

# The Influence of Mathematical Teacher Competency on Creative Teaching Practice

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## Abstract

Mathematics is often regarded as a complex subject and there is no room for creative practice in teaching. The creative practice of teaching by math teachers should be given due attention in order to nurture a culture of creativity among students. This concept paper aims to discuss the effect of the mathematical teacher competence on creative teaching practices. Teachers 'domain domains of teachers' knowledge, skills and attitudes and personality are seen to have a significant influence on creative teaching practices. The influence will have implications for the establishment of human capital aspired by the state. Hence, proactive steps should be taken by mathematics teachers, school administrators and the Ministry of Education Malaysia (MOE) in enhancing the competence of mathematicians so that creative teaching practices can be implemented effectively.

**Keywords:** Teacher Competence, Creative Teaching; Mathematics Teachers, Creative Exercises, Professional Development Training

## Introduction

Creative practice in teaching has gained worldwide attention. Implementation of this practice able to create conducive learning environment, build student cognitive development, predictor of achievement and academic success and make learning more meaningful (Freund & Holling, 2008). Creative practice starts with the application of creativity culture. According to Rinkevich (2011), creativity culture should be nurtured in order to promote student learning. Since the last ten decades of the 20th century, there has been an increase in the policy of a country in developing and enhancing the culture of creativity as in Europe, the United States, Japan and China (Craft, 1997). Most areas such as economy, industry, business, entertainment, sports and so on require creativity to move forward with the development of world technology. Hence to meet the needs of new generation education that can compete globally, the culture of creativity should be empowered in the education system. Malaysia is

also no exception in pioneering the practice and culture of creativity. In an effort to cultivate creativity among the people, the Prime Minister has declared 2010 as a year of innovation and creativity. The innovation and creativity initiatives were created as one of the strategies in the Ministry of Education's Interim Strategic Plan (Kementerian Pelajaran Malaysia) 2011-2020. This is in line with the goal of the National Education Philosophy that emphasizes the development of good, balanced and integrated human beings so that they can advance to the fore. This strategy is to produce innovative and creative students with the latest skills and knowledge (Kementerian Pelajaran Malaysia 2012a).

Emphasis on the creativity aspect, especially at the national level, is crucial to promoting the nation's competitiveness and awakening the Malaysian society, especially the younger generation in the importance of creativity, and subsequently cultivating it as a daily practice. The ability of creative and innovative individuals to produce ideas and inventions is expected to be the practice and culture of their lives. In the context of education, the Ministry of Education Malaysia (MOE) has taken a proactive step by implementing a transformation in transforming a more innovative curriculum structure by emphasizing critical and creative thinking skills in the Primary School Integrated Curriculum (KBSR) and the Integrated School Curriculum (KBSM). The move to empower the culture of creativity and innovation at the school level was implemented through a curriculum change from KBSR to the School Standard Curriculum Low (KSSR) started in 2011. Three value-added elements were introduced in KSSR namely creativity and innovation, entrepreneurship and information and communication technology (ICT). The purpose is to meet the needs of students in developing holistic, knowledgeable, creative, critical, innovative, creative thinking, critical thinking and innovative, highly skilled and high-profile human capital (Kementerian Pelajaran Malaysia, 2012a).

### **Background of the Study**

Human capital development is a fundamental and critical element in transforming the economy Malaysia from a middle-income country to a high-income nation by 2020 (RMK-10). To meet the needs of the country in the 21st century, the Master Plan for Education Development (PIPP) 2006-2010 emphasizes on developing creative and innovative human capital (Kementerian

Pelajaran Malaysia, 2011). This emphasis is further strengthened in the Malaysia Education Blueprint 2013-2025. The ability of the individual creative and innovative in producing ideas and inventions is expected to be the practice and culture of their lives.

Implementation of elements of creativity and innovation is a catalyst for the country's transformation agenda. In the context of education, the process of creativity and innovation goes hand in hand and becomes an important element in teaching and learning. Creativity in teaching and learning can be seen when students like questions and find answers, anticipate events, make connections, explore ideas, create speculation about possibilities, always critical reflection on ideas, actions and outcomes and may laterally think (Kementerian Pelajaran Malaysia, 2012b).

Malaysia Education Blueprint Report 2013-2025 says access, quality, equity, unity and efficiency are the five aspirations of the Malaysian education system. Quality is the most important and most important aspect. However, the quality of student achievement in Malaysia in the subject of science and mathematics has not yet reached the expected quality. The country ranks below the bottom of the 74 countries participating in the PISA (Program For International Student Assessment) 2009+ and lower than the average of the international

and OECD countries (Organization for Economic Co-operation and Development) highlighted the malfunction of our country's science and mathematics education compared to regional countries such as Japan, Singapore, Hong Kong and Korea (Kementerian Pelajaran Malaysia, 2012a). The lack of attention to the needs of the pupils dominates the various cognitive skills such as problem solving, thinking and innovative thinking and thinking make students less inclined to apply science knowledge and creative thinking outside the academic context. Hence, in order to improve the quality of science and mathematics education, the goal of national education is to be in the top third group in international assessments such as TIMSS (Trends in Mathematics and Science Studies) and PISA within 15 years. (Kementerian Pelajaran Malaysia, 2012b).

The problem of lack of quality in terms of the achievement of science and mathematics subjects in our country is related to the competence of math teachers. Some domestic and international studies have shown that teachers, especially math teachers, are still less competent in practicing creative teaching. The study by Tengku Zawawi (1999) found that the teaching strategies of mathematics teachers in Malaysia are mostly still teachers and traditional in nature and only emphasize academic achievement in examinations, especially public examinations. Teachers lack the time to implement creative practices because they are too chasing after the need to be resolved immediately to implement the questions in the past years. Mathematical teachers were also more likely to use the blackboard in teaching because they found it more effective in delivering knowledge and mathematical skills (Subahan, 2007). This situation is less encouraging creative atmosphere in the classroom. his finding is in line with the study (Saracho, 2012) who finds the teacher's teaching procedure still focusing on adherence, good behavior and traditional thinking that hinder creativity. Mathematical teaching is still focused on procedural skills (Goldrick-Rab et al., 2007) and less related to real world problems (Tengku Zawawi, 1999). In addition, the teaching of mathematics teachers was also found to be less involving thinking skills as pupils' learning was more memorized and relying heavily on teachers to know when and how the mathematics was studied (Effandi & Zanaton, 2007).

The study by Rohani et al., (2005) found that teachers' attitude toward mathematics influenced their approach and approach in teaching. It is difficult to implement creative practices in teaching if Teachers themselves are negative. According to Beghetto (2008) and Fleith (2010), there are some negative mathematical teachers who consider integrating creative elements in teaching and learning is an additional task. This negative attitude would make the mathematics teacher less concerned in practicing the teaching creatively so that the students who received the lesson would feel bored because they were not given the opportunity to highlight their creativity optimally. There is therefore a negative perception among the students that mathematics is a difficult, abstract and boring subject (Azizi, Jamaluddin & Yusof, 2007).

Creative teaching practices are largely influenced by less competent teachers in teaching creative. In the context of mathematical education, mathematics teachers are individuals who directly impact this creative teaching practice. Competent mathematical teachers are able to create an exciting and fun learning atmosphere and are more instrumental in stimulating and developing students' creative and critical thinking. This concept paper aims to diffuse the influence of the mathematical competence of teachers on creative teaching practices and their implications on the world of education and suggestions to address the problem of less competent mathematical teachers in creative teaching.

### ***Teacher Competency***

Another term for competence is generic skills, basic skills, key skills, and skills personal references to the knowledge and skills and attitudes that are based on tasks or job responsibilities entrusted across all areas (Rylatt and Lohan, 1995). According to Boyatzis & Kolb (1995), competence is a combination of knowledge, capabilities and experience that allows the individual to perform a task perfectly. Boyatzis (1982) also defines competence as a person's ability to demonstrate a functionally related system in achieving achievement goals. The word skills often referred to as competence are a group of knowledge related to attitudes and skills that influence one's work, relate to work performance and measured in accordance with certain standards. Mestry & Grobler (2005), has proposed the "Iceberg" Model which states that knowledge and skills are more easily developed and identified than difficult to identify. However, personality is an important factor in creating a brilliant employee who has the necessary knowledge and skills.

Based on the definition and model of 'iceberg' competence, it can be concluded that the competence of teachers in teaching is a combination of the domain of knowledge, skills and attitudes and personality of teachers in implementing effective teaching practices. This concept paper refers to the three domains of competence as a mathematical teacher competence that affects creative teaching practices.

### ***Creative Teaching***

Many studies and writings on creative teaching. Most authors give the interpretation Solely related to creative teaching as well as suggesting creative teachers' features in producing creative teaching. According to Lou & Chen (2012), creative teaching is an open and inspiring approach in encouraging students to explore and innovate aims to develop thinking abilities and create. Creative teaching applies appropriate and flexible techniques to make the class interesting and fun. The main purpose is to encourage students' creative skills. Teachers are inspirational guides, guides and ready to share knowledge.

Teaching can be considered creative when a teacher combines existing knowledge in new or unique ways or introduces a new process in cultivating thought (cognition) to get useful results (Reilly et al., 2011). This can either be planned before the teaching action, or modified in response to the needs of the learning context Generally, personality traits, values and teaching positions are synthesized into creative teaching that including curriculum preparation, teaching methods, relationships with students, relationships with the environment, and reflection on practice (Reilly et al, 2011). Sawyer (2004), the view of creative teaching is the improvement of teaching. Teachers act as implementers, decision makers and facilitators. Creative teaching not only requires teachers to have pedagogical content but also need skills in teaching. Rinkevich (2011) defines creative teaching as a unique, specific and meaningful transfer of knowledge among individuals in the context of learning. It is clear that creative teaching is an ever-improved, flexible, open, and instructive lesson is a combination of existing knowledge to produce new, useful and meaningful knowledge. Teachers act as creative executives who are able to encourage students to explore and innovate to improve their thinking skills and create them. This concept paper focuses on the discussion of the effect of the competence of mathematic teachers on creative teaching practices.

### ***The Effect of Competency of Mathematics Teacher to Creative Teaching***

Mathematics is often regarded as a complex subject, full of procedures and rules as well as only Give correct or wrong answers to mathematical problems. This incorrect response causes space to implement creative teaching practices in mathematics seems to be closed rather than other subjects such as art and language. Thus, the result of the definition of competence, the three domains of mathematical teacher competence in influencing the practice of creative teaching are divided into three domains namely (i) teacher knowledge, (ii) teacher's skills and (iii) teacher's attitude and personality.

#### ***Teacher's Knowledge***

Knowledge is the domain of competence of math teachers who have strong influence on practice creative teaching. Mathematical teachers need to master the knowledge of mathematical content well to become creative and effective mathematical teachers (Borko & Putnam, 1996). Less mathematical teacher the subject of mathematical subjects will have trouble teaching more so to be creative. This applies especially to new teachers who need time to master the curriculum at school (Murray & Male, 2005).

Teachers who mastered mathematical content also improved their student achievement. The study by Hill, Rowan, & Ball (2005) found that there was a significant relationship between the mastery of mathematical content and the achievement of students in mathematical subjects. Teachers' competence is not only in the knowledge of mathematics but also in the field of pedagogy. According to Shulman (1986), content pedagogical knowledge (PCK) will help promote conceptual understanding. The influence of content pedagogical knowledge should be given attention as the teacher should not only master the content of the subjects taught, but also to learn how to teach the subject (Yu et al., 2012; Maher, 2011; R. Y. Kim, Ham, & Paine, 2011). Teachers who have pedagogical knowledge of mathematical content will easily choose effective strategies and methods in creative teaching.

Learning the ability of students, the ability to choose teaching resources such as teaching aids and the ability to choose teaching objectives also influence the practice of creative teaching. Mathematical teachers who know their pupil's abilities such as cognitive style differences will be able to determine their pupils' learning needs and will be able to choose the teaching style appropriate to their cognitive level. According to Lin & Li (2009), good and creative teaching should be Has the objective of teaching that can be achieved. Clear and achievable objectives will guide teachers to ensure that their teaching does not escape the predetermined foundation **Teacher's Skills**

Mathematical teacher skills also influence creative teaching. Teacher planning and preparation before implementing the teaching and learning process will affect their creative teaching practices. Creative mathematical teachers should be wise in making systematic planning and inventory in all their actions (Alkharusi et al., 2012; Akyuz et al., 2013). This means making sure the teacher's teaching is effective and creative, preparation and planning are neat before entering the classroom. Emphasized. Skills in classroom management during teaching also influence the practice of creative teaching. Efficient teachers and successful classroom management effectively will be able to teach creatively and perfectly (Wang, 2006).

To practice creative teaching, mathematical knowledge and skills must also be clearly communicated (Cochran-Smith, 2005) by diversifying teaching strategies (Ruey, 2010, Cheng,

2011; Jang et al., 2009; Schmeichel, 2012). Mathematical teachers who always use various methods in teaching will be easily accepted by students (Hong et al., 2005). Pupil participation is also important in influencing creative teaching practices. Thus, teachers should be wise and proficient in determining the teaching strategy which can involve the involvement of students. The study by Tarmizi, Lojinin, & Mokhtar (2010) found that creative teaching activities such as problem-based learning can increase the involvement of students in teaching and learning. Communication and good relationships between teachers and students are no exception in influencing the atmosphere of creative teaching and learning. The poor communication between teachers and students in the teaching and learning process makes the students' creativity unobstructed. On the other hand, a good relationship will reduce the student's concern for the subject of mathematics. This is evidenced by the study of McGlynn-Stewart, (2010), which found good communication between himself as a teacher and a mathematician capable Increase confidence in math.

Similarly, the evaluation of student learning in the classroom. Assessment can be formative or summative. The ability to carry out student learning assessments is an essential skill to improve the quality of teacher teaching and student achievement (Alkharusi et al., 2012). To improve the shortcomings, mathematics teachers need to have the skills to always reflect on themselves (willingness) and are willing to develop self-professionalism continuously (Kennedy, 2005). The use of technology also plays a key role in helping teachers implement creative teaching. Competent mathematics teachers should be able to integrate educational technology into their teaching practices (Zhu et al., 2013; Gouws & Dicker, 2011).

### ***Teacher's Attitude and Personality***

The attitude and personality of mathematics teachers also influence creative teaching. To be creative, teacher Mathematics needs to have a good attitude and personality (Cropley & Cropley, 2011; Koster et al., 2005; Zampetakis et al., 2010) as always motivated, intelligently controlling stress, confidence and always positive thinking. Professionally-accredited teachers are encouraged to attract students to their teaching (Klausen, 2010; Fleith, 2010; Maksić & Pavlović, 2011). This opinion is consistent with Malikow (2005) and Harslett et al. (2000), which states attitude and personality such as flexible, philanthropic, patient, creative, Caring, and always showing enthusiasm and interest in teaching contribute to the effectiveness of teacher teaching. Additionally, willingness to take risks, tolerate ambiguity and always act Want to know (Brinkman, 2010) is also a competency of math teachers that influence creative teaching practices. From the above literature discussion, it can be concluded that the knowledge, skills and attitudes and personality of the mathematicians have had a profound effect on the practice of creative teaching. Table 1 below shows the formula for the influence of the competence of mathematics teachers on creative teaching practices.

Table 1

*Master's Domain and Element Competencies*

Domain Competence	Competency Elements
Knowledge Teacher	a) Mathematical content knowledge b) Knowledge of mathematical content pedagogy; c) Knowledge of the students' ability level d) Knowledge of teaching resources e) Knowledge chooses teaching objectives
Skills Teacher	(a) Planning skills of preparation teaching (b) Classroom management skills (c) Skills to diversify teaching strategies (d) Skill involving pupils (e) Communication skills (f) Assessment of pupils' learning skills (g) Skills for teaching reflection (h) Skills to improve the level of professionalism
Attitude and Personality Teacher	(a) flexible (b) auctioneer (c) motivated (D) believe in (e) ready to take risks (F) patient (g) curiosity

***Implications and Recommendations***

The implications of the effect of the competence of mathematics teachers on creative teaching according to the domain of knowledge, skills and attitudes and personality are:

- a) The competence of math teachers should be given due attention to creative teaching practices.
- b) The three domains of teacher competence namely knowledge, skills and attitudes and personality need to be aligned and mastered in determining the competence of a mathematical teacher.
- c) Pupils will have a direct impact if mathematics teachers are not or less competent in teaching.
- d) Country aspirations to create creative and innovative human capital and to compete in the rankings. Global is difficult to realize if teachers do not have the necessary competencies.

In order to meet those implications and improve the competence of math teachers on creative teaching practices, the following recommendations should be considered:

- a) School administrators should always support by encouraging appropriate environments and autonomy for mathematical teachers to practice creative teaching.

b) Teachers should constantly improve their self-professionalism in creativity and creative teaching through self-directed learning or attending courses organized by Kementerian Pelajaran Malaysia or private. Creative skills are not necessarily natural but can be nurtured from time to time.

c) The Ministry of Education (MOE) should be more proactive in providing professional development training in an effort to improve the creative teaching of mathematical teachers. Creativity-related courses need to be increased.

d) It is more effective if the creative training is given as long as the mathematician is in a training program in institute training that offers teaching programs such as university and teacher education institute (IPG). Initial disclosure will make it easier for math teachers to carry out creative teaching as soon as they have the initial teacher.

e) A mathematical creative teaching modules of mathematics need to be built and tested for their scientific effectiveness. The purpose is to ensure the validity and reliability of the training modules. The training modules can be used to train trainees and teachers well as they have been tested for their effectiveness.

In conclusion, creative teaching practices should be nurtured from the early stages of education before to a higher level. Mathematical teachers have a great responsibility and role in nurturing creativity among students. The effect of teacher's competence on teachers' knowledge, skills and attitudes needs to be enhanced and given due attention in the effort to empower creative teaching practices among mathematics teachers in Malaysia.

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