere of our lives, e.g. from personal relationships to the structure and content of work, economic investment to leisure. How to continue to use these technologies and the vast knowledge bases they provide in a useful and meaningful way is arguably more important than gathering and storing yet more data (De Bono, 2000). Children must be guided and taught how to sort and synthesize the meaningful from the useless, discern connections between pieces of relevant information, analyze detail while recognizing the whole, strategize how to solve problems and distinguish what matters in life situations.

Critical thinking

An important type of thinking skill is critical thinking which is open to a wide range of interpretations. The literature on this construct concerns philosophy and psychology (Lewis & Smith, 1993) and also the field of education as Sternberg has noted in 1986. He points out that the philosophical approach emphasizes an ideal type of critical thinker inquisitive in nature, flexible, open-minded and that considers other perspectives. Paul (1992) views critical thinking in the context of perfection of thought.

Some definitions of critical thinking from the philophical tradition include:

- ‘reflective and reasonable thinking that is focused on deciding what to believe or do’ (Ennis, 1985, p.45)’.
- ‘Disciplined, self-directed thinking that exemplifies the perfection of thinking appropriate to a particular mode or domain of thought’ (Paul, 1992, p.9).
- ‘Judging in a reflective way what to do or what to believe’ (Facione, 2000, p.61).

The limit of this approach to defining critical thinking is that it does not always correspond to reality and it does not contribute to the discussion on how people actually think.

The cognitive psychological approach, in the behaviourist tradition, tends to focus on how people actually think and tends to define critical thinking by the types of actions or behaviours critical thinkers can do and usually concerns a list of skills or procedures performed by critical thinkers (Lewis & Smith, 1993). Cognitive psychologists identify behaviours as products of thought (e.g. formulating good questions, analysis, etc.).

A definition of critical thinking from the cognitive approach is:

- ‘The mental process, strategies, and representation people use to solve problems, make decisions, and learn new concepts’ (Sternberg, 1986, p.3).

The educational approach regards educators that have participated in discussions about critical thinking like Bloom and his associates (1956). Their taxonomy is hierarchical with ‘comprehension’ at the bottom and ‘evaluation’ at the top. The three highest levels (analysis, synthesis, and evaluation) usually represent elements of critical thinking. This approach is based on years of classroom experience and observations of student learning but concepts from the taxonomy are not as clear to guide instruction and assessment in a useful way (Ennis, 1985; Sternberg, 1986).

There is a common core to all the different definitions from the three perspectives and their approach to defining critical thinking, and researchers of critical thinking agree on the specific abilities, e.g:

- Making inferences using inductive or deductive reasoning (Ennis, 1985; Facione,1990; Paul, 1992; Willingham, 2007).
- Making decisions or solving problems (Ennis, 1985; Halpern, 1998; Willingham, 2007).
- Judging or evaluating (Bloom, 1956; Case, 2005; Ennis, 1985; Facione, 1990; Lipman, 1988).

Reserchers also agree that in addition to skills or abilities, critical thinking also involves dispositions as 'consistent internal motivations to act toward or respond to person, events, or circumstance in habitual, yet potentially malleable ways' (Facione, 1990, p.64). Critical thinking dispositions include e.g.:

- ✓ Flexibility (Facione, 1990; Halpern, 1998).
- ✓ Fair-mindedness (Bailin et al., 1999; Facione,1990).
- ✓ The propensity to seek reason (Bailin et al., 1999; Ennis, 1985; Paul, 1992).
- ✓ Inquisitiveness (Ballin et al., 1999; Facione, 1999 e 2000).

Facione (1990) noted that identification and analysis of critical thinking skills transcend specific subjects or disciplines, but to learn and to apply these skills in many contexts requires domain-specific knowledge. The domain-specific knowledge includes understanding methodological principles and competence to engage in norm-regulated practices that are at the core of reasonable judgements. Critical thinking is not simply a list of logical operations and domain-specific knowledge is not simply an aggregation of information.

How to teach critical thinking skills

The ability to think critically is a primary goal of education. Critical thinking skills are skills that children need to learn to be able to solve problems, analyzing and evaluating information that is provided, whether that information is through observation, experience or communication. The core of critical thinking is being responsive to information and not just accepting it (Willingham, 2007)

There is an open discussion about whether the critical skills should be taught in a non explicit way through the curriculum, the 'immersion method'; or taught explicitly across the curriculum, the so-called 'infusion method' that takes place when critical thinking principles are made explicit in the course of teaching curriculum subjects (Ennis, 1997). Smith (2002) argues with respect to high schools and colleges that general thinking skills should be taught in dedicated courses, and only subsequently applied to subject domains. Swartz and Park (1994) promote the integration, or infusion, of explicit teaching of thinking into the curriculum to encourage pupils to develop good thinking habits. The infusion method not only needs development in the mind set of teachers but also development in the teachers' confidence in applying this understanding to the practice of the classroom (Helpern, 1998).

Willingham (2007) points out that critical thinking is not a skill like riding a bicycle, and once you learn it you can apply it in any situation. He noticed that the process of thinking is interwined with the content of thought. If you remind a student to look at an issue from multiple perspectives but he needs to know a lot about the issue to think about it in the way requested, it does not make sense to try to teach factual content without giving the student the opportunity to practice using it.

Also in England, since the mid-1990s, a high portion of teachers have undertaken professional development in the field of teaching thinking skills, and the inclusion of the

teaching of thinking skills is a mandatory element of the current National Curriculum for England (DfES and QCA 2000).

Burke et al. (2007) reported a study which examines teachers' perceptions of teaching thinking skills within the curriculum.

Forty-eight primary schools in a region of central Scotland were asked to rate how frequently they perceived each thinking skill within the six main thinking types in the framework (i.e. searching for meaning, critical thinking, creative thinking, metacognition, decision making and problem solving) to be taught in each curricular area. For example, for critical thinking respondents had to rate how often (in each curricular area) they taught the following skills: making predictions and formulating hypotheses, drawing conclusions, giving reasons, distinguishing fact from opinion, determining bias, the reliability of evidence, being concerned about accuracy, relating causes and effects, and designing a fair test. The results suggest that thinking skills are integrated more successfully into some areas of the curriculum than into others. Therefore, awareness needs to be raised not only of how thinking skills can be infused into all curricular areas, but also that children need to be given practice at using a wide range of thinking skills within each broad thinking type. However, not all thinking skills are appropriate for use in all contexts, situations and subject areas, and for this reason teachers also need to provide children with opportunities to select and employ situation-specific thinking skills in a variety of contexts. These data also suggest that more emphasis in classrooms needs to be placed on encouraging learners to think about their thinking, with the aim of improving their metacognitive abilities. Furthermore, contrary to expectations, children in upper primary were not exposed more frequently to complex thinking skills than children in early primary. This is interesting, given developmental evidence that older children are more able to engage in some of these thinking skills. It would be expected that there would be significantly more opportunities provided for older children (8–12 years) to develop their metacognitive skills. If teachers are attuned to their children's development then they should mirror age changes in their teaching methods. Indeed, developmental trends emerge in children's understandings of thinking skills (Burke and Williams, 2005). It was anticipated, therefore, that teachers would be teaching age-appropriate thinking skills to correlate with children's understandings and abilities. Teachers need to be supported through training and resources to encourage them to develop their developmentally appropriate teaching methodologies, incorporating thinking skills at relevant stages in the primary curriculum. This would allow children to experience continuity, progression and depth of thinking skills throughout the curriculum.

Authors as Ennis and Sternberg suggested that a mixed approach could be the third way to teach thinking skills forward in most situations, where both explicit and implicit methods are used deliberately (Ennis, 1997; Sternberg, 1986).

Onosko in 1991 found in his study of fifty-six social studies teachers that there were a number of interrelated factors influencing the lack of teaching of critical thinking. In-depth

interviews were conducted and questionnaire responses were gathered in 16 social studies departments in the USA from 56 teachers and from each department chair and principal. Nearly 500 classroom observations of teachers' lessons were gathered by a 6-member research team. In addition, extensive interviews were conducted and written responses to a questionnaire were obtained from 25 staff developers from around the country working to help improve teachers' instruction for thinking.

Based upon the above data, informal observations from each member of the research team, and a perusal of the research literature on social studies education and the broader, school change literature, a number of barriers to the promotion of thinking were identified. Using analytic arguments, classroom observations, and/or interview data, the research team reached consensus on six dominant barriers to thinking: instruction as knowledge transmission; broad, superficial content coverage; teachers' low expectations of students; large numbers of students; lack of teacher planning time; a culture of teacher isolation.

Regarding the first barrier to thinking (instruction as knowledge transmission) the author affirmed that the overriding agenda in classrooms remains student acquisition of knowledge, be it generalizations, themes, facts, chronological events, or beliefs held by prominent people past and present. The dominant goal is to transmit these conclusions to students and to ensure that they can reproduce them. The drive to expose students to knowledge deemed important by society is so pervasive that it tends to displace thinking from the school agenda. An inordinate emphasis on student acquisition of products of authoritative inquiry, rather than student participation in inquiry, was observed in the research and serves as one of the major barriers to the promotion of students' thinking.

The barrier *teachers' low expectations of students* leads to instruction in which factual information is emphasized because students are perceived to be incapable of succeeding with or unwilling to attempt higher-order challenges involving more complex information and ideas. Classroom observations revealed that fact-driven instructional agendas not only curbed student opportunities to do higher-order thinking, but negated opportunities for teachers to model higher-order thinking.

There is also an organizational barrier to instruction for higher-order thinking regarding the *lack of teacher planning time*. Due to the inadequacies of textbooks, teachers must venture to the library to find, read, and then modify and photocopy reading materials for upcoming lessons. They must also review or acquire initial understanding of the ideas to be discussed, apply their pedagogical knowledge to craft lessons that promote higher-order thinking, and begin to map out the direction of upcoming units. In traditionally organized schools, one 45 minute time block is typically allocated for teacher planning, during which very little of the preparation outlined above can be accomplished.

The last major barrier is the culture of isolation common to many departments and schools. Teachers spend their day with students, not fellow teachers. Teachers operate in isolation from one another, and this isolation severely limits their access to the curricular and

instructional ideas of colleagues, and shields them from both constructive criticism of and recognition for their instructional practice. Opportunities are not available to discuss with colleagues broad department goals, course goals, general instructional techniques related to thinking, and specific ideas and issues regarding subject matter and strategies to address this content with students.

The barriers presented above, although separate and identifiable, are interconnected. This is illustrated with some examples. Large total student load and large class size limit opportunities for thoughtful interaction between teachers and students, which, in turn, contributes to low student expectations on the part of teachers. Instruction by transmission tends to foster a curriculum of coverage, and in reciprocal fashion, the demands of content coverage necessitate instruction by lecture (transmission) to ensure that everything gets covered. Little planning time for teachers to exchange ideas with colleagues helps to ensure the continuation of a culture of isolation and traditional methods of instruction.

As the barriers are connected, it would appear that reformers interested in placing greater emphasis on the promotion of student thinking need to consider all of the barriers in a comprehensive plan of action. Barriers that are ignored may significantly reduce the effectiveness of the reform effort. Further study is needed to determine (a) the extent to which barriers are inextricably linked, (b) if the barriers are equally detrimental, and (c) whether or not a specific sequence of attack is advantageous.

Teaching of high and low critical thinking skills to different population of learners

Although learning theories see the development of students' thinking as an important goal for all students, teachers often believe that stimulating higher order thinking is appropriate only for high achieving students (Zohar, Degani, & Vaakinin, 2001). Raudensbrush et al. (1993) examined in 303 secondary teachers the relationship between academic track and emphasis on high-CT activities. Results showed that teachers were more likely to focus on high-CT activities in high-track classes than low-track ones. Teachers' beliefs regarding low achieving students and instruction of higher order thinking were analysed in a study of 40 secondary teachers using clinical interviews (Zohar et al., 2001). Data told us that only 20% of the interviewed teachers believed that the goal of teaching higher order thinking is equally appropriate for low and high achieving students, whereas 45% believed that it is appropriate only for high achieving students. Teachers considered that higher order thinking activities creates difficulties and confusion for weak students and alienates them from the lesson. Indeed, teachers' beliefs that it is inappropriate for low achieving students to engage in higher order thinking seems to be a major factor in dissuading them from using this method. In addition the findings suggest that teachers' beliefs are related to a traditional view of learning, seeing learning as progressing from simple, lower order cognitive skills to more complex ones. The consequences as Zohar (2001) highlighted, could be the deprivation for low achieving students from tasks requiring higher order thinking, which are crucial for their

development. Zohar and Dori (2003) in four studies examined this issue by asking the follow question: Do low achieving students gain from teaching and learning processes that are designed to foster higher order thinking skills? Each of the four studies addressed a different project whose goal was to teach higher order thinking in science classrooms. Tenth grade students in Israel are required to take at least one science course. The module assessed in the first study was developed as a part of Science, Technology, and Environment in Modern Society project. The goal was to expose students to controversial issues, to develop their ability to pose questions, and to teach them how to read scientific articles in a critical manner. The module consisted of five case studies taken from sources such as daily newspaper articles and popular science magazines that were applied using the Jigsaw cooperative learning method. After reading the case studies students were requested to analyze data, solve complex problems, pose questions, conduct critical group discussions, play different roles, and write creative titles and passages with regard to controversial issues. Where they were exposed to new learning situations through case studies, students interacted with each other, thereby constructing new knowledge and posing questions at various complexity levels The results indicated that overall, students increased their scores in the post-test compared to the pre test. Students' performance improved significantly between the pre-test and post-test with respect to all three components that were analyzed. The total number of questions posed by students increased from 298 in the pre-test to 639 in the post-test. Regarding question orientation, we found that in the pre-test half of the students were primarily concerned with hazards related to the problems presented in the case study. Examining trend changes in question orientation, they found that the percentage of solution and argument oriented questions increased from 19% in the pre-test to 33% in the post-test. Fewer questions in the post-test, 24%, than in the pre-test, 45%, deal with hazard related to the problem. Regarding question complexity they found that the mean question complexity increased from 3.88 in the pre-test to 8.87 in the post-test. In comparing academic levels, they found a significant difference in the extent of increase in the average number of questions among the three levels and a significant difference between high level and low level students. The increase in question posing capability was significant for both. The distribution of question orientation in the pre and post-test was similar for high and low level. Regarding the solution orientation of their question, the low achieving student increased from 14% to 35%. This is a higher increase than that of the high level students. Studying the complexity of the question posed by students, they found that both levels of students improved significantly in the post-test. All the four studies confirm that thinking is for all students and although the students with high academic achievements gained higher reasoning scores than their peers with low academic achievements, the second group of students improve significantly the initial starting point. The empirical evidence shows that low achieving students and higher order thinking skills are not mutually exclusive. This conclusion could have an important impact in the process of changing teacher's beliefs and

practices in this field. Teachers are often correct when they think that some tasks may be difficult for some of their students but staff development programs may equip teachers with tools for helping students construct better abilities, e.g. using metacognitive processes, peer learning, scaffolding, assessment instruments for their classes (White & Fredriksen, 1998, 2000).

Research reported by Raudenbush et al. (1993) and Zohar et al. (2001) examines beliefs about high-CT but not about low-CT. Torff (2005) affirmed that remains unclear how teachers' beliefs about high-CT and low-CT activities compare. This comparison could be crucial to understand if the advantage effect is specific to high-CT beliefs or it depends on a more general belief that considers all types of educational activity more effective for high-advantage students than low-advantage ones. For these reasons Torff and Warburton (2005) designed the Critical Thinking Beliefs Appraisal (CTBA) to assess secondary teachers' beliefs for high-advantage and low-advantage learners. Torff and colleague report a series of survay studies using the CTBA in which teachers were found to support a curriculum offering disdvantaged students reduced access to high-critical thinking activities (Torff, 2005, 2006, 2008; Torff & Warburton, 2005; Warburton & Torff, 2005). In particular teachers rated high-CT prompts as more effective with high-advantage learners than low-advantage ones. This result is consistent with previous advantage-effect research (Raudenbush et. al., 1993; Zohar et al., 2001). Teachers also rated low-CT prompts as more effective with high-advantage than low-advantage learners. In addition, teachers preferred high-CT activities to low-CT ones when teaching low-advantage learners, demonstrating an apparent preference for high-CT activites for low-advantage learners as well as high-advantage ones. Researchers have suggested that teachers judge low-CT activities to be more appropriate than high-CT ones for low-advantage learners (Pogrow, 1994; Raudenbush et al., 1993; Zohar & Dori, 2003; Zohar et al., 2001) but such results were not produced in Torff & Warburtons' study (2005), where teachers' preference for high-CT activities over low-CT ones was considerably stronger for high-advantage learners than low-advantage ones. This suggests that teachers are more favourable to high-CT activities when teaching high-advantage learners than low-advantage ones. Torff (2011) affirmed that a *rigor gap* emerges in which disadvantaged students are judged to require less rigorous curriculum compared the more privileged peers.

II. Assessment of teachers' beliefs about the classroom use of critical thinking activities. The Critical Thinking Beliefs Appraisal for Primary School Teachers (CTBA-P).

1. Introduction

Learning theories see the development of students' thinking as an important goal for all students and underscores the importance of critical thinking as purposeful and goal direct cognitive skills or strategies that increase the likelihood of a desired outcome (Ennis, 1987; Browne & Keeley, 2001; Halpern, 2002). Over the past few decades, researchers have placed a premium on critical thinking skills, focusing on approaches to 'become a critical thinker', 'teaching for thinking', and 'teaching higher-order thinking skills' (Pogrow, 1990, 1994; O'Tuel & Bullard, 1993; Tishman, Perkig, & Jay, 1995). School increasingly requires students to be involved in high-critical thinking activities, e.g. discussion, instead of low-critical thinking activities, e.g. memorization and repetition.

As described in chapter 1, teachers' beliefs have been shown to influence how they structure tasks and interact with learners (Anning, 1988; Pissanos & Allison, 1993; Wilson, 1996; Richardson, 2002). One of several lines of this research focuses on teachers' beliefs about the educational effectiveness of critical thinking enriched instruction (Resnick, 1987; Brown & Campione, 1990; Henderson, 2001). In particular, researchers have studied the relationship between teachers' beliefs about critical thinking and factors that influence their decision-making concerning its use in the classroom, such as teachers' beliefs about the relative effectiveness of activities that are high-critical thinking versus low-critical thinking. Literature on teachers' beliefs about high-critical thinking and low-critical thinking activities has also focused on the relationship between such beliefs and teachers' perceptions of learners as 'high-advantage' or 'low-advantage' (i.e. differing in academic track, level of achievement, or social economic status) (Oakes, 1990; Page, 1990; Pogrow, 1990, 1994). A recurrently cited assertion about teachers' beliefs is that low-advantage learners often receive limited access to high-critical thinking activities in schools because teachers presumably believe that low-critical thinking activities are more appropriate than high-critical thinking ones for low-advantage learners (Radenbush, Rowan, & Cheong, 1993; Zohar, Degani & Vaakin, 2001; Zohar & Dori, 2003). According to this line of reasoning: high-advantage learners receive more high-critical thinking which results in high-level academic performance, which in turn makes even more high-critical thinking lessons likely; but low-advantage learners receive few high-critical thinking lessons, making them less likely to develop sufficiently strong academic skills to permit high-critical thinking instruction in subsequent lessons.

Although theory and research on critical thinking (CT) are growing, relatively few studies have been conducted to validate the construct '*teachers beliefs about critical thinking*'. Increasing attention has been paid to elements that influence teachers' beliefs concerning

appropriate classroom use of, or 'demand for,' critical thinking (i.e. 'CT-demand'). These elements include teachers' beliefs about the effectiveness of classroom activities that are high in CT-demand (e.g. self-guided, discussion, reflection) versus ones with low CT-demand (e.g. lecture, memorization). Torff and Warburton's studies (2005), in a sequence of five validation studies validated the theoretical and practical utility of the *CT-related beliefs* construct. A four-factor scale instrument, *Critical Thinking Belief Appraisal* (CTBA), measuring secondary teachers' beliefs about the effectiveness of high-CT and low-CT activities for high-advantage and low-advantage learners was made (Torff & Warburton, 2005). The three "advantage characteristics" employed by the CTBA for secondary school students are *ability*, *prior knowledge* and *motivation.* Five validation studies were carried out to develop the CTBA and to evaluate it for reliability and validity. The scale produced scores with high internal consistency, with an overall alpha level of .89. The CTBA was found to have a stable factor structure composed of four factors that collectively accounted for 62% of the within-group variance, representing teachers' beliefs regarding the effectiveness of: a) high-CT activities for high-advantage learners, b) high-CT activities for low-advantage learners, c) low-CT activities for high-advantage learners, d) low-CT activities for low-advantage learners. The results strongly support these three advantage characteristics as effective indicators of teachers' perceptions of learner advantages, (Torff & Warburton, 2005).

In the same year, Warburton and Torff (2005) carried out a study involving practicing secondary teachers from secondary schools on Long Island (New York) who completed the CTBA. The aim was to investigate teachers' beliefs about critical thinking activities for different populations of learners. Teachers rated both high-CT and low-CT activities as more effective for high-advantage learners than low-advantage learners, demonstrating strong "advantage effects". They also rated high-CT activities as more effective than low-CT ones for both high-advantage and low-advantage learners, demonstrating stronger "pedagogical preference effects" for high-advantage learners than low-advantage learners. Although the results are inconsistent with the assertion that teachers favour low-CT activities over high-CT activities for low-advantage learners, the results suggest that low-advantage learners may receive fewer high-CT activities in schools, which may hinder their academic performance. In other words, the study confirmed an *advantage effect*, with teachers rating high-CT activities as significantly more effective for high-advantage learners than for low-advantage ones.

These results were replicated in two other studies (Torff, 2005 and Torff, 2006) with inservice, preservice teachers, prospective teachers and a non-teachers group control. Findings supported a strong and consistent 'advantage effect' which is comparable to the tracking effect reported by Raudenbush et al. (1993) and achievement effect reported by Zohar et al. (2001). At the same time, in results not shown in past research, inservice teachers also rated low-CT activities as more effective for high-advantage students than for low-advantage students, so strong advantage effects were found for low-CT activities, not

only for high-CT ones. According to these results, teachers prefer high-CT activities for all students, but they give fewer high-CT activities to low-advantage students compared to their high-advantage peers, so teachers support a more rigorous curriculum for high- than for low-advantage students. With respect to preservice teachers the results show a reduced support for high-CT activities for high-advantage learners and low-CT activities for both learner populations. As such, preservice education seems the best time for promoting changes in CT-related beliefs.

In Torff's 2006 study he also considers the sample comprised not only of inservice teachers but of expert teachers too. Experts are teachers with the highest level of teaching skill (even though they work as inservice teachers) and inservice teachers are the group representing the full range of levels of teaching skill (even though some teachers classifiable as experts are likely to be included in such a group). The results showed how teachers in both groups judge high-CT activities and low-CT more effective with high-advantage than low-advantage learners, demonstrating the advantage effects obtained in prior research. It is noteworthy that the effect sizes produced by inservice teachers were considerably larger than those yielded by expert teachers, indicating that inservice teachers demonstrated much stronger advantage effects relative to expert teachers. In accordance with results obtained in previous research (Torff, 2005; Warburton & Torff, 2005), both experts and inservice teachers evidenced a pedagogical preference effect favouring high-CT activities over low-CT ones for high-advantage learners. This effect was far stronger for experts than for inservice teachers. For low-advantage learners, experts (but not inservice teachers) demonstrated a pedagogical-preference effect.

Torff and Warburton (2005) investigated the predictive validity of scores produced by the CTBA i.e. the strength of association between CTBA results and teachers' observed classroom practice. Participating teachers (N=72) were randomly selected from faculty rosters at 35 schools that were randomly selected from a list of all secondary schools. Observers visited the classrooms of participating secondary teachers and rated their use of CT activities ("observed CT use"). The participating teachers were asked to identify the observed classes as low or high with respect to each of the three advantage characteristics (ability, prior knowledge, and motivation). The teachers were asked to complete the CTBA. The scale's predictive validity was then evaluated by calculating the correlation between observed CT use and the classroom matched items on the CTBA (i.e. items that correspond to the configuration of advantage characteristics that teachers identified as describing the observed class). The correlations between observed CT use and classroom matched CTBA scores in all groups suggest that the CTBA produced scores with satisfactory predictive validity.

These authors also investigated the discriminant validity of scores yielded by the CTBA.

In particular: to explore the possibility that individuals with a high level of CT ability favour the use of such skills in the classroom; to investigate the possibility that teachers with high CT

disposition favour CT activities in the classroom; to explore the possibility that the CTBA operates as a proxy for the need for social approval.

California Critical Thinking Skills Test Form (CCTST) was used as a test of CT ability. Need For Cognition scale (NCS) was used to measure an individual's propensity to engage in CT in everyday situations and professional contexts. Marlowe-Crowne Social Desirability Scale (MCSDS) was used to measure an individual's inclination to behave in ways that he or she perceives to be agreeable to others. Participants were drawn randomly from preservice secondary teachers (N= 100). All participants completed the CTBA, CCTST, NCS, and MCSDS. Cronbach's alpha was used to measure reliability of CCTST, NCS, and MCSDS for this group of participants. Correlations between CCTST, NCS, and MCSDS and the four CTBA factors were computed. The results showed that high alpha coefficients provided evidence for the reliabilities of the CCTST, NCS, and MCSDS with this group of participants. Near zero correlations were found between the MCSDS and the four CTBA score sets, indicating that the CTBA tapped a construct distinguishable from need for social approval. Correlations were very small between the NCS and all four CTBA score sets, demonstrating that the CT-use construct was distinct from participants' CT disposition. Small or near zero correlations were found between the CCTST and two score sets of the CTBA, low-CT prompts for high-advantage learners and low-advantage learners. Slightly larger correlations were found between the CCTST and the remaining two CTBA score sets i.e. high-CT prompts for high-advantage and low-advantage learners. These results suggest that the CTBA tapped a construct that was, perhaps, related to but distinguishable from CT ability.

In the Torff and Session study (2006) no statistical interactions were found between the independent variables that were age, teaching experience, gender and educational attainment.

All studies mentioned above concern only secondary school teachers' beliefs. There are no studies about beliefs in this field with primary school teachers despite critical thinking being considered an important goal in the primary curriculum of many countries. Early research in the Piagetian tradition tended indeed to view the cognitive processes of young children as insufficient in relation to those of older individuals. Following Piaget's stages of development, young children are incapable of formal operations which are required for critical thought. In spite of this, more recent research has found that young children engage in many of the same cognitive processes that adults do, which means that there is a place for critical thinking in the elementary curriculum (Silva, 2008). Kennedy (1981) refers that, although critical thinking ability appears to improve with age, even young children can benefit from critical thinking instruction. Bailin et al. (1999) argue that critical thinking instruction at primary school can include teaching students to e.g.: value reason and truth; be open-minded; respect others during discussion; be willing to see things from another's perspective. For example, most British schools acknowledge the importance of thinking skills and some have embarked on thinking skills programmes and view thinking as a discrete

subject and commonly teach a pre-set series of thinking lessons. Programmes based on this approach include Philosophy for Children (e.g. Lipman et al., 1980), Instrumental Enrichment (Feuerstein, 1980), Cognitive Research Trust (de Bono, 1976, 1981) and "Let's Think" (Adey et al., 2001). In other cases, schools are intent on infusing thinking skills into subject content currently taught, and follow the advice of particular psychology strategies and educational theorists such as Beyer (1987, 1997), McGuinnes (1999, 2000) and Swartz and Parks (1994).

The Italian national curriculum recommended teaching critical thinking from an early age and in recent years there is a growing body of experiences based on programmes such as Philosophy for Children (Lipman, 1980) and Cognitive Research Trust (de Bono, 1981) in primary and secondary schools. Regarding Philosophy for Children in accordance with the Lipman programme, there are quite a few experiences in Italian primary and secondary schools. In the Italian context, Santi argues that Philosophy for Children is a suitable pedagogical approach to promote capable agents and enhance critical, creative and caring thinking and it is also a pedagogical base and possible instrument to foster the individual faculties, e.g. critical thinking, creativity to allow individuals to participate fully in society (2012).

Aims

To sum up the literature examined, it appears important to promote critical thinking even at primary school age; teachers' beliefs about CT influences their use of CT activities with pupils; in Italy there are no studies and instruments regarding teachers' beliefs about the use of critical thinking activities in the classroom; the CTBA created by Torff and Warburton (2005) appears the most complete instrument compared with the previous ones. Thus, the present study was conducted to create a new instrument for analysing teachers' beliefs about the use of critical thinking with different types of learners, using the Torff and Warburton CTBA as a model. In particular, the aims were to:

1) develop a new instrument to analyse the beliefs on critical thinking adapting the CTBA for Italian primary school teachers;
2) verify the psychometric characteristics (internal validity and reliability) of the new instrument on teachers' beliefs on CT;
3) analyse the primary teachers' beliefs about the use of critical thinking with different populations of learners, and differences in teachers' CT beliefs with respect to teachers' characteristics.

To reach these aims, first of all a preliminary study will be carried out to make the instrument to measure teachers' beliefs about critical thinking activity in the classroom. Secondly, the internal validity and reliability of the new instrument will be tested. Finally comparison

analysis will be carried out to investigate teachers' beliefs about the use of critical thinking activity with different populations of learners and with respect to teachers' characteristics.

2. Development of the Italian primary school version of the CTBA

3. Preliminary study

The original CTBA comprises 12 prompts in total, 6 describe high-CT activities and 6 low-CT activities for secondary students. Torff and Warburton (2005) devised a contextualized assessment scheme drawing on teachers' conceptions of the particular characteristics they take into consideration in classifying a learner as high-advantage or low-advantage. They nominated three "advantage characteristics". This three-characteristic design of the original CTBA is used in the new instrument as indicators of teachers' perceptions of learner advantages for a total of 6 different groups of students: high ability, low ability, high prior knowledge, low prior knowledge, high motivation, and low motivation. The meaning of three "advantage characteristics" employed by the CTBA is *ability:* learners' capacity for intellectual or skill achievement when dealing with the specific topic the class is studying; *prior knowledge:* how much learners know about the specific topic the class is studying before they participate in additional lessons; *motivation:* how much interest and attention learners show when dealing with the specific topic the class is studying (Torff & Warburton, 2005, p.157). Respondents use 6-point Likert-type scales to rate the effectiveness of each prompt for 3 of 6 different groups of learners described above and in this way they pay attention to the advantage level, so they naturally begin to ask themselves when advantage level makes a difference. The 6 characteristics of students are equally distributed among the 36 items.

3.1 Method

Item construction

To develop the Italian primary school version of the CTBA (CTBA-P), 20 prompts were prepared, which describe classroom critical thinking activities set in some of the primary school level subjects (Italian, Mathematics, Science, English, Social studies) in accordance with the present national curriculum. Equal numbers of high-CT and low-CT activities were made considering the theoretical premise that teachers' CT-related decision making is based on beliefs about both CT-rich and CT-lean activities (Torff & Warburton, 2005).

Below, one example of each type of CT activity is shown:

High-CT: *Una classe sta leggendo un racconto di Gianni Rodari. L'insegnante chiede agli studenti di leggere fino ad un certo punto e di scrivere poi la propria versione del finale. (A class is reading a short story by Gianni Rodari. The teacher asks the students to read up to a certain point, and then to write their own version of the ending).*

Low-CT: *Una classe sta studiando il vocabolario di inglese utile per fare ordinazioni al ristorante. L'insegnante scrive diverse nuove parole alla lavagna, le definisce, chiede agli studenti di ripeterle, e fornisce una scheda dove gli studenti le aggiungono a delle frasi esemplificative. (A class is studying useful English vocabulary for ordering at a restaurant. The teacher writes various new words on the board, defines them, asks the students to repeat them, and provides a handout where the students add the words to some illustrative sentences*).

Experts' prompts evaluation

There was a risk that the 20 prompts designed to be high-CT would not universally be considered high-CT by all teachers. The same risk applies to low-CT prompts. As such, in order to guarantee that there was no ambiguity in the classification of a prompt as high-CT or low-CT, 20 experts in educational research where selected from the Department of Education at Roma Tre University. The participants consisted of 11 men and 9 women. Nine of them were associate professors, five researchers, three ordinary professors, and three post-doc students that were teaching at primary school.

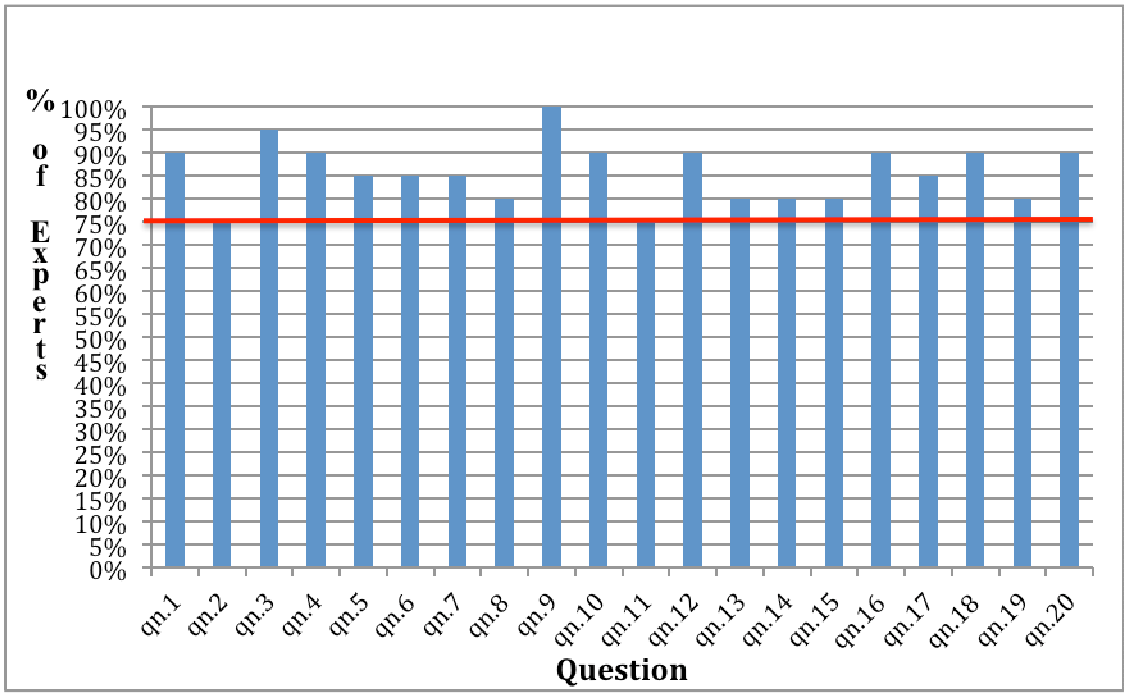
Through a questionnaire sent by mail, they were asked to classify each of 20 prompts as high-CT or low-CT. At the beginning of the questionnaire there were two definitions of high-CT and low-CT in accordance with the theoretical literature. Specifically, a low critical thinking activity needs memorisation and recovery of information, whereas a high critical thinking activity requires analysis, hypothesis, comparison, asking questions, finding solutions, developing new ideas and synthesizing information (Bloom, 1956; Resnick, 1987; Zohar & Dori, 2003).

3.2 Results

The answers of the 20 experts to the 20 prompts were analysed and the percentage of agreement was calculated. To choose the prompts, a criterion of agreement and a criterion of correspondence with national curriculum were applied. The first considers coherent all prompts with at least 75% agreement between the experts. The second considers the suitability of the prompt with the primary school level and typical classroom activities.

As shown in Figure 1, all prompts were at or above the 75% agreement threshold, with the minimum level of agreement being 75% for questions n. 2 and n. 11, and the maximum level of agreement being 100% for question n. 9.

Figure 1 Percentage of agreement between experts for the 20 questions of the questionnaire



A small number of experts wrote down some observations with their responses (for example, for some prompts in the questionnaire there were doubts about judging the activity in a dichotomous way). All the observations collected were useful in making the best possible choice of items in respect of the two criteria cited above. Following the criteria of level of agreement, as explained above, and the criteria of correspondence of the activities with the aims of the Italian national curriculum, twelve prompts were chosen. In particular, despite the minimum level of agreement (75%), the critical thinking activities in question number 2 and number 11 were chosen for the questionnaire considering the popularity of these activities in primary school. Question number 2 regards the teaching of inventions during the prehistory. In the activity described in question number 11, the teacher, after delivering an English lesson about adjectives, gives a handout to the students and asks them to correct wrong sentences about adjectives used to describe clothing.

The final version of the CTBA-P (see appendix 1) comprises 12 prompts (from n. 1 to n. 12), describing classroom activities in various primary school subjects. There are 36 items in total, 18 items for high-advantage learners and 18 for low-advantage ones. Each prompt is followed by three items assessing the effectiveness of the prompt for high-advantage or low-advantage learners. The three “advantage characteristics” are: *ability*, *prior knowledge* and *motivation* (for the description of each characteristic see the first section of this paragraph). The instrument includes 12 of each of the three advantage characteristics, six for high-advantage learners and six for low-advantage learners. Each item is scored on a six-point

Likert-type scale from 1 (highly ineffective) to 6 (highly effective).

4. Study 1

Once the CTBA-P has been designed, it is necessary to analyse its internal validity and reliability. It was planned to conduct an exploratory factor analysis to identify dimensions underlying teachers' beliefs on the use of CT and to select items. It was expected that the factor structure of the CTBA-P would represent the tendency among teachers to differentiate CT-rich and CT-lean activities according to learners' perceived advantages. To analyse the reliability, Cronbach alpha coefficients were calculated.

4.1 Method

Participants

Participants in this study comprise 174 inservice Italian primary school teachers based in five state schools in Rome and its surroundings.

The group consists of 164 women and 10 men with a mean age of 45.80; 81% were between 31 and 60 years. 64 teach maths, 80 literacy, 20 English as a foreign language, and 32 teach children with special needs. The majority of teachers (74%) have a full-time contract. The majority of the teachers have (at most) a high school education (56%) which is slightly more than those with a masters degree. 35% of the teachers have been teaching at primary school for between 11 and 20 years, 23% have up to 10 years of primary teaching experience, 18% have been teaching for between 21 and 30 years, 13% have more than 30 years of primary teaching experience and 11% did not specify their teaching experience. This means that in the sample 66% have more than 10 years of experience but there is not a large amount of very experienced teachers. 61% of teachers in the sample are teaching a group of several subjects either in the same or different area. Only 24% of teachers are *prevalente* teachers.[1] The teaching of mathematics (37%), language (38%), art and social studies are more or less equally distributed across the teachers. 19% are special needs teachers and there are a few teachers teaching religion (8%) and English as a foreign language[2]. In the sample 12% are "specialist" English teachers and 10% are "specializzata" English teachers. 51% of the sample participated in at least two educational events such as conferences during the school year (either proposed by their head teacher or following personal choice).

[1] *Prevalente* teacher in Italian primary school system is a teacher who teaches the main subjects in the classroom such as language and maths.

[2] In Italian primary schools there are two types of English teacher: one called *specialista* that has an English language Masters degree and she/he can only teach English as a foreign language at school, and another one called *specializzata* who does not have a Masters degree in English language but obtained the title to teach English at primary school in teachers' preparatory courses.

Procedure

All participants completed the CTBA-P (described in the above paragraph) at the schools at which they were employed. Before starting the questionnaire, teachers were informed that participation was voluntary and anonymous, and that there were no right or wrong answers. They were also informed that the information would be kept confidential and used only for the purpose of academic research. Completed questionnaires were handed in immediately. Data were collected in accordance with Italian law and the ethical code of the Professional Psychologists Association.

4.2 Results

Factorial analysis

Principal axis factoring and varimax rotation was conducted on the 36 items of the CTBA-P. The number of candidate factors was determined by eigenvalues greater than one and examination of the scree plot. The results produced a 4 factor structure and these factors accounted for a high percentage of the variance (63%). The actual item loading in the factors ranged from .925 to .468 (see table 1).

As noted, the structure coefficients and the distribution of items suggest that the items represent teachers' reported tendency to support high-CT and low-CT activities depending upon learners' advantage level (high-Ad versus low-Ad). The factors are linked to high-CT/high-Ad, high-CT/low-Ad, low-CT/high-Ad and low-CT/low-Ad. Items are not equally distributed across the four factors as shown in table 1 and not all 36 items loaded on one of the four factors. Items included in the prompts n. 4, n. 6, n. 9 didn't load on one of the four factors and were removed from the questionnaire.

The CTBA-P yield four scale scores with satisfactory internal consistency: high-CT activities for high-advantage learners (alpha = .89); high-CT activities for low-advantage learners (alpha = .87); low-CT activities for high-advantage learners (alpha= .79), and low-CT activities for low-advantage learners (alpha = .86). Table 1 presents factor structure, with interpretative labels for each of the four factors.

Table 1. CTBA-P item distribution across the four factors, percentage of variance and Cronbach's coefficents.

Item	Prompt	Advantage characteristic	High-CT x LAd	High-CT X HAd	Low-CT X LAd	Low-CT X HAd
11b	*A class is studying English adjectives used to describe clothing. The teacher provides a handout with some advertising images containing captions which include adjectives, then gives a second handout with deliberately incorrect captions and asks the students to correct them.*	L_PKN[3]	**,755**	,091	,017	-,113
8a	*A class is studying how to calculate the area of a triangle. The teacher asks the students to evaluate various possible formulas to calculate the area, to determine which is the correct one and to explain their answer.*	L_ABL	**,732**	,074	,156	,062
8b	The same as in item n.8a	L_PKN	**,700**	,158	,123	,020
11c	The same as in item 11b	L_MTV	**,687**	,023	,108	-,159
3c	*A class is studying single variables in algebra.The teacher poses a problem which requires a single variable for its solution, asks the students to find a way of writing down the problem and then compares their structures with the algebraic structure written on the board.*	L_MTV	**,683**	-,095	,084	,211
3a	The same as in item n.3c	L_ABL	**,661**	-,072	,205	,280
11a	The same as in item 11b	L_ABL	**,640**	,101	,142	-,090
3b	The same as in item n.3c	L_PKN	**,631**	-,039	,144	,310
5a	*A class is studying the sun. The*	L_ABL	**,468**	,053	,192	,107

[3] PKN= prior knowledge
ABL=ability
MTV=motivation
H=High
L=Low

	teacher asks the students to write down different ways in which the sun influences everyday life, and to predict what would happen if the sun no longer shone.					
2b	*A class is studying how to transform fractions into decimals. The teacher explains how to do the transformation, completes example problems using a projector and then gives a classroom exercise where the students have to solve similar problems.*	H_PKN	,085	**,925**	-,006	,058
12a	*A class is studying how to transform fractions into decimals. The teacher explains how to do the transformation, completes example problems using a projector and then gives a classroom exercise where the students have to solve similar problems*	H_ABL	,127	**,824**	,003	,099
12c	The same as in item n.12a	H_MTV	,092	**,780**	-,051	,131
10b	*A class is reading a short story by Gianni Rodari. The teacher asks the students to read up to a certain point, and then to write their own version of the ending.*	H_PKN	-,033	**,735**	,022	,115
10a	The same as in item n.10b	H_ABL	-,002	**,654**	-,017	,175
2a	*A class is studying the prehistory. The teacher provides some students with a list of inventions, explaining the impact of these inventions during this period, and describing how they continue to influence the world today.*	L_ABL	,079	-,093	**,791**	-,062
2b	The same as in item n.2a	L_PKN	,164	-,142	**,750**	-,022
1a	A class is studying a comic book, a type of text. The teacher explains the story and the structure, shows a list of famous cartoonists and asks the	L_ABL	,149	,193	**,660**	-,029

	students individually to read some cartoons out loud.					
2c	The same as in item n.2a	L_MTV	,183	-,131	**,636**	-,011
1b	The same as in item n.1a	L_PKN	,210	,130	**,565**	,018
7c	*A class is studying the Edict of Constantine issued in 313 A.D. with which the emperor conceded religious freedom to the Christians, and the Edict of Thessalonica issued in 380 A.D. with which Christianity was declared the official religion and other religions were prohibited. The teacher asks the students to imagine writing a letter to the Emperor Theodosius argueing their agreement or disagreement with his edict of 380 A.D.*	H_MTV	,082	,144	-,035	**,859**
7b	The same as in item n.7c	H_PKN	,048	,214	-,068	**,795**
7a	The same as in item n.7c	H_ABL	,071	,192	-,020	**,683**
	Cronbach Alpha		.87	.89	.79	.86
	Variance		25%	18%	11%	9%

The first factor, high-CT/low-Ad, accounts for 25% of the variance. It comprises nine items describing high-CT activities for students with low ability, low prior knowledge and low motivation. For example, in item n. 5 *students are studying the importance of the sun and the teacher asks to predict what would happen if the sun no longer shone.*

The second factor number, high-CT/high-Ad (accounts for 18% of the variance), includes 5 items about high-CT for students with high ability, high prior knowledge and high motivation. For example in item n.12 *a class is studying how to transform fractions into decimals. The teacher explains how to do the transformation, completes example problems using a projector and then gives a classroom exercise where the students have to solve similar problems.*

The third factor, low-CT/low-Ad (accounts for 11% of the variance) comprises 5 items regarding low-CT activities for students with low ability, low prior knowledge and low motivation. For example in item n.1 *The teacher explains the story and the structure of the*

comic book and shows a list of famous cartoonists, then asks the students individually to read some cartoons out loud.

The fourth factor, high-CT/high-Ad (accounts for 9% of the variance), includes 3 items regarding high-CT activities for students with high ability, high prior knowledge and high motivation. For example in item n. 7 *A class is studying the Edict of Constantine issued in 313 A.D. with which the emperor conceded religious freedom to the Christians, and the Edict of Thessalonica issued in 380 A.D. with which Christianity was declared the official religion and other religions were prohibited. The teacher asks the students to imagine writing a letter to the Emperor Theodosius argueing their agreement or disagreement with his edict of 380 A.D..*

5. Comparisons among teachers

- *Primary teachers' beliefs about CT thinking activities with different advantage students*

Statistical analysis was conducted to analyse the primary teachers' beliefs about the use of critical thinking with high-advantage and low-advantage populations of learners**.**

Means and standard deviations for the dependent variable in the study were calculated and a within-participants MANOVA procedure was carried out to analyse the difference between the four factor scores. The MANOVA resulted in a significant difference [$F(3,133)=74.0$, $p<.001$].

.

Table.2 Means and Standard Deviation of CTBA-P factors.

Factors	M	SD
Low CT_HAd	4.67	1.05
LowCT_LAd	3.83	1.05
HighCT_Had	4.69	1.11
HighCT_Lad	3.13	0.99

As illustrated in table 2, teachers believe that for low-advantage learners the low-CT activities are more effective compared to the high-CT activities. In addition, teachers consider high-CT activities more effective with high-advantage learners than low-advantage learners. Teachers also consider low-CT activities to be more effective for high-advantage learners than low-advantage learners. All these differences are statistically significant. Finally, teachers evaluate both high-CT and low-CT activities as effective, at the same level, for high-advantage learners.

- *Difference in teachers' CT beliefs with respect to teachers' characteristics*

The purpose of these tests is to establish whether there are significant differences in the mean scores for each of CTBA dimensions (LowCT-HAd, HighCT-LAd, LowCT-LAd, HighCT-HAd) for different cross-sections of the group of teachers, e.g. subject taught, years of experience, type of teacher (prevalente or not), qualifications.

The sample was examined using analysis of variance (ANOVA). The only significant result was for *prevalenti* teachers that consider low-CT activities to be effective for high-advantage students to a much greater extent than *non-prevalenti* teachers [$F(1,95)=6.39$, $p<.01$] as illustrated in table 4. No significant results emerged with respect to the subjects taught and the highest degree attained.

Table 4. Analysis of variance (CTBA-P and Teacher's Type).

	Prevalente teacher (Maths & Italian)		Not *prevalente* teacher (Other subjects)		Teacher's Type	
Variable	M	SD	M	SD	F (1, 95)	Sign.
LowCT_Had	5.03	.91	4.53	1.08	6.39	.01*
LowCT_Lad	3.70	.92	3.85	1.07	.62	.43
HighCT_HAd	4.77	.98	4.70	1.11	.11	.73
HighCT_LAd	3.23	1.17	3.20	.89	.006	.93

6. Discussion

The first aim of this study was to develop an instrument to assess primary teachers' beliefs about CT activities for different populations of learners.

The Critical Thinking Beliefs Appraisal for Primary School (CTBA-P) was created using Torff and Warburton's Critical Thinking Beliefs Appraisal as a model.

As described in the preliminary study, after making a set of high and low critical thinking activity prompts for primary school, evaluation of experts in educational research guaranteed the correspondence of each prompt with the level (high or low) established and allowed the best prompts in the original set to be chosen. This was done in accordance with the criteria of agreement and consistent with activities suitable for primary school level in line with the Italian national curriculum.

Subsequently, a validation study was conducted to explore the factor structure of scores on the 36 selected items as announced in the second aim of this study. Results support a four-factor model as in the original questionnaire (Torff & Warburton, 2005). Strong dominance of the four-factor set, stable structure coefficients, and high internal consistency reliabilities indicated that the shared variation of the items reliably assessed a common set of factors.

This was followed by statistical analyses using MANOVA procedures which were carried out to investigate primary teachers' beliefs about the use of critical thinking with high and low-advantage populations and statistically significant differences were obtained. Firstly, teachers consider high-CT activities and low-CT activities to be more effective for high-advantage learners than low-advantage learners. This *advantage effect* is consistent with prior research (Raudenbush et al., 1993; Zohar et al. 2001; Warburton and Torff, 2005; Torff and Warburton, 2005; Torff, 2006).

In addition, teachers consider low-CT activities to be more effective than high-CT activities for low-advantage learners. This result did not confirm the finding of previous research (e.g. Torff, 2006) where teachers produced a *pedagogical-preference effect* for high-CT, considering high-CT activities more effective than low-CT ones but for both populations of learners. In this study there is a pedagogical-preference effect for low-CT, as teachers believe these activities are more effective than high-CT activities for disadvantaged pupils. This is in line with the literature which states that although learning theories see the development of students' thinking as an important goal for all students, teachers often believe that stimulating high-CT is appropriate only for high achieving students (Zohar, Degani, & Vaakinin, 2001).

The sample also was examined using analysis of variance to establish whether there are significant differences for each CTBA-P dimension for different cross-sections of the group of teachers (e.g. subject taught, age experience, qualification). The only significant result obtained was regarding a group of teachers called *prevalenti,* who teach mathematics and language in the same classroom, and who believe low-CT activites are effective with high-advantage students to a greater extent than non-prevalenti teachers.

No significant results were found with respect to other cross-sections of the group of teachers (e.g. age, years of experience). This is in line with previous findings for example Torff (2006).

III. Relationship between Primary school teachers' beliefs about the classroom use of critical thinking activities and their beliefs about teaching and learning. The influence of teachers' sense of efficacy.

1. Introduction

In the past decades, educational psychologists and researchers have focused on the nature and impact of teachers' beliefs about learning and teaching (e.g. Pajares, 1992; Calderhead, 1996; Fang, 1996; Richardson 1994, 1996; Pederson and Liu, 2003; Tadich et al. 2007; Fives & Bhuel, 2012). Teachers' beliefs have been shown to influence practices and how teachers structure tasks and interact with learners (e.g Anning, 1988; Peterson, Fennema, Carpenter, & Loef, 1989; Richardson, 1996; Mansour, 2009; Basturkmen, 2012).

A subset of this theory and research (see chapter 1, paragraph 5) concerns teachers' beliefs about critical thinking (CT): "the ability to use cognitive skills and strategies in order to engage in thinking that is purposeful, reasoned, and goal-directed. The kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions" (Halpern, 2003, p.6).

Based on Bloom's taxonomy (1956), memorization and recall of information are classified as lower order thinking whereas analyzing, synthesizing, and evaluating are classified as higher order. Zohar and Dori (2003) suggest additional examples of higher order cognitive activities, such as asking research questions, making comparisons, dealing with controversies, and identifying hidden assumptions. In school, teachers could have opted to share their knowledge of the topic either in a lecture format (an approach low in CT) or in a high-CT lesson with the benefits of making students active in their learning and requiring them to reason as scientists do.

Research on teachers' beliefs about high-CT and low-CT activities has focused on the relationship between such beliefs and teachers' perceptions of learners as high-advantage or low-advantage (i.e. differing in academic track, level of achievement, or socioeconomic status) (Pogrow, 1990; Zohar, Degani & Waakin, 2001; Zohar & Dori, 2003; Torff, 2003). Studies investigating differences in CT-related beliefs for high-advantage and low-advantage learners have been motivated by the assertion that teachers judge high-CT activities to be ineffective for low-advantage learners (Pogrow, 1990,1996; Raudensbush et al., 1993; Zohar et al., 2001). According to this line of reasoning, low-advantage learners receive few high-CT activities. As a consequence their academic growth is restricted which in turn makes high-CT activities even less likely to be subsequently used. In contrast, high-advantage learners receive an abundance of high-CT activities which results in enhancement of their academic

growth and increases the likelihood of subsequent high-CT instruction (Zohar et al., 2001). The consequence of these teachers' beliefs about the use of critical thinking is that disadvantaged students will probably receive impoverished critical thinking lessons that limit their academic growth; conversely, the advantaged receive rich critical thinking lessons that increase their academic performance.

All the studies mentioned are regarding secondary teacher beliefs about the use of critical thinking activities with different populations of learners. There are no studies about primary teachers despite of the importance attributed to critical thinking in the primary school national curriculum in many European and non-European countries.

The studies mentioned, and illustrated in depth in chapters I and II, did not consider the possible relationship between teachers' beliefs about the use of critical thinking activities in the classroom and other variables such as teachers' beliefs about teaching and learning, and teachers' beliefs about self-efficacy, that could present a more complex picture of teachers' beliefs. Is it possible that teachers' beliefs about CT are related to their beliefs about the nature of teaching and learning processes? Could they be related to teachers' perception of self efficacy in teaching? Knowing these possible relationships can help to comprehend the influence of these constructs and to take them into account when training teachers.

Teachers can possess a wide range of different beliefs about approaches to teaching such as transmission of knowledge (e.g. Hancock & Gallard, 2004), teacher-centred practices (Teo et al., 2008) constructivist teaching (e.g.Pederson & Liu, 2003) and student-centred practices (Snider & Roehl, 2007).

The research literature has evolved to focus on two large categories: student-centred models, typically reflecting constructivist views of teaching and teacher-centred models, typically a transmission model of teaching (e.g. Bunting, 1985; Ling, 2003; Richards & Gipe, 1994). In these investigations, the two categories are frequently pitted against each other and used as a lens for comparison. As a theory of learning, constructivism assumes that learners are active in constructing their own knowledge, that social interactions are important in this process, and that learning involves the integration of human biological, contextual, and social influences (Windschitl, 2002). In a constructivist school setting usually teachers pose a central question (Jonassen, 1999) that creates a need for certain knowledge and activities. A central question can be determined by the students too (Hannafin, Land, & Oliver, 1999) and it can take a variety of forms: a problem, an issue, a case, or a project. The students are presented with a situation or activity which frames this central question, thereby giving learners a common goal. The central question is usually at least somewhat ill structured, meaning that the goals and constraints of the question are not clearly stated, there may be multiple justifiable responses, responses may incorporate tradeoffs or drawbacks, it is not obvious what concepts or actions are relevant to the development of a response, and learners must make and justify decisions (Jonassen, 1997). The author

specifies that work in classroom with students begins with the presentation of this central question, and learning is the result of student efforts to develop a response to that question. As with the question, the response can take a variety of forms such as a solution, an opinion, a decision, a plan of action, a design, or other product, depending on the nature of the central question. Finally he highlights how, in teacher-directed instruction, the teacher sets learning objectives, and then plans a set of activities designed to help learners meet those objectives. Because learners are not assumed to be able to determine a process to meet these objectives, it is the responsibility of the teacher to guide or direct students through a step-by-step process and to make sure that any difficulties they encounter during this process are resolved. In student-centred learning, the teacher presents the central question (issue, case, problem), and then works as a facilitator as students determine the nature of the response they will develop, and then formulate and carry out a process to develop that response. Teachers help students to work through the difficulties they encounter by questioning them and helping them to identify alternative paths or resources, but they do not resolve these difficulties for the students. The success of the cooperative learning movement has resulted in an increase in the amount of interaction between students during teacher-directed instruction. This interaction, however, is frequently under teacher control, with teachers determining group membership, the nature of the interactions between the members, and even the role each member of the group plays. Teachers intervene in the group process when there are difficulties, and hold the group accountable for individual learning. Bruffee (1995) argued that the structure and vigilance teachers provide during cooperative learning tends to undermine students' control over their own process. Instead, student-centred approaches, which also assume a great deal of student interaction, are more in keeping with collaborative learning than cooperative learning. Collaborative learning emphasizes students' self-governance of their interactions, allowing them to make decisions about the individuals they work with, and how. As students negotiate their relationships with each other, they must articulate their ideas, and engage in a disciplined social process of inquiry and these activities are in keeping with constructivist principles and the goals of student-centred learning.

In 1985, Bunting attempted to validate prior work in which she identified four separate dimensions of teachers' educational beliefs (affective and cognitive educational values, directive teaching behaviour, and relevancy in subject matter). Using a sample of 320 teachers from kindergarten through to sixth grade, she analyzed responses to an inventory of 81 statements reflective of the beliefs listed above. This analysis revealed two independent dimensions of beliefs held by teachers: student-centred and directive factors. Student-centred factors included the importance of students' emotional development, the active and direct involvement of students in the learning process and the development of students' problem-solving skills. The directive factor included statements that were highly teacher-directed and controlling of the educational process.

About thirty years later, Pederson and Liu (2003) in a qualitative case study focused on the concerns and beliefs of teachers regarding student-centred learning. Researchers observed and designed to support a student-centred model. When describing their role during this and other teaching activities, most teachers described themselves as facilitators. They also generally believed that collaboration between students was a valuable teaching technique to enable students to learn how to work together but not necessarily to improve problem-solving and communication skills. Teachers also reported beliefs that factual information could not effectively be learned through student-centred instructional techniques. Most of the teachers did, however, believe that the students' struggles during these types of activities were beneficial and led to greater learning. One teacher in this study commented: *We say in the scientific method that you sometimes don't get the right answer but you still learn something from the wrong answer. So I think it's extremely valuable*. Another teacher reported a lack of belief in the constructivism approach to problem solving, namely a concern that student-centred activities caused confusion and frustration. She remarked that she disliked and found frustrating workshops where the materials were set out and she was expected to make something without direction. As result, this teacher reported: *I usually give them some direction just because it's frustrating for me*. This illustrates the power of beliefs in guiding teachers' classroom decisions and practices and the need to examine teachers' beliefs about both teaching practices and learning theories.

One assumption held in research on educational beliefs is that different beliefs can be structured into an overarching belief system (e.g.Green, 1971; Pajares, 1992). Individual beliefs always emerge in groups and are not held by each member independently of one another (Green, 1971). This assumption has led to a myriad of studies on different clusters of educational beliefs, such as pedagogical/didactical beliefs (Woolley et al., 2004). This finding is in line with previous research on the dimensionality of educational beliefs in which beliefs are presented as a multilayered construct (e.g. Denessen, 1999; Kerlinger, 1959a, 1959b; Woolley et al., 2004). Woolley et al. (2004) developed a three-dimensional Teacher Beliefs Survey to measure primary teacher beliefs. The dimensions, traditional teaching and traditional management, mainly zoom in on traditional approaches to the curriculum and assessment of the teaching component and behaviour management of the management component. In addition to the traditional dimensions, the validation study revealed the constructivist teaching dimension which focuses on constructivist approaches to teaching and learning.

In the context of teaching, educational researchers have also examined the construct of self-efficacy and the antecedents and consequences of a teacher's self-efficacy beliefs (Tschannen-Moran & Woolfolk Hoy, 2007; Woolfolk Hoy & Davis, 2006). Bandura (1977) introduced the construct of self-efficacy as belief in one's capabilities to organize and execute the courses of action required to produce given attainments. Despite the construct's brief history, empirical evidence supports Bandura's theory of self-efficacy and the

construct's ability to predict future behaviour. Applied in the context of education, teacher efficacy has generally been defined by Dembo and Gibson (1985) as the extent to which teachers believe they can affect student learning. The authors, in a study from 1984, found that, compared with low efficacy teachers, high efficacy teachers spent less time in small group discussions and more time monitoring and checking seatwork, in preparation or paperwork and in whole class instruction. High efficacy teachers also showed significantly more persistence than low efficacy teachers in leading students to correct responses and work longer with students who are either struggling or are disadvantaged (for example regarding their socioeconomic background or their abilities). Associations have been found between teachers' efficacy and the observed practices of teachers. In one study by Anderman and colleagues (2002), teachers with low mastery beliefs were found to consider learning to be an individual process, best achieved by listening to the teacher and following instructions. Student interaction was not considered helpful for learning and students were not encouraged to collaborate or share answers. Students received recognition if they followed procedures and obeyed the teacher rather than through achieving success on tasks. In contrast, teachers high in mastery beliefs focused on understanding and improvement because mistakes were considered informative for learning. Conversations with students were supportive, constructive and focused on the next steps in learning. Students were encouraged to actively participate in class and to work together. Students received feedback in relation to the task rather than in relation to procedures. Thus it can be seen that teacher beliefs appear to influence teacher practice.

On the basis of Bandura's (1997) definition of self-efficacy, several instruments have been developed to measure teacher self-efficacy. To measure teacher self-efficacy as a single dimension, Schwarzer, Schmitz, and Daytner (1999) developed a short instrument on which teachers responded to each of 10 statements on a 4-point scale from *not true at all* to *exactly true*. A limitation in the scale by Schwarzer et al. (1999) is that it measures teacher self-efficacy as a one-dimensional construct, making it less useful both for research purposes and for assessing the need for school development. Recognizing the need for a multidimensional scale, Tschannen-Moran and Woolfolk Hoy (2001) developed a 24-item Teachers' Sense of Efficacy Scale consisting of three dimensions: instructional strategies, classroom management, and student engagement. Each dimension has high reliability, and factor analysis confirmed the existence of three separate dimensions. Fives and Buehl (2012) examined the factor structure of the long and short forms of the Teachers' Sense of Efficacy Scale (Tschannen-Moran & A. Woolfolk-Hoy, 2001) for practicing (n = 102) and preservice teachers (n = 270), comparing the responses to both forms of the TSES, and looked for differences in teachers' efficacy with respect to experience and grade level taught. They found the 3-factor structure: efficacy for classroom management, instructional practices, and student engagement to be appropriate for practicing teachers, but they found a single efficacy factor to be appropriate for preservice teachers. The long and short forms of

the TSES produced similar means and reliability information, suggesting that either form is appropriate for use with preservice or practicing teachers. Lastly, they found that teachers with 10 or more years of teaching experience and those teaching at elementary level reported significantly higher levels of efficacy than preservice teachers and those teaching at middle or high school levels respectively.

There are only a few studies regarding the topic of teacher self-efficacy towards the teaching of thinking skills (e.g. Thomas &Walker, 1997) showing that when the teacher's level of self efficacy is low, the thinking skills teaching is also most likely negative. Davies (2004) investigated the relationship between teacher efficacy and the emphasis that teachers placed on higher order thinking in their teaching programs. In the study, this emphasis on higher order thinking was labelled "higher order instructional emphasis" and was operationalized through the emphasis placed on higher order instructional objectives and outcomes in the Australian science and history curriculum (for a description of this study see chapter I paragraph 4). The research examined teaching in New South Wales government schools in the subject areas of history and science in Year 7 to Year 10 (students from 12 to 15 years of age).

Aims

To sum up the literature examined, teachers' beliefs about teaching and learning styles can explain how teachers structure tasks and practices, interact with learners and take classroom decisions (e.g. Fives & Buehl, 2012; Pajares, 1992). There is also a lack of knowledge about teachers' beliefs about teaching/learning and teachers' beliefs about the use of critical thinking with different populations of learners. Studies also refer the influence of teachers' teaching and learning style on critical thinking skills (McCormick & Whittington, 2000; Saade, 2012).

Teachers with strong teaching self-efficacy believe they are capable of positively influencing student performance. They choose challenging activities, open the classrooms to new approaches to teaching and learning, and try harder when confronted with obstacles such as student ability or a student's home environment. In addition, these teachers tend to believe that all students can learn if appropriate conditions for learning can be provided (Tschannen-Moran & Hoy, 2001). Teachers with high self-efficacy beliefs are likely to adopt more student-centred (or constructivist) approaches in educational settings such as the classroom (e.g. Swars, 2005). Nevertheless, there are no studies about the relationship between teachers' beliefs about the use of critical thinking with different populations of students and teachers' self efficacy. In addition, there are no studies between the former and teachers' beliefs about teaching/learning style. In particular, the reciprocal influences of these three constructs have not been investigated in a single study.

The following aims were raised:

1) Analyse, for primary teachers who differ in teaching style beliefs, beliefs about the use of critical thinking activities with different populations of pupils.
2) Analyse the relationship between teachers' beliefs about the use of critical thinking with different populations of learners and teachers' beliefs about their teaching styles, and the relationship between the former and teachers' sense of self-efficacy dimensions.
3) Verify the concurrent influence of beliefs about teaching and self-efficacy on primary teachers' beliefs about the use of critical thinking with different populations of learners.

To ascertain primary teachers' beliefs about critical thinking with different populations of learners the new Critical Thinking Beliefs Appraisal for Primary School (CTBA-P) described in chapter 2 will be used. To investigate primary teachers' beliefs about the constructivist and traditional approach the Teacher Beliefs Survey (Wolley, 2004) will be administered, and to measure primary teachers' self-efficacy (efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement) the Teachers' Sense of Efficacy Scale (Tschannen & Hoy, 2001) will be handed out.

To reach the first aim, the CTBA-P and the TBS (Wolley, 2004) were planned to be administered to a group of primary teachers to find out, respectively, which beliefs about the use of critical thinking activities these teachers take into account in deciding whether to use high-CT or low-CT activities with different populations of learners, and their beliefs related to constructivist and traditional approaches to teaching and learning. A comparison analysis will be carried out to analyse teachers' beliefs about the use of critical thinking in teachers who hold different teaching styles.

To reach the second aim, a correlation analysis was planned between primary teachers' beliefs about the use of critical thinking activities with different populations of learners and teachers' beliefs about their teaching styles, and between the former and teachers' sense of self-efficacy.

Successively a regression analysis will be used to investigate in depth the influence of teachers' beliefs about teaching styles and teachers' self-efficacy on teachers' beliefs about critical thinking activities for high and low-advantage pupils.

2. Study 2

2.1 Method

2.2 Participants

The research involved a group of 174 primary school teachers described in the first study (see chapter 2 for a description of the sample).

2.3 Instrument

All participants, at the schools where they were employed, spent half an hour completing a questionnaire about their beliefs on teaching/learning, their sense of efficacy, and the use of critical thinking with children at primary school.

The questionnaire includes three validated instruments: the Critical Thinking Beliefs Appraisal for Primary School (CTBA-P); the Teacher Beliefs Survey (TBS, Woolley, 2004) and the Teachers' Sense of Efficacy Scale (TSES, Tschannen & Hoy, 2001). The questionnaire also includes a form about personal information (gender; age) and teaching career (subjects taught; highest degree attained; refresher courses; etc.).

The Critical Thinking Beliefs Appraisal for Primary teachers school (CTBA-P)

To investigate primary teachers' beliefs about the use of CT with different populations of learners the CTBA-P was administrated (see chapter 2 for a description of this instrument).

The Teacher Beliefs Survey (TBS)

The TBS (Wolley, 2004) translated into Italian (the back translation was used), contains 21 items yielding a three factor structure confirmed by the sample in this present study: traditional management, traditional teaching, and constructivist teaching.

Teachers are asked to imagine setting up their future classroom, as they read each of the survey statements, and to write a number on the line besides each statement to indicate how much they disagree or agree with the statement on a scale ranging from 1 (*strongly disagree)* to 6 (*strongly agree)*.

See below for samples of administrated statements and their English versions:

2. *Credo che utilizzare le idee degli alunni sia una buona strada per costruire la programmazione della classe. (I believe that expanding on students' ideas is an effective way to build my curriculum).*

13. *Stabilisco un tempo libero durante il quale gli alunni possano lavorare insieme senza la mia direzione. (I make it a priority in my classroom to give students time to work together when I am not directing them).*

21 Spesso baso le unità didattiche sugli interessi e le idee degli alunni. (I often create thematic units based on the students' interests and ideas).

The Teachers' Sense of Efficacy Scale

The long form of TSES (Tschannen & Hoy, 2001) translated into Italian (the back translation was used) comprises 24 items and three subscales: efficacy for instructional strategies (8 items), efficacy for classroom management (8 items), and efficacy for student engagement (8 items).

A fourth factor was identified to measure teacher self-efficacy for individual teaching. Many researchers have documented admonitions about adapting instruction to individual student's

needs from the early 1980s (e.g., Como & Snow, 1986; Federico, 1980; Reiser, 1987; Tobias, 1989). Adaptive instruction has been viewed as a primary factor for the success of instruction (Como & Snow, 1986) and Dewey in his 1902 essay emphasizes a curriculum development that produces an instruction that does not ignore the child's individual peculiarities, whims, and experiences. Based on the theoretical framework, items n. 5, n.6., n.14, n.17 were choosen and analysis of internal consistency gave an alpha of .83.

Items were introduced with the phrase *"How much can you do to…".* For each of the 24 items teachers responded on a 9-point Likert scale, ranging from 1=nothing to 9=great deal.

See below for samples of the items and their English translation:

2) *Quanto si sente capace di aiutare i suoi studenti a pensare criticamente? (How much can you do to help your students think critically?*).

9) *Quanto si sente capace di aiutare i suoi studenti ad autovalutare il proprio apprendimento? (How much can you do to help your students value learning?).*

17) *Quanto si sente capace di adattare le sue lezioni al livello di ciascuno studente? (How much can you do to adjust your lessons to the proper level for individual students?).*

2.4 Procedure

Before starting the questionnaire, teachers were informed that participation was voluntary and anonymous, and that there were no right or wrong answers. They were also informed that the information would be kept confidential and used only for the purpose of academic research. Completed questionnaires were handed in immediately. Data were collected in accordance with Italian law and the ethical code of the Professional Psychologists Association.

2.5 Results

2.6 Comparison among teachers

The sample was examined employing analysis of variance (ANOVA) using the four factors of CTBA-P as dependent variables and the TBS scores as grouping variables considering two factors: traditional teaching and traditional management, and constructivist teaching.

To compare teachers with respect to their teaching styles two groups were selected based on the median score: a) teachers with a traditional style and b) teachers with a constructivist style. The median for traditional teaching and traditional management was 3.30, and for constructivist teaching was 4.28. Thus the group of traditional style comprises teachers with higher scores in traditional teaching style and lower scores in constructivist teaching style, respectively scores over 3.30 and under 4.28. The group of constructivist teachers

comprises teachers with higher scores in constructivist teaching and lower scores in traditional teaching, respectively scores over 4.28 and under 3.30.

A significant result was found regarding high-CT for low-advantage pupils. Indeed, as shown in table 7, constructivist teachers believe that high-CT activities are effective for low-advantage students to a greater degree than traditional teachers. This result is statistically significant at the 2% significance level. In addition, constructivist teachers consider high-CT activities to be effective for high-advantage students to a greater extent than traditional teachers. This result is statistically significant at the 5% significance level. No statistically significative results were found regarding low-CT for high-advantage students and low-CT for low-advantage students.

These results suggest that teachers who prefer constructivist teaching/learning consider high-CT activities to be effective for both high-advantage and low-advantage pupils to a greater extent than traditional teachers.

Table 7. Analysis of variance CTBA-P and Teaching/Learning Style

	Traditional		Constructivist		Teaching/Learning Style	
Variable	M	SD	M	SD	F (1, 95)	Sign.
LowCT_HAd	4.47	1.17	4.67	.99	.76	.38
LowCT_LAd	3.75	.96	3.75	1.20	.0	.99
HighCT_LAd	2.87	.83	3.32	1.01	4.92	.02*
HighCT_HAd	4.47	1.01	4.89	1.02	3.87	.05*

2.7 Relationship between the three administrated instruments

The second aim of this study was to investigate the nature of the correlation between primary teachers' beliefs about the use of critical thinking activities with different populations of learners (CTBA-P) and teaching/learning style (TBS). In addition, the correlation between use of CT beliefs and teachers' sense of self-efficacy (TSES) was also investigated.

As shown in table 8, with respect to the relationship between CTBA-P and TBS, high-CT for low-advantage pupils scores are positively correlated with constructivist teaching scores (r=.27, significant at 1% level). This result suggests that beliefs about the effectiveness of high-CT activities with low-advantage students are related to constructivist beliefs rather than traditional ones: the more the teachers beliefs are constructivist, the more they believe that high-CT activities are effective with low-advantage pupils.

Regarding CTBA-P and TSES, beliefs of high-CT activities for the low-advantage population of learners is positively correlated with the four dimensions of teacher self efficacy related to: instruction (r=.18, significance at 5% level), classroom management (r=.23, significant at 1% level), student engagement (r=.22, significant at 1% level) and individual teaching self-

efficacy (r=.25, significant at 1% level). These results suggest that teachers with high self-efficacy with respect to all four dimensions are more likely to consider high-CT activities to be effective with low-advantage learners.

Furthermore, there is significant correlation between low-CT for low-advantage pupils and instructional self-efficacy (r=.16, 5% significant at 5% level), classroom management (r=.21, significant at 1% level) and student engagement (r=.18, 5% significant at 5% level significance level). These results show that beliefs about the effectiveness of low-CT for low-advantage pupils is related to the three dimensions of self-efficacy: the more teachers feel confident in instructional self-efficacy, classroom management and student engagement, the more they believe that low-CT activities are effective with low-advantage students.

In addition, a significant correlation was noticed between high-CT for low-advantage students and low-CT for low-advantage learners (r=.35, significant at 1% level) and high-CT for high-advantage pupils with low-CT for high-advantage students (r=.36, significant at 1% level).

No significant results emerged in this present study between teachers' self-efficacy dimensions and teaching styles.

Table 8. Correlation analysis (CTBA-P, TBS, TSES)

		Low-CT_HAd	High-CT_LAd	Low-CT_LAd	High-CT_HAd	Traditional teaching and management	Constructivist teaching	Instructional Self-efficacy	Classroom management Self-efficacy	Student engagement Self-efficacy	Individidual teaching Self_efficacy
Low-CT_HAd	Pearson Correlation	1									
	Sign. (two tail)										
	N	164									
High-CT_LAd	Pearson Correlation	,112	1								
	Sign. (two tail)	,193									
	N	138	140								
Low-CT_LAd	Pearson Correlation	-,008	,349**	1							
	Sign. (two tail)	,918	,000								
	N	159	137	166							
High-CT_HAd	Pearson Correlation	,359**	,154	-,022	1						
	Sign. (two tail)	,000	,070	,785							
	N	156	139	154	159						
Traditional teaching and management	Pearson Correlation	-,087	-,063	,024	-,146	1					
	Sign. (two tail)	,274	,467	,768	,072						
	N	158	135	156	153	161					
Constructivist teaching	Pearson Correlation	,148	,270**	-,049	,138	-,257**	1				
	Sign. (two tail)	,063	,002	,546	,089	,001					
	N	158	135	156	152	159	160				
Instructional Self-efficacy	Pearson Correlation	,007	,178*	,162*	,021	,110	,038	1			
	Sign. (two tail)	,931	,036	,039	,794	,167	,632				
	N	163	139	162	157	160	159	168			
Classroom management Self-efficacy	Pearson Correlation	,086	,230**	,209**	,055	,144	,017	,862**	1		
	Sign. (two tail)	,274	,006	,008	,490	,070	,835	,000			
	N	163	139	162	157	160	159	168	168		
Student engagement Self-efficacy	Pearson Correlation	,007	,221**	,177*	,058	,089	,005	,883**	,874**	1	
	Sign. (two tail)	,931	,009	,024	,474	,264	,950	,000	,000		
	N	163	139	162	157	160	159	168	168	168	
Individual teaching Self-efficacy	Pearson Correlation	,019	,249**	,119	,044	,103	,006	,889**	,870**	,904**	1
	Sign. (two tail)	,810	,003	,131	,587	,193	,937	,000	,000	,000	
	N	163	139	163	157	160	159	168	168	168	169

** The correlation is significant at the 1% level (two tail).

* The correlation is significant at the 5% level (two tail).

2.8 Relationship between high-CT for low-advantage pupils and teachers' characteristics

The results from the previous correlation analysis provide motivation to investigate further the discovered relationships by employing regression analysis, using as dependent variable the high-CT for low-advantage pupils score and as independent variables: teacher age, teaching experience, constructive teaching and, traditional management and teaching. In addition, the following independent variables were added in four different analyses:

1. instructional strategies self-efficacy (regression 1/table 9);
2. classroom management self-efficacy (regression 2/table 10);
3. engagement self-efficacy (regression 1/table 11);
4. individual teaching self-efficacy (regression 4/table 12).

In the first model, teaching experience and teacher age enter in the first step without significant effect, followed by constructivist teaching and traditional teaching and management in the second step, and instructional strategies in the third step. As shown in the table 9, there is a significant relationship between high-CT activities for low-advantage pupils and constructive teaching score, but not with traditional teaching and instructional strategies self-efficacy. This result suggests the more teachers prefer constructivist teaching, the more they believe that high-CT activities are effective with low-advantage pupils.

Table. 9 Multiple regression analyses of High-CT_LAd on teacher age, teaching experience, traditional management and teaching, constructive teaching and instructional strategies self-efficacy.

		High-CT _LAd	
		At entry β	Incremental R2
Step 1			,00
	teaching experience	,022	
	teacher age	-,001	
Step 2			,07
	teaching experience	,032	
	teacher age	-,005	
	constructivist teaching	,274**	
	traditional management and teaching	,034	
Step 3			,02
	teaching experience	,045	
	teacher age	-,032	
	constructive teaching	,263**	
	traditional management and teaching	,016	
	instructional teaching self-efficacy	,134	

Multiple R	0.29
R2	0.09
Adjusted R2	0.04

Note: All multiple R and R2 are significant ($p < 0.001$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

In the second model, teaching experience and teacher age enter in the first step without significant effect, followed by constructivist teaching and traditional teaching and management in the second step, and classroom management self-efficacy in the third step. As shown in table 10, there is a significant relationship between high-CT activities for low-advantage pupils and constructivist teaching classroom management self-efficacy. The more teachers prefer constructivist teaching style and feel confident in their classroom management, the more they believe that high-CT activities are effective for low-advantage pupils.

Table.10 Multiple regression analyses of High-CT_LAd on teacher age, teaching experience, traditional management and teaching, constructive teaching and classroom management self-efficacy.

		High-CT_Lad	
		At entry β	Incremental R2
Step 1			,00
	teaching experience	,022	
	teacher age	-,001	
Step 2			,07
	teaching experience	,032	
	teacher age	-,005	
	constructivist teaching	,274**	
	traditional mangement and teaching	,034	
Step 3			,03
	teaching experience	,032	
	teacher age	-,051	
	constructive teaching	,260**	
	traditional management and teaching	,004	
	classroom management self-efficacy	,195*	
Multiple R		0.32	
R2		0.10	
Adjusted R2		0.06	

Note: All multiple R and R2 are significant ($p < 0.001$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

In the third model, teaching experience and teacher age enter in the first step without significant effect, followed by constructivist teaching and traditional teaching and management in the second step, and student engagement self-efficacy in the third step. As shown in table 11, there is a significant relationship between high-CT for low-advantage students and constructivist teaching and student engagement self-efficacy. The more teachers prefer the constructivist teaching style and feel confident in student engagement, the more they believe that high-CT activities are effective for low-advantage pupils.

Table.11 - Multiple regression analyses of HighCT_LAd on teacher age, teaching experience, traditional management and teaching, constructive teaching and student engagement self-efficacy.

		High-CT_La	
		At entry β	Incremental R2
Step 1			,00
	teaching experience	,022	
	teacher age	-,001	
Step 2			,07
	teaching experience	,032	
	teacher age	-,005	
	constructist teaching	,274**	
	traditional management and teaching	,034	
Step 3			,03
	teaching experience	,054	
	teacher age	-,057	
	constructive teaching	,262**	
	traditional management and teaching	,006	
	student engagement self-efficacy	,193*	

Multiple R	0.32
R2	0.10
Adjusted R2	0.63

Note: All multiple R and R2 are significant ($p < 0.001$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

In the fourth model, teaching experience and teacher age enter in the first step without significant effect, followed by constructivist teaching and traditional teaching and management in the second step, and individual teaching self-efficacy in the third step. As shown in the table 11, there is a significant relationship between high-CT for low-advantage students and constructivist teaching and individual teaching self-efficacy. The more teachers

prefer constructivist teaching style and feel confident in individual teaching, the more they belief that high-CT activities are effective for low-advantage pupils.

The association among predictors and dependent variables was moderately high, with multiple correlation coefficients between 0.29 and 0.34. Overall the proposed models accounted for approximately 10% of the variation.

Table. 12 Multiple regression analyses of HighCT_LAd on teacher age, teaching experience, traditional management and teaching, constructive teaching and individual teaching self-efficacy.

		High-CT_LAd	
		At entry β	Incremental R2
Step 1			,00
	teaching experience	,022	
	teacher age	-,001	
Step 2			,07
	teaching experience	,032	
	teacher age	-,005	
	constructivist teaching	,274**	
	traditional management and teaching	,034	
Step 3			,05
	teaching experience	,048	
	teacher age	-,056	
	constructivist teaching	,258**	
	traditional management and teaching	-,002	
	individual teaching self-efficacy	,222*	

Multiple R	0.34
R2	0.12
Adjusted R2	0.75

Note: All multiple R and R2 are significant ($p < 0.001$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

3. Discussion

Comparative analysis in primary teachers who differ in teaching style beliefs told us that constructivist teachers in the sample consider high-CT activities to be effective with low-

advantage students to a greater extent than traditional teachers. The same constructivist teachers consider high-critical thinking activities to be effective with high-advantage pupils to a greater extent than traditional teachers. These are new results that are not comparable with previous research. The constructivist theory recognises that students need to be exposed to learning experiences that enable them to construct their own knowledge (Cobb, 1994; Driver, Asoko, Leach, Mortimer, & Scott, 1994) and are more effective in recognizing the importance of higher-order critical thinking skills with both high and low-advantage population of learners.

These expected findings are in line with the theoretical background and the current reform trends in science education, where the relevant change is from a traditional view of teaching based on lower-order cognitive skills, to one based on developing students' higher-order cognitive/thinking skills (see for example: Leou, Abder, Riordan, & Zoller, 2006).

Moreover, this study confirms, for both constructivist and traditional teachers, the *advantage effect* found in prior research (Raudenbush et al., 1993; Zohar et al. 2001; Warbutron &Torff ,2005; Torff &Warburton, 2005; Torff, 2006) as teachers rated both highCT and lowCT activities as significantly more effective for high-advantage learners than low-advantage ones.

Investigation on this Italian sample revealed, contrary to the findings in Torff's studies (e.g. 2005) a *pedagogical effect* regarding low-advantage learners, with low-CT activities being considered more effective than high-CT activities for low-advantage pupils.

Constructivist teachers and traditional teachers both consider low-CT activities to be more effective for low-advantage learners compared to high-CT activities. This result is not in line with previous research (e.g. Torff, 2006) where teachers produced a *pedagogical-preference effect* for high-CT, considering high-CT activities more effective than low-CT ones for both populations of learners. In contrast, in the present study teachers show a *pedagogical-preference effect* for low-CT.

Correlation analysis also showed a positive result between high-CT for low-advantage learners and constructivist teachers. This result confirmed that teachers who prefer constructivist teaching are more likely to consider high-CT activities to be effective for low-advantage pupils. In addition, a positive correlation result was observed between high-CT for low-advantage learners and the four dimensions of self-efficacy: teachers who score highly in the four self-efficacy dimensions analysed are more likely to consider high-CT activities to be effective with low-advantage learners. Teachers with high self-efficacy, with the exception of individual teaching self-efficacy, are also more likely to consider low-CT activities to be effective with low-advantage students. This is in line with research on teacher self-efficacy, which tells us that teachers who consider themselves to be effective can implement better teaching programmes and make a greater effort to provide learning opportunities to students with low-advantage pupils (e.g Davies, 2004).

Finally, results of regression analysis offer us an in depth view of teachers' beliefs about the use of high-CT activities with low-advantage students. The more teachers prefer the constructivist teaching style and feel confident in classroom management, student engagement and individual individual self efficacy, the more they believe that high-CT activities are effective for low-advantage pupils. This last result shows that constructivist teaching style and a strong sense of self-efficacy positively influence beliefs about the effectiveness of high-CT activities for low-advantage pupils.

Conclusion

The CTBA-P represents the first instrument to investigate teachers' beliefs about the use of critical thinking activities with different populations of learners in the Italian context and, in particular, for primary school teachers. The positive validation and reliability of the instrument encourages us to investigate a larger sample to confirm or otherwise the findings of this present study.

In addition, considering that the original CTBA to assess secondary school teachers (Torff and Warburton 2005) can also be used with preservice teachers, allowing researchers to investigate the origin and development of CT-use beliefs, the same practical utility would also be expected from the CTBA-P. For example, once teachers' beliefs about the use of critical thinking for both inservice and preservice teachers are better known, it could be possible to plan specific teacher training courses to make teachers conscious of their beliefs and change those which discourage learning.

The use of the CTBA-P for this present study provided us with new additional information about primary teachers' beliefs regarding the use of critical thinking skills with different populations of learners. Teachers believe that, for low-advantage learners, low-CT activities are more effective than high-CT activities. This result did not confirm the finding of previous research (e.g. Torff, 2006) where teachers produced a *pedagogical-preference effect* for high-CT. In that case teachers considered high-CT activities to be more effective than low-CT ones for both populations of pupils. In this case there is a *pedagogical-preference effect* for low-CT, as teachers believe these activities are more effective for disadvantaged pupils.

In addition, teachers consider both high-CT and low-CT activities to be more effective with high-advantage learners than low-advantage learners. Finally, teachers evaluate both high-CT and low-CT activities as effective, at the same level, for high-advantage learners. This *advantage effect* is consistent with prior research (Raudenbush et al., 1993; Zohar et al. 2001; Warbutron and Torff ,2005; Torff and Warburton, 2005; Torff, 2006).

This suggests that, in general, Italian teachers assign more importance to the pupil's level than the level of the critical thinking activities.

The relationship between teachers' beliefs about the use of critical thinking activities and teaching/learning style, and between the former and teachers' sense of efficacy give us the following information. Teachers are more likely to consider high-CT activities to be effective with low-advantage students when they have constructivist teaching beliefs with a strong sense of self-efficacy in the following three dimensions of self-efficacy: classroom management, student engagement and individual teaching.

In other words, investigation on teachers' beliefs about learning styles and about sense of efficacy presented a more complex picture of teachers' beliefs about CT activities. In this present study, beliefs about learning style and teachers' sense of efficacy play a relevant role and explain beliefs about the effectiveness of the use of critical thinking activities with low-advantage pupils.

These results should be taken into account in teacher training and in post-secondary teaching courses considering that teachers' beliefs and practices are connected. Teacher training needs to underline not only the importance and the value of thinking skills teaching but also to consider that teaching style and teachers' self efficacy can play a relevant role in favour of high critical thinking skills also for low-advantage students. Indeed the constructivist theory recognises that students need to construct their own knowledge (Cobb, 1994; Driver, Asoko, Leach, Mortimer, & Scott, 1994). For this reason, compared to the traditional approach, constructivist teachers are more effective in recognizing the importance of higher-order critical thinking skills with both high and low-advantage populations of learners.

Self-efficacy is considered as an important variable in research about goal attainment, academic achievement, professional development and teacher training, and research reports significant associations between self-efficacy and the cited variables (Pajares, 1996, 2002). When the level of self-efficacy is low, the impact upon performance with respect to teaching thinking skills is most likely negative (Hampton, 1996). Teachers' self-efficacy beliefs are critical in the development of a young person's own self-efficacy towards thinking (Thomas & Walker, 1997).

Torff's studies in 2005 found differences in ratings of high-CT for low-advantage students between four teacher groups (prospective, preservice, inservice and control group): prospective teachers and preservice teachers were significantly higher than controls. Preservice teachers were also significantly higher than inservice ones. Prospective teachers produced higher ratings than controls, and prospective and preservice teachers produced similar ratings. Inservice teachers produced slightly lower ratings relative to preservice teachers. That suggests that the best time to promote investigation and change in beliefs is during post secondary teaching courses.

In this present study, no differences in beliefs about the use of CT activities with different levels of pupils were found in respect of years of experience and this is in line with Torff's

studies (e.g. 2006). Future research may not confirm this result and investigation of prospective teachers' beliefs can add additional information to the present findings.

Limitations of this present study can give directions for future research. First of all, the study could be replicated with a larger group of teachers, to verify or otherwise the results of this study. Secondly, this sample considers only inservice teachers and not prospective teachers. Another limitation is that no investigation on teachers' critical thinking was carried out in this present study to find out whether there is a relationship between beliefs about the use of critical thinking with different populations of students and teachers' critical thinking to confirm or otherwise Torff's previous study (2005). Torff (2005) investigated the predictive validity of scores produced by the CTBA and the correlations between observed CT use and classroom matched CTBA scores in all groups suggest that the CTBA produced scores with satisfactory predictive validity. In addition, he investigated the possibility that teachers with high CT disposition favour CT activities in the classroom. Slightly larger correlations were found between the dimensions of California Critical Thinking Skills Test Form that was used as a test of teachers' CT ability, and high-CT prompts for high-advantage and low-advantage learners. These results suggest that the CTBA tapped a construct that was, perhaps, related to but distinguishable from CT ability.

Finally, the predictive validity of scores produced by the CTBA needs to be investigated in the Italian context i.e. the strength of association between CTBA results and teachers' observed classroom practice as demonstrated in the previous findings (Torff, 2005).

References

Allinder, R.M. (2004). The relationship between efficacy and the instructional practices of special education teachers and consultants. Teacher Education and Special Education, 17, pp.86-95, In Davies, B. (2004). The relationship between teacher efficacy and higher order instructional emphasis. *Australian Educatinal Research.*

Anderman, E. M., Austin, C. C., & Johnson, D. M. (2002a). The development of goal orientation. In A. Wigfield & J. S. Eccles (Eds.), Development of achievement motivation (pp. 197–220). San Diego, California: Academic.

Anderman, L. H., Patrick, H., Hruda, L. Z., & Linnenbrink, E. A. (2002). *Observing classroom goal structures to clarify and expand goal theory. In C. Midgley (Ed.), Goals, goal structures, and patterns of adaptive learning (pp. 243-294). Mahwah, NJ: Lawrence Erlbaum.*

Anderson, R., Greene, M., & Loewen, P. (1988). Relationships among teachers' and students' thinking skills, sense of efficacy, and student achievement. *Alberta Journal of Educational Research*, *34*, 148-165.

Anning, A. (1988). Teachers' theories about children's learning, in: J. Calderhead (Ed.) *Teachers' Professional Learning.* Lewes, Falmer Press. Anthony, T. & Kritsonis, W. (2007). A mixed methods assessment of the effectiveness of strategic e-mentoring in improving the self-efficacy and persistence (or retention) of alternatively certified novice teachers within an inner city school. District Doctoral Forum. *National Journal for Publishing and Monitoring Doctoral Student Research*, 4(1), 1–8.

Ashton, P.T., & Webb, R.B. (1982). *Teacher's sense of efficacy: Toward an ecological model.* Paper presented at the annual meeting of the American Educational Research Association. New York.

Ashton, T. & Webb, B. (1986) Making a Difference: Teachers' Sense of Efficacy and Student Achievement. White Plains, NY: Longman.

Baillin, S., Case, R., Coombs, J.R. & Daniels, L.B. (1999). Conceptualizing critical thinking. *Journal of Curriculum Studies, 31*(3), 285-302.

Ball, C. (1989). *Towards* an *enterprising culture,* a *challenge for education and training.* Paris: OECD/CERI.

Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioural change. *Journal of Personality and Social Psychology, 35,* 125-139.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Basturkmen, H. (2012). Review of research into the correspondence between language teacher's stated beliefs and practices. *System: An International Journal of Educational Technology and Applied Linguistics,* 40(2), 282-295.

Baumfield, V., Butterworth, M., Downey, G., Gregson, M., Higgins, S., Lin, M., Moseley, D. & Rockett, M. (2004). Thinking skills apporaches to effective teaching and learning; what is the evidence for impact on learners? EPPI-Centre.

Bentley, T. (2000). Learning Beyond the Classroom: Education for a Changing World. London. Routledge.

Bloom, B. S. (Ed.). (1956). Taxonomy of educational objectives: Vol.1. Cognitive domain. New York: Long- mans, Green.

Brophy, J. E. (1985). Teacher-student interaction. In J. B. Dusek (Ed.), *Teacher expectancies* (pp. 303 - 328). Hillsdale, N. J.: Lawrence Erlbaum.

Brophy, J. E., & Good, T. L. (1974). *Teacher-Student Relationships: Causes and Consequences*. New York: Holt, Rinehart & Winston.

Brown, A. L., & Campione, J. C. (1990). Interactive learning environments and the teaching of science and mathematics. In M. Gardner, J. Greens, F. Reif, A. Schoenfeld, A. di Sessa, & E. Stage (Eds.), *Toward a scientific practice of science education* (pp. 111-139). Hillsdale, NJ: Erlbaum.

Brown, A., & Campione, J. (1990). Communities of learning and thinking, or a context by any other name. In D. Kuhn (Ed.), *Developmental perspectives on teaching and learning thinking skills: Contributions to child development* (Vol. 21, pp. 108-126). Basel, Switzerland: Karger.

Browne, M., & Keeley, K. (2001). *Asking the right questions: A guide to critical thinking* (6th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Bruffee, K. (1995). Sharing our toys: Cooperative verses collaborative learning. *Change, 27*, 12-18.

Bryan, L. (2003). Nestedness of beliefs: Examining a prospective elementary teacher's belief system about science teaching and learning. *Journal of Research in Science Teaching, 40,* 835–868.

Bullock, D. (2010). Learner self-assessment: An investigation into teachers' beliefs. *ELT Journal* 65(2), 114-125.

Bunting, C.E. (1985). Dimensionality of teacher educational beliefs: A validation study. *Journal of Experimental Education, 53* (4), 188-192.

Burden,.L.& Williams,M.(Eds)(1998).*Thinking through the Curriculum*. London. Routledge.

Burke, L. A., and Williams, J. M. (2005), 'Developmental Changes in Children's Understandings of Intelligence and Thinking Skills', British Psychological Society Developmental Section annual conference, Edinburgh, 5–8 September.

Burke, M., Williams, J. and Skinner D, (2008). Teachers' perceptions of thinking skills in the primary curriculum. Moray House School of Education, University of Edinburgh

Calderhead, J. (1996). Teachers: Belifs and knowledge. In D. C. Berliner & R.C. Calfee (Eds.), *Handbook of educational Psychology* (pp.709-725). New York, N.Y.:Macmillan.

Caprara, G., Barbaranelli, C., Steca, P. & Malone, P. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: a study at the school level. *Journal of School Psychology*, 44(1), 473–90.

Case, R. (2005). Moving critical thinking to the main stage. *Educational Canada*, 45(2), 45-49.

Chai, C.S., Teo, T., & Lee, C.B. (2009). The change in epistemological beliefs and beliefs about teaching and learning: A study among preservice teachers. *Asia-Pacific Journal of Teacher Education, 37, 351-362.*

Chan, K.W. (2011). Preservice teacher education students' epistemological beliefs and conception about learning. *Instructional Science, 39* . 87-108.

Cheng, M.M., H., Chan, K., Tang, S. Y. F., & Cheng, A. Y. N. (2009). Preservice teacher education students' epistemological beliefs and their conceptions of teaching. *Teaching and Teacher Educatio, 25*, 319-327

Cheung, H. (2008). Teacher efficacy: a comparative study of Hong Kong and Shanghai primary in-service teachers. *Australian Educational Researcher*, 35(1), 103–23.

Ciani, K.D., Summer, J., & Easter, M.A. (2008). A "top-down" analysis of high school teacher motivation. *Contemporary Educational Psychology,* 33(4), 533-560.

Cotton, K. (2002). Teaching thinking skills. School Research Series (SIRS). Portland, OR: Nortwest Regional Education Laboratory.

Darling-Hammond, L., Chung, R. & Frelow, F. (2002). Variation in teacher preparation: how well do different pathways prepare teachers to teach? *Journal of Teacher Education*, 53(4), 286–302

Davies, B. (2004). The relationship between teacher efficacy and higher order instructional emphasis. *Australian Educational Research.*

Davison, B., & Dunham, R. (1997). Assesing EFL student progress in critical thinking with the Ennis-Weir Critical Thinking Essay Test. *JALT Journal, 19*(1), 43-57.

De Bono, E. (1976). Teaching thinking. London: Maurice Temple Smith.

De Bono, E. (2000). De Bono Thinking Course. Revised. London. BBC Worldwide Publishing.

Dembo, M. H., & Gibson, S. 1985. Teacher's sense of self-efficacy: An important factor in school improvement. *Elementary School Journal,* 86, 173–184.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educational process.* Lexington, MA: D.C. Heath

Dewey, J. (1966). Democracy and education. Toronto: Collier-Macmillan.

Ennis, R.H. (1985). A logical basis for measuring critical thinking skills. *Educational Leadership*, *43*(2), 44-48.

Ennis, R. (1987). A taxonomy of critical-thinking dispositions and abilities. In J. Baron & R. Sternberg (Eds.), *Teaching thinking skills: Theory and practice* (pp. 9-26). New York: Freeman.

Ennis, R.H. (1997). Incorporating Thinking Skills into the Curriculum. An Introduction to some basic issues. *Inquiry: Critical thinking Across the disciplines,* Spring1997. Vol XVI, 3.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teachers beliefs and technology integration practices: a critical relationship. *Computers & Education,* 59(2), 423–435. Experimental Education, 53(4), 188-192.

Facione, P.A. (1990). *Critical thinking: A statement of expert consensus for purpose of educational assessment and instruction,* Millbrae, CA: The California Academic Press.

Facione, P.A. (2000). The disposition toward critical thinking: Its character, measurement, and relation to critical thinking skills. *Informal Logic, 20*(1), 61-84.

Fang, Z. (1996). A review of research on teacher beliefs and practices. *Educational Research, 38*(1), 47-65.

Feuerstein, M. (1980). Participatory evaluation: An appropriate technology for community health programmes. Contact, 55, l-8

Fisher, R. (2000). Teaching Thinking: Philosophical Enquiry in the Classroom. London. Continuum.

Fives, H., & Buehl, M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology, 33,* 134–176.

Fives, H., & Buehl, M. M. (2012). Spring cleaning for the 'messy' construct of teachers' beliefs: What arethey? Which have been examined? What can they tell us? In: K.R. Harris, & T. Urdan (eds.) APA educational psychology handbook: vol 2. Individual differences and cultural and contextual factors (pp.471–499).

Halpern, D. F. (2003). Thinking critically about creative thinking. In M. A. Runco (Ed.), Critical creative processes (pp. 189–208). Cresskill, NJ: Hampton.

Hampton, M. (1996). *The relationship of learning disabilities to the studies of self-efficacy, efficacy expectations, and academic achievement in high school students.* Doctoral dissertation. Lexington, Kentucky.

Henson, K. (2001). Relationships Between Pre-service Teachers' Self-Efficacy, Task Analysis, and Classroom Management Beliefs. Paper presented at the Annual Meeting of the South- west Educational Research Association, New Orleans.

Gardner, H. (1983). Frames of mind: the theory of multiple intelligence. New York. Basic books.

Georgiadou-Kabouridis, B. & Potari, D. (2009). A primary teacher's mathematics teaching: the development of beliefs and practice in different "supportive" contexts. *Journal of Mathematics Teacher Education, 12, 7-25.*

Giallo, R. & Little, E. (2003). Classroom behaviour problems: the relationship between preparedness, classroom experiences, and self-efficacy in graduate and student teachers. *Australian Journal of Educational & Developmental Psychology*, 3, 21–34.

Gibson, S. & Dembo, H. (1984). Teacher efficacy: a construct validation. *Journal of Educational Psychology*, 76(4), 569–82.

Gill, M.G., & Hoffman, B. (2009). Shared planning time: A novel context for studying teachers' discourse and beliefs about learning and istruction. *Teachers College Record, 111*, (5), 1242-1273.

Goddard, R. D., Hoy, W. K., & Woolfolk Hoy, A. (2004). Collective efficacy: Theoretical developments, empirical evidence, and future directions. *Educational Researcher, 33*, 3- 13.

Goddard, R., Hoy, W. & Woolfolk, A. (2004). Collective efficacy beliefs: theoretical developments, empirical evidence, and future directions. *Researcher*, 3(33), 3–13.

Green, T. (1971). *The activities of teaching.* New York, NY:McGraw-Hill.

Guskey, T. (1986). Staff development and the process of teacher change. *Educational Researcher*, 15(5), 5-12.

Halpern, D.F. (1998). Teaching critical thinking for transfer across domains: Dispositions, skills, structure training, and metacognitive monitoring. *American Psychologist, 53*(4), 449-455.

Halpern, D. (2002). *Thought and knowledge* (4th ed.). Mahwah, NJ: Erlbaum.

Hancock, E., & Gallard, A. (2004, November 1). Preservice science teachers' beliefs about teaching and learning: The influence of K–12 field experiences. *Journal of Science Teacher Education, 15,* 281–291.

Hannafin, M., Land, S, and Oliver, K. (1999). Open Learning Environments: Foundations, Methods, and Models. In Reigeluth, C.M. (ed.), Instructional-Design Theories and Models: A New Paradigm of Instructional Theory. Volume II (pp. 215-239). Lawrence Erlbaum.

Henderson, J. (2001). *Reflective teaching: Professional artistry through inquiry* (3rd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall

Higgins, S., E. Hall, V. Baumfield, and D. Moseley. 2005. A meta-analysis of the impact of the implementation of thinking skills approaches on pupils. London: EPPI-Centre.

Hoy, A. (2004) What Do Teachers Need to Know About Self-Efficacy? Paper presented at the annual meeting of the American Educational Research Association, San Diego.

Jenkins, J. 2004. What evidence is there that the use of thinking for learning approaches improves standards? Morpeth: Northumberland County Council.

Johnson, A. (2000b). Up and out: Using creative and critical thinking skills to enhance learning.

Johnson, K. (1994). The emerging beliefs and instruc- tional practices of preservice English as a second lan- guage teachers. *Teaching and Teacher Education, 10,* 439–452.

Jonassen, D. H. (1997). Instructional design models for well-structured and ill-structured problem-solving learning outcomes. Educational Technology: Research and Development, 45(1), 65-94.

Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional design theories and models: A new paradigm of instructional theory* (Vol. 2, pp. 371–396). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Jones, Hanneke (2008) 'Thoughts on teaching thinking: perceptions of practitioners with a shared culture of thinking skills education', Curriculum Journal, 19: 4, 309-324

Jorgensen, R., Gootenboer, P., Niesche, R., &Lerman, S. (2010). Challenges for teacher education: The mismatch between beliefs and practice in remote indigenous contexts. *Asia-Pacific Journal of Teacher Education, 38(*2), 161-175.

Jussim, L., Robustelli, S. L., & Cain, T. R. (2009). Teacher expectations and self-fulfilling prophecies. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation in school* (pp. 349-380). New York: Routledge.

Kagan, D. M. (1992). Implications of research on teacher belief. *Educational Psychologist, 27,* 65–90.

Kang, N. (2008). Learning to teach science: Personal epistemologies, teaching goals, and practices of teaching. *Teaching and Teacher Education, 24,* 478-498.

Kennedy, W. B. (1981). Highlander praxis: Learning with Myles Horton. *Teachers College Record, 83,* 105-119.

La Paro, K., Siepak, K., & Scott-Little, C. (2009). Assessing beliefs of preservice early childhood education teachers using Q-sort methodology. *Journal of Early Childhood Teacher Education, 30,* 22–36.

Leat, D. 1998. Thinking through geography. Cambridge: Chris Kington 1999. Rolling the stone uphill: teacher development and the implementation of thinking skills programmes. Oxford Review of Education 25, no. 3.

Lee, Y. S., Baik, J., & Charlesworth, R. (2006). Differential effects of kindergarten teacher's beliefs about developmentally appropriate practice on their use of scaffolding following inservice train- ing. *Teaching and Teacher Education, 22,* 935–945.

Lewis, A., & Smith, D. (1993). Defining higher order thinking. *Theory into Practie, 32* (3), 131-137.

Lim, C., & Chai, C. (2008). Teachers' pedagogical beliefs and their planning and conduct of computer-mediated classroom lessons. *British Journal of Educational Spring Cleaning for the Construct of Teachers' Beliefs Technology, 39,* 807–828.

Ling, L.Y. (2003). What makes a good kindergarten teacher? A pilot study in Hong Kong. *Early Child Development and Care, 173* (1), 19-31.

Lipman, M., Sharp, A. & Oscanyan, F. (1980). *Philosophy in the classroom*. Philadelphia, PA: Temple University Press.

Lipman, M. (1985) Thinking skills fostered by philosophy for children. In Segal, J, Chipman, S and Glaser, R (eds) (1985)*Thinking and Learning Skills Vol 1*, New Jersey: Lawrence Erlbaum Associates.

Lipman, M. (1998). Critical thinking. What can it be? *Educational Leadership, 46*(1), 38-43.

Liu, S. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education, 56*, 1012-1022.

Lumpe, A., Czerniak, C., Haney, J., & Beltyukova, S. (2012). Beliefs about teaching Science: The relationship between elementary teachers' participation in professional development and student achievement. *International Journal of Science Education, 34*(2), 153–166.

MacBride, R., & Bonnette, R. (1995). Teacher and at-risk students' cognitions during open-ended activities: Structuring the learning enviornment for critical thinking. *Teaching and Teacher Education,* 11(4), 373-378.

Mansour, N. (2009). Science teachers' beliefs and practices: issues, implications and research agenda. *International Journal of Environmental and Science Education, 4*(1), 25–48.

Marin, L.M., & Halpern, D.F., 2010 Pedagogy for developing critical thinking in adolescents: Explicit instruction produces greatest gains. *Thinking Skills and Creativity*.

Mason, M. (2010). *Critical thinking and learning*. New York, NY: Wiley

Metz, M. H. (1978). *Classrooms and corridors: The crisis of authority in desegregated second- ary schools*. Berkeley: University of California Press.

Monsour, N. (2009) 'Science Teachers' Beliefs and Practices: Issues, Implications and Research Agenda', *International Journal of Enviromental and Science Education,* 4(1), 25-48.

Moseley, D., V. Baumfield, J. Elliott, M. Gregson, S. Higgins, M. Lin, J. Miller, D. Newton, and S. Robson. 2003. Thinking skill frameworks for post-16 learners: an evaluation. Learning and Skills Development Agency (LSDA). Available online at: http://www.lsda.org.uk/files/pdf/1541.pdf.

Mouza, C. (2009). Does Research-Based Professional Development Make a Difference? A Longitudinal Investigation of Teacher Learning in Technology Integration. *Teachers College Record, Vol. 111*(Issue 5), 1195-1241.

Needham Heights, MA: Allyn and Bacon.Nickerson, J. (1988). "On improving thinking through instruction", Review of research in education, Vol. 15, Rothkopf Education, Ez

Nespor, J. (1987). The role of beliefs in the practice of teaching. *Journal of Curriculum Studies, 19,* 317–328.

Niyozow, S. (2009). Understanding teaching beyond content and method: Insights from Central asia. *European Education, 40 (4),*46-69.

Nolen, S., Ward, C., Horn, I., Campbel, S., Mahna, K. & Childers, S. (2007) Motivation to Learn During Student Teaching. Paper presented at the annual meeting of the American Educational Research Association, Chicago.

O'Tuel, F., & Bullard, R. (1993). *Developing higher-order thinking in the content areas*. Pacific Grove, CA: Critical Thinking Books and Software.

Oakes, J. (1990). *Multiplying inequities: The effects of race, social class, and tracking on opportunities to learn math and science*. Santa Monica, CA: Rand Corporation.

Ogan-Bekiroglu, F. & Akkoc, H. (2009). Preservice teachers' instructional beliefs and examination of consistency between beliefs and practices International Journal of Australian Journal of Teacher Education Science and Mathematics Education, 7(6), 1173-1199.

Oliver, W. A. (1953). Teachers' educational beliefs versus their classroom practices. *The Journal of Educational Research, 47,* 47–55.

Onosko, J. (1991). "Barriers to the promotion of higher-order thinking in social studies." *Theory and Research in Social Education,* 19(4), 341-366.

Osisioma, I., & Moscovici, H. (2008). Profiling the beliefs of the forgotten teachers: An analysis of intern teachers' frameworks for urban science teaching. *Journal of Science Teacher Education, 19,* 285–311. doi:10.1007/ s10972-008-9093-8

Oxford Review of Education 32, no. 2: 185–96.

Page, R. N. (1990). The lower-track curriculum in a college-preparatory high school. *Curriculum Inquiry, 20*(3), 249-281.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62(3), 307–332.

Pajares, F. (1996). Self-efficacy beliefs in achievement settings. *Review of Educational Research*, 66, 543-578.

Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. *Theory into Practice, 41,* 116-125.

Paul, R.W. (1992). Critical thinking: What, why, and how? New Direction for Community Colleges, 1992(77), 3-24.

Pedder, D., M. James, and J. MacBeath. 2005. How teachers value and practise professional learning. *Research Papers in Education* 20, no. 3: 209–43.

Pedersen, S., & Liu, M. (2003). Teachers' beliefs about issues in the implementation of a student-centred learning environment. *Educational Technology Research & Development, 51*(2), 57-76.

Perkins, D. N. (1986). Thinking frames. Educational Leadership, 42, 4-10.

Peterson, P. L., Fennema, E., Carpenter, P. T., & Loef, M. (1989). Teachers' peda- gogical content beliefs in mathematics. Cognition and Instruction, 6, L-40.

Philips, S., & Borg, S. (2009). Exploring tensions between teachers' grammar teaching beliefs and practices. *System*, *37*, 380-390.

Piaget, J. (1926). The language and the thought of the child. New York. Harcourt, Brace

Piaget, J. (1929). The child's conception of the world. New York. Harcourt, Brace.

Pissanos, B. W., & Allison, P. C. (1993). Students' constructs of elementary school physical education. *Research Quarterly for Exercise and Sport, 64*, 425-435.

Pogrow, S. (1990). Challenging at-risk learners: Findings from the HOTS program. *Phi Delta Kappan, 71.* 389-397.

Pogrow, S. (1996). HOTS: Helping low achievers in grades 4-7. Principal, 76(2), 34-35. Presented at the ESRC Seminar in Creativity and Thinking Skills. Newcastle University 2006. Tools for pedagogical inquiry: the impact of teaching thinking skills on teachers.

Purdie, N., Hattie, J., & Douglas, G. (1996). Student conceptions of learning and their use of self-regulated learning strategies: A cross- cultural comparison. *Journal of Educational Psychology, 88,* 87-100.

Raudenbush, S., Rowen, B., & Cheong, Y. (1992). Contextual effects on the self- perceived efficacy of high school teachers. *Sociology of Education, 65,* 150-167.

Raudenbush,S.W.,Rowan,B.,& Cheong,Y.F.(1993). Higher order instructional goals in secondary schools: Class, teacher, and school influences. American Educational Research Journal, 30, 523-553.

Resnick, L. (1987). *Education and learning to think*. Washington, DC: National Academy Press.

Resnick, L.B. (1987). Learning In School and Out. Educational Researcher, 16, 13-20.

Richard, J. C., & Gipe, J. P. (1994). Metaphor analysis: An alternative approch for identifying preservice teachers' orientation. *Research in the Schools*, 1(2), 53-63.

Richards, J. C., & Gipe, J. P. (1994). Metaphor analysis: An alternative approach for identifying preservice teachers' orientations. *Research in the Schools, 1*(2), 53-60.

Richardson, V. (1994). The consideration of beliefs in staff development. In V. Richardson (Ed.), *Teacher change and the staff development process: A case of reading instruction* (pp. 90-108). New York: Teachers College Press.

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. In J. Sikula (Ed.), *Handbook of research on teacher education* (pp. 102–119). New York, NY: Macmillan.

Richardson, V. (Ed.). (2002). *Handbook of research on teaching* (4th ed.). Washington, DC: American Educational Research Association.

Rimm-Kaufman, S., Storm, M., Sawyer, B., Pianta, R., & LaParo, K. (2006). The Teacher Belief Q Sort: A measure of teachers' priorities in realtion to disciplinary practice, teaching practices, and beliefs about children. *Journal of School Psychology, 44,* 141–165.

Ross, J. (1998). The antecedent and consequences of teacher efficacy. *Advances in Research on Teaching*, 7, 49–73.

Rubie-Davies, C. M. (2007). Classroom interactions: Exploring the practices of high and low expectation teachers. *British Journal of Educational Psychology, 77*, 289-306.

Rubie-Davies, C. M. (2008a). Teacher beliefs and expectations: Relationships with student learning. In C. M. Rubie-Davies & C. Rawlinson (Eds.), *Challenging thinking about teaching and learning* (pp. 25-39). Haupaugge, NY: Nova.

Rubie-Davies, C. M. (2010). Teacher expectations and perceptions of student attributes: Is there a relationship? *British Journal of Educational Psychology, 80*, 121-135.

Ruston, T., Lotter, C. (2011). Chemistry Teachers' Emerging Expertise in Inquiry Teaching: The Effect of a Professional Development Model on Beliefs and Practice. *Journal of Science teacher education.* Springer.

Saklofske, D., Michaluk, B., & Randhawa, B. (1988). Teachers' efficacy and teaching behaviours. *Psychological Report, 63*, 407-414.

Saklofske, D.H., Michayluk, J.O. and Randhawa, B.S.(2004). Teachers' efficacy and teaching behaviours. Psychological Reports, 63, pp.407-414, In Davies, B. (2004). The relationship between teacher efficacy and higher order instructional emphasis. *Australian Educational Research.*

Schullo, S. A., & Alperson, B. L. (1998). *Low SES algebra I students and their teachers: Individual and a bi-directional investigation of their relationship and implicit beliefs of ability with final grades*. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

Sewell, A. & St-George, A. (2000). Developing efficacy beliefs in the classroom*. Journal of Educational Enquiry, 1(2), 58–71.*

Shernoff, E. & Kratochwill, T. (2007). Transporting an evidence- based classroom management program for preschoolers with disruptive behaviour problems to a school: an analysis of implementation, outcomes, and contextual variables. *School Psychology Quarterly*, 22(3), 449–72.

Shukor, A. (2001). "Development of a learning and thinking society", International conference on teaching and learning, Bangi 2001, Malaysia.White, B.Y., & Frederiksen, J.R. (1998). Inquiry, modeling and metacognition: Making science accessible to all students. Cognition and Instruction, 16(1), 3-118.

Silva, E. (2008). *Measuring Skills for the 21st Century* [Report]. Washington, DC: Education Sector. Retrieved from http://www.educationsector.org/usr_doc/MeasuringSkills.pdf.

Skaalvik, E. M., & Skaalvik, S. (2007). Dimensions of teacher self-efficacy and rela- tions with strain factors, perceived collective teacher efficacy, and teacher burnout. *Journal of Educational Psychology*, 99, 611-625.

Smith, G.F. 2002. Thinking skills: the question of generality. *Journal of Curriculum Studies* 34, no. 6: 659–78.

Snider, V.E., & Roehl, R. (2007). Teachers' beliefs about pedagogy and realted issues. *Psychology in the Schools, 44* (8), 873-886.

Song, Y., & Looi, C.-K. (2012). Linking teacher beliefs, practices and student inquiry-based learning in a CSCL environment: A tale of two teachers. *International Journal of Computer-Supported Collaborative Learning*, 7(1), 129-159.

Soodak, L.C. and Podell, D.M. 1993. Teacher efficacy and student problems as factors in special education referral. Journal of Special Education, 27, pp. 66-81, In Davies, B. (2004). The relationship between teacher efficacy and higher order instructional emphasis. *Australian Educatinal Research.*

Sternberg, R.J. (1986). Critical thinking: Its nature, measurement, and improvement National Institute of Educational. Retrieved from http:eric.ed.gov/PDFS/ED272882.pdf.

Swain, K. D., Nordness, P. D., & Leader-Janssen, E. M. (2012). Changes in preservice teacher attitudes toward inclusion. *Preventing School Failure*, 56(2), 75-81.

Swartz, R., and S. Parks. 1994. Infusing the teaching of critical and creative thinking into content instruction. Pacific Grove, CA: Critical Thinking Books and Software.

Tadich, B., Deed, C., Campbell, C., & Prain, V. (2007). Student engagement in the middle years: A year 8 case study. *Issues in Educational Research, 17*(2), 256-271.

Teo, T., (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. Australasian Journal of Educational Technology, 24(4), 413–424.

Teo, T., Chai, C.S., Hung, D., & Lee, C. B. (2008). Beliefs about teaching and uses of technology among pre-service teachers. *Asia-Pacific Journal of Teacher Education 35* (2), 163-174.

Thomas, C., & Walker, P.C. (1997). A critical look at critical thinking. *Western Journal of Black Studies 21*, 221-224.

Thomas, C., & Walker, P.C. (1997). A critical look at critical thinking. *Western Journal of Black Studies 21*, 221-224.

Thompson, A G. (1992). Teachers' Beliefs and Conceptions: A Synthesis of the Research. In D. A. Grouws (Ed.), *Handbook of Research on Mathematics Teaching and Learning*, (pp. 127-146). New York: Macmillan Publishing Company.

Thoonen, E.J., Sleegers, P.J.C., Oort, F.J. (2011). How to improve teaching practices: the role of teacher motivation, organizational factors and leadership practices. *Educational Administration Quarterly, 47*(3), 496-536.

Tishman, S., Perkins, D., & Jay, E. (1995). *The thinking classroom*. Boston: Allyn and Bacon.

Torff, B. (2003). Developmental changes in teachers' use of higher order thinking and content knowledge. *Journal of Educational Psychology, 95,* 563-569.

Torff, B. , & Warburton, E.C. (2005). Assessment of teachers' beliefs about classroom use of critical thinking activities. *Educational and Psychological Measurement, 63*, 155-179.

Torff, B. (2006). Expert teachers' beliefs about use of critical thinking activities with high and low-advantage learners. *Teacher Education Quarterly*, Spring, 37-52.

Torff, Bruce. (2008). Factors Associated with Teachers' Attitudes about Professional Development. Teacher Education Quarterly, Spring, pp 123-133.

Torff, B. 2011. Teacher beliefs shape learning for all students. Phi Delta Kappan 93, no. 3: 21–3.

Trickey, S., and K.J. Topping. 2004. 'Philosophy for Children': a systematic review. Research Papers in Education 19, no. 3.

Tsangaridou, N. (2008). Trainee primary teachers' beliefs and practices about physical education during student teaching. *Physical education and sport pedagogy*, 13(2), 131-152.

Tschannen-Moran, M., Woolfolk-Hoy, A. & Hoy, K. (1998). Teacher efficacy: its meaning and measure. *Review of Educational Research*, 68, 202–48.

Tschannen-Moran, M., & Woolfolk-Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17,* 783–805.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2007). The differential an- tecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education, 23,* 944–956.

Tschannen-Moran, M. & McMaster, P. (2009). Sources of Self-Efficacy: Four Professional Development Formats and Their Relationship to Self-Efficacy and Implementation of a New Teaching Strategy, *Elementary School Journal, 110,* 228-248.

Turner, J. C., & Reynolds, K. J. (2001). The social identity perspective inintergroup relations: Theories, themes, and controversies. In R. Brown &S. Gaertner (Eds.),Blackwell handbook of social psychology, vol. 4:Intergroup processes (pp. 133–152). Oxford, UK: Blackwell.

Turner, J.C. & Reynolds, K. J. 2011, 'Self-categorization theory', in Van Lange, Kruglanski and Higgins (ed.), *Handbook of theories in Social Psychology*, Sage Publications, UK, pp. 399-417.

Urdan (Eds.), *APA educational psychology handbook: Volume 2 Individual differences and cultural and contextual factors* (p. 471–499). Washington: American Psychological Association.

Usher, E. & Pajares, F. (2006). Inviting confidence in school: invitations as a critical source of the academic self-efficacy beliefs of entering middle school students. *Emory University Journal of Invitational Theory and Practice*, 12, 7–16.

Verjovsky, J., & Waldegg, G. (2005). Analyzing beliefs and practices of a Mexican high school biology teacher. *Journal of Research in Science Teaching, 42* (4), 465-491

Vygotsky, L.S. (1981). The genesis of higher mental function in J.V. Wertch (ed.) *The concept of Activity in Soviet Psychology.* Armonk, NY: Sharp

Vygotsky, L.S. (1986). Thought and Language (A. Kozulin ed.), Revised edn. Cambridge, MA: MIT Press.

Warburton, E. C., & Torff, B. (2005). The effect of perceived learner advantages on teachers' beliefs about critical-thinking activities. *Journal of Teacher Education, 56*(1), 24-33.

Wehiling, L. & Charters, W. (1969). Dimensions of teacher beliefs about the teaching process. *American Educational Research Journal*, 6(1), 7-29.

Wentzel & A. Wigfield (Eds.), *Handbook of Motivation in School* (pp. 627-653). New York: Routledge.

Wheatley, K. F. (2002). The potential benefits of teacher efficacy doubts for educational reform. *Teaching and Teacher Education, 18,* 5-22.

White, B.Y., & Frederiksen, J.R. (2000). Metacognitive facilitation: an approach to making science inquiry accessible to all. In J. Minstrell & e. H. van Zee (Eds.), *Inquiring into inquiry*

learning and teaching in science (pp.331-370). Washington, DC: American Association for the advancement of Science.

Wilcox-Herzog, A. (2002). Is there a link between teachers' beliefs and behaviours? *Early Educa- tion and Development*, *13*, 81-106.

Wilkins, J. (2008). The relationship among elementary teachers' content knowledge, attitudes, beliefs and practices. *Journal of Mathematics Teacher Education*, 11, 139-164.

Willingham, D.T. (2007). Critical thinking: Why is it so hard to teach? *American Educator*, 8-19.

Wilson, B. (Ed.). (1996). *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications.

Windschitl, M. (2002). Framing constructivism in prac- tice as the negotiation of dilemmas: An analysis of the conceptual, pedagogical, cultural, and political challenges facing teachers. *Review of Educational Research, 72,* 131–175.

Windschitl, M. (2002). Framing constructivism in practice as negation of dilemmas: An analysis of the conceptual, pedagogical, cultural, and political challenges facig teachers. Review of Educational Reserach, 72, 131-175.

Woolfolk, A. & Hoy, W. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, 82, 81–91.

Woolley, S. L., Benjamin, W. J. J., & Woolley, A. W. (2004). Construct validity of a self-report measure of teacher beliefs related to constructivist and traditional approaches to teaching and learning. *Educational and Psychological Measurement*, 64, 319-331.

Woolfolk-Hoy, A., Davis, H., & Pape, S. J. (2006). Teacher knowledge and beliefs. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 715–737). New York, NY: Routledge.

Woolfolk Hoy, A., Hoy, W. K., & Davis, H. A. (2009). Teachers' self-efficacy beliefs. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of Motivation at School* (pp.627-653). New York: Routledge.

Yadav, A., & Koehler, M. (2007). The role of epistemo- logical beliefs in preservice teachers' interpretation of video cases of early-grade literacy instruction. *Journal of Technology and Teacher Education, 15,* 335–361.

Yildirim, A. (1994). Teachers' theoretical orientations toward teaching thinking. Journal of Educational Research, 88(1), 28-35.

Yilmaz, H. & Cavas, P.(2008) 'The effect of the teaching practice on pre-service elementary teachers' science teaching efficacy and classroom management beliefs'. *Eurasia Journal of Mathematics, Science & Technology Education*, 4(1), 45–54.

Zohar, A., Degani, A., & Vaakin, E. (2001). Teachers' beliefs about low-achieving students and higher-order thinking. *Teaching and Teacher Education*, *17*, 469-485.

Zohar, A., & Dori, J. (2003). Low-achieving students and higher-order thinking: Are they mutually exclusive. *Journal of the Learning Sciences, 12*, 145-182.

Appendix 1. The Critical Thinking Beliefs Appraisal for Primary School Teachers (CTBA-P)

CTBA-P

Di seguito sono descritte delle attività didattiche e/o parti di una lezione in classe. Le chiediamo di indicare l'efficacia di ciascuna attività rispetto alle tipologie di studenti indicate cerchiando il numero appropriato. Si presume che ciascuna attività sia adatta all'età degli studenti cui è proposta.

Prima di rispondere alle domande le chiediamo di leggere la definizione dei tre concetti chiave che troverà nelle affermazioni del questionario:

- **Abilità:** la capacità degli studenti di conseguire risultati scolastici quando affrontano un argomento specifico in classe.
- **Conoscenze pregresse:** ciò che gli studenti hanno appreso su uno specifico argomento prima che venga proposto dal docente in classe.
- **Motivazione:** il grado di interesse e di attenzione che gli studenti mostrano per un determinato argomento di studio.

1. Una classe sta studiando il fumetto, una forma di testo. L'insegnante spiega la sua storia e struttura, mostra un elenco di fumettisti famosi e chiede individualmente agli studenti di leggere ad alta voce alcune vignette.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **basso livello di conoscenze precedenti** sull'argomento?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **alta motivazione?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

2. Una classe sta studiando la preistoria. L'insegnante fornisce agli alunni una lista di invenzioni, spiegando l'impatto di queste invenzioni durante questo periodo, e descrive come queste continuano ad influenzare il mondo attuale.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **basso livello di precedenti conoscenze sull'argomento?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **bassa motivazione?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

3. Una classe sta studiando la variabile singola in algebra. L'insegnante pone un problema che richiede una variabile singola per la sua risoluzione, chiede agli studenti di trovare un modo per scrivere il problema e poi compara le loro scritture con quella algebrica scritta sulla lavagna.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **basso livello di precedenti conoscenze sull'argomento?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **bassa motivazione?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

4. Una classe sta studiando il vocabolario inglese utile per fare ordinazioni al ristorante. L'insegnante scrive diverse nuove parole alla lavagna, le definisce,

chiede agli studenti di ripeterle, e fornisce una scheda dove gli studenti le aggiungono a delle frasi esemplificative.

Quanto questa attività sarebbe efficace per:

a) Studenti con **alta abilità?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **alto livello di precedenti conoscenze sull'argomento?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **bassa motivazione?**

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

5. Una classe sta studiando il sole. L'insegnante chiede agli studenti di scrivere diversi modi in cui il sole influenza la vita di tutti i giorni, e di predire successivamente cosa accadrebbe se il sole finisse di splendere.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **alto livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **alta motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

6. Una classe sta studiando Pinocchio di Collodi. L'insegnante illustra la vita e il lavoro di Collodi, spiega la storia e il significato dell'opera, e descrive l'influenza di Collodi sugli autori contemporanei.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **basso livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **bassa motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

7. Una classe sta studiando l'editto di Costantino emanato nel 313 d.C con il quale l'imperatore concede libertà di culto ai cristiani e l'editto del 380 d.C. dell'imperatore Teodosio con il quale si dichiara il cristianesimo religione ufficiale e si proibiscono le altre religioni. Immagina di scrivere una lettera all'Imperatore Teodosio argomentando il tuo accordo o disaccordo con il suo editto del 380 d.C.

Quanto questa attività sarebbe efficace per:

a) Studenti con **alta abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **alto livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **alta motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

8. Una classe sta studiando come calcolare l'area di un triangolo. L'insegnante domanda agli studenti di valutare diverse possibili formule per calcolare l'area, di determinare qual è quella corretta e di spiegare perché hanno risposto in quel

modo.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **basso livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **alta motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

9. Una classe sta studiando la coniugazione dei verbi del present perfect nella lingua inglese. L'insegnante fornisce una scheda che spiega le regole della coniugazione, coniuga diversi esempi di verbi alla lavagna e poi consegna agli studenti una scheda per praticarli.

Quanto questa attività sarebbe efficace per:

a) Studenti con **alta abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **alto livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **alta motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

10. Una classe sta leggendo un racconto di Gianni Rodari. L'insegnante chiede agli studenti di leggere fino ad un certo punto e di scrivere poi la propria versione del finale.

Quanto questa attività sarebbe efficace per:

a) Studenti con **alta abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **alto livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **bassa motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

11. Una classe sta studiando gli aggettivi usati per descrivere l'abbigliamento in lingua inglese. L'insegnante fornisce una scheda con immagini pubblicitarie aventi una didascalia che include gli aggettivi, consegna poi una seconda scheda con le didascalie volutamente incorrette e chiede agli studenti di

correggerle.

Quanto questa attività sarebbe efficace per:

a) Studenti con **bassa abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **basso livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **bassa motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

12. Una classe sta studiando come trasformare le frazioni in numeri decimali. L'insegnante spiega come fare la trasformazione, completa esempi di problemi usando un proiettore a poi consegna un compito in classe dove gli studenti devono risolvere problemi simili.

Quanto questa attività sarebbe efficace per:

a) Studenti con **alta abilità**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

b) Studenti con **alto livello di precedenti conoscenze sull'argomento**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace

c) Studenti con **alta motivazione**?

Per nulla efficace ① ② ③ ④ ⑤ ⑥ Altamente efficace