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Science Creative Teaching Design for Science Teachers

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Abstract
STEM education is an approach for teaching and learning that integrates the content, processes, and skills of mainly in science, technology, engineering and mathematics in facing the 21st-century challenges. Teachers should guide students to problem solving process, plan and design teaching activities that lead to the development of creativity and STEM proficiency. STEM students should be able to answer complex questions, investigate global issues and develop solutions for challenges and real-world problems while applying the rigor of science, technology, engineering and mathematics content in a seamless fashion. Therefore, creativity in teaching science subject is very important to encourage the students interests and engagement in science learning. A primary concern of this Science Creative Teaching Design (SCTD) is that it enables science teacher to plan and produce flexible, practical and feasible lesson plan and conduct teaching and learning. Furthermore, it encourages the teacher become creative as well as the students. Therefore, SCTD was developed from the integration of design thinking and creative thinking tools to facilitate science teachers in teaching activities. It comprises namely as Creo 1 for empathy, Creo 2 for build analogy, Creo 3 for ideation, Creo 4 for synthesis and justification and finally Creo 5 for application of knowledge. Several creative strategies were suggested in these Creo tools based on the literature reviews including role play, showing short videos, forward thinking, problem solving and designed games. It is hope that by using this Creo's suggested will help the science teacher to plan attractive creative teaching for science teaching.
Keywords: Creative Teacher, Creative Teaching, Creativity, Science, Middle School

Introduction

It has been alarming nowadays for the need of creativity to prepare students for the global age. Creativity is very important in education as literacy as a fundamental life skill that enable our future generations to survive and thrive for 21st century. However, currently worldwide concern about the decline in students' interest in science. Since the last two decades, there has been a main concern about both the declining interest in many high school students attitude towards science at school and the decrement number of students pursuing science tertiary education

Danaia, Fitzgerald & McKinnon (2013). Science teaching were affected by above issues. Science teachers should struggle to enhance positive interest in science and should be taken seriously in the school curriculum (Dierks, Höffler, Blankenburg, Peters & Parchmann, 2016).

However, Al-Abdali and Al-Balushi (2016) found that that science teacher is still using teacher-centered approach to prepare the students for examinations. Students dislikes science subjects if were not taught in more creative ways (Sarsani, 2008). Therefore, creative teaching in science can be by a creative teacher as creativity is considered one of the main domains of science education (Yeager, & Dweck, 2012).

Creative Teacher

A creative teacher is a teacher that possesses creative personality characteristics and creative thinking processes that uses to design instruction strategies to enhance learning and motivates student (Palaniappan, 2009). These are the individuals that willingly to push boundaries and take risks (Rinkevich, 2011). Creative teachers in both their planning and teaching are alert to the potential mental connections between imagination and personal/professional experience and attribute high value to curiosity and risk taking, to ownership and autonomy and to the development of imaginative and unusual ideas in both themselves and in their children (Cremin & Oliver, 2017). This also supported by Morris, Snell and Wright (2006) also concluded that a creative teacher will use imaginative approaches to make the learning more interesting, engaging, exciting and effective.

A creative teacher will encourage reasonable risks and unpredictable situations, while reinforcing creative activities. There is a close relationship with students and a motivating class environment should also be both in harmony with a good scientific background of the teacher and with her/his ability to be challenging at the cognitive level. However, personality traits, family factor, experiences of growth and education, beliefs in teaching, hardworking and motivation and the administrative side of school organization also contribute to creative teaching (Horng, Hong, ChanLin, Chang & Chu, 2005). A qualitative study by Chan and Yuen (2014) explored that personal factors such as personality traits, motivation, attitude, environmental factors and community does affect creative teacher behavior. Other than that, element needed by the creative teacher is how to create an appropriate learning environment. Teachers might need more practical suggestions on how to promote classroom creativity and expose students to various ideational tasks (Pang, 2015). Therefore, creative teaching strategies need to be incorporated in the teaching using developed Science Creative Teaching Tool for teacher.

Creative Teaching

Creative teaching has been variously defined. Sale (2005) indicated that creative teaching as a teacher's routines that combines ready knowledge either it is new or unique or introducing new process to foster thinking to scaffold students in producing good results. Palaniappan (2009) defined creative teaching in the definition of creative teaching as a process of incorporating creative processes and components of creativity in the teaching process.

Creative teaching as characterized by Starko (2013) are alludes to the creativity of teachers teaching instead to build the students creativity. Examples of creative teaching would

be activities that promote "creative problem solving, creative association, invention, creative imagery, and various forms of divergent thinking" (Chan, 2007). Mayer (1989) defined creative teaching as several teaching techniques aimed to help students to study teaching materials in a way which the student can transfer the knowledge to solve new problems. Therefore, Anderson (2002) and Jeffrey and Craft (2004) argued that creative teaching is as an effective teaching. Hence, Jeffrey and Craft (2004) defined creative teaching will make the students learning more intriguing and more compelling through creative methodologies. In the same line, Daud, Omar, Turiman and Osman (2012) concludes that creative teaching strategies can help the students to generate new ideas and explore areas in greater depth yet an appropriate technique in developing creative ideas is needed.

Science Creative Teaching Design Tool

This Science Creative Teaching Design consists of five Creo that can be use by science teachers to design their teaching. There were five tools created by the researcher named as Creo 1, Creo 2, Creo 3, Creo 4 and Creo 5. It is expected that science teacher can use the suggested approaches in Creo in their teaching. This creative tool is developed from the design thinking approach and Professor Robert Fisher tools for creative thinking. First is Creo 1 are building empathy. In most studies, describe empathy as able into someone's experience (Oxley, 2011) by exploring from one's ways of understanding, to project into others' situations and anticipate possibilities in their thinking, feelings, intentions and actions. Moreover, empathy development is linked to prosocial behavior in the form of successful interpersonal relationships and social adjustment (Komorosky & O'Neal, 2015). The purpose is to develop a sense of empathy towards the people students design for. Students able to behave, to feel and think the way they demonstrate while they play the role in a real-world setting.

The creative strategies that can be used by science teachers were role play, research, interview, making observation and storytelling. Role play is a way of working through a situation or scenario or a problem by assuming roles. Students act as analogues for components and processes and help access abstract ideas and allows border crossing between arts and science (Braund, Moodley, Ekron & Ahmed, 2015). Role-play is simple type of learning and accessible in classroom learning. Additional to that, role-play can encourage science students become engaged, active and able to lead activity in the learning environment (Smith, 2015). Finally, it can enhance the student's creativity. Students should seek information on role given by doing research using various kinds of media such as internet search, magazine, newspaper cutting and articles. Other than that, students can conduct interview to get real information from the real role that they are design for. Previous observation on certain character for example when seeing a doctor or nurse can be share member in their group. Storytelling can be done by sharing student's experiences with the group member. By sharing the stories that each member has observed, the team can get up to speed on progress, draw out meaning from the stories, and capture interesting details of the observation work. Moreover, empathy and socio-emotional development among students can be increase by teacher's shared stories (Daly & Suggs, 2010). As conclusion, empathy compromises phenomena, including cognitive and affective (Batson, 2009).

Next is Creo 2 that is to build analogy. Analogy presented by relating new and real concept to things/process around us to express our idea or to explain complex matters in an understandable way. It is also can nurture analytical and creative thinking after identifying the special needs and enriched instructional activities (Kao, 2014). Analogies used to gain a fresh way of looking at an environment**,** and we use them in instances where direct observation is hard to achieve. The creative strategies that can be used to build analogy are by showing short videos, articles or photos. The use of 4W 1H questioning technique will make students able to relate with real life situation.

Next is Creo 3 that is ideation. Ideation is generating, developing and communicating new ideas, where an idea is understood as a basic element of thought that can be visual, concrete, or abstract. It can be explain using mind map or fishbone chart or drawings and sketching. Teachers need to provide students with more opportunities to engage in idea-generation activities, so it can unleash students creative potentials (Pang, 2015). Students are able to generate abundance of ideas that so the team group can filter then. Creative strategy such as visualization the ability to represent the visual-spatial world internally in student's mind. It involves sensitivity to lines, shape, form, space and the way they are related. It also includes the capacity to internally represent visual or spatial ideas. Forward Thinking is a starting point of divergent thinking. It allows students to think along a time scale into the future: immediate, short-term, medium-term, long-term. Possibility thinking is the practice to make students to think of alternatives, possibilities and choices. Mind Map is a graphical way to represent ideas and concepts. It is a visual thinking tool that helps structuring information, helping students to better analyze, comprehend, synthesize, recall and generate new ideas. Meanwhile, fishbone map (Ishikawa diagram) is a visualization tool for categorizing the potential causes of a problem to identify its root causes. Abundance of ideas can be obtained using brainstorming which is a creative technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by group members. Moreover, experiment can be conducted to discover something unknown or of testing a principle or ideas.

Next is Creo 4 that is synthesis and justification. Students must discuss certain topic/issues/matters/situation/problem either by agreeing or arguing opinion and views based on facts. Reasonable justification is needed. Students need to make reasoning for chosen solution or decision. The creative strategies suggested are through debate, challenge assumptions, problem solving, collaborative learning, problem-based learning, synthesis idea, compare ideas, provocation and fishbone map (Ishikawa diagram).

Finally, is Creo 5 is the application of knowledge in which students able to describe and apply learned knowledge. The suggested creative strategies are storyboards, online quiz such as plickers, design games, making connection and test.

Conclusion and Implications

This study was carried out to help teachers as well as the students. SCTD aids teachers in preparation and implementation of teachers' lessons. Teachers can certainly make use of SCTD to enhance their professional's capabilities. It is hope that with this study it can be a great support and able to consult teacher during designing their lesson plan as well as assessing their teaching session. Students also can get positives benefits such as the development of interests, curiosity

and thinking culture. In further, qualitative study will be conducted to explore the teaching and learning process using SCDT.

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