

THE 5 E'S INSTRUCTIONAL MODEL AS A CONSTRUCTIVIST/ CONCEPTUAL CHANGE APPROACH TO ENHANCE STUDENTS' LEARNING IN SCIENCE

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ABSTRAK

Traditional teaching approach is still applied in most of the schools in the world. There is a critique to traditional teaching approach, because traditional teaching approach does not meet students' need and fail to prepare students for the demand of society. 5 E's instructional model is a constructivist/conceptual change approach to teaching. The aims of this paper is to discuss 5 E's instructional model. Considering to the benefits that have been provided in this paper, it can be concluded that 5 E's Instructional Model might be a solution to the critiques of traditional approach to teaching and learning.

Key Words: The 5 E's Instructional Model, Constructivist/Conceptual Change Approach, Science learning

1. INTRODUCTION

Currently, traditional teaching approach is still applied in most of the schools. In Korea, general public and parents have criticized the public schools which are still adopted traditional teaching approach, they argued that traditional teaching approach does not meet students' need and fail to prepare students for the demand of society (Kim, 2005). Constructivist approach might be a solution to the problems that are faced in traditional teaching approach. Curriculum concept (n.d.) suggested, although there is no one type of teaching approach perfect for all students, the educators recommended to emphasize more on the constructivist approach to teaching than behaviorism or traditional approach to teaching. 5 E's instructional model is a constructivist/conceptual change approach to teaching (Hubber and Tytler, 2004). The aims of this paper is to discuss 5 E's instructional model. As 5 E's instructional model is a constructivist approach, it might be necessary to review constructivist or conceptual change approach.

2. CONSTRUCTIVIST OR CONCEPTUAL CHANGE APPROACH

Traditional approach to learning and teaching is a process where the teaching and learning only occur in one way process, from the teacher to the students (Zhao, 2003). In this teaching and learning approach, students are considered as passive learners, and a teacher has an important role as an expert which responsible to transfer the knowledge to their students. Zhao added this model is no longer considered as an effective model of teaching and learning for

preparing students as educated citizen, because this model of teaching is unable to improve students' creativity. As considering students as passive learner, traditional approach to teaching and learning might not in accordance to students' conceptions in science. In addition, Gilbert, Osborne and Fensham stated that "children are not passive learners and the way they make sense of their experiences led to this intuitive knowledge being called 'children's science'" (1982, p.623, cited in Duit and Treagust 2003).

Researches into students' conceptions in science suggested that students have their own conceptions and understanding of the phenomena in the world before the come into the class (Tytler, n.d.; Duit and Treagust, 2003). Therefore, before they study the science lesson in the class, they already have the conceptions on the topic of the lesson. Tytler stated that most of their conceptions are alternative conceptions which are very different to scientific conceptions. He also added that, mostly students' alternative conceptions are difficult to shift to scientific conceptions. In contract, sometimes students' alternative conceptions in form of prior knowledge will be useful in helping the students to learn the concepts in science effectively. As consequence to results of research into children's conceptions, there are some teaching sequences which are proposed to apply in teaching science. These sequences of teaching include the various types of constructivist theory and the empirical results of students' conceptions research (Hubber & Tytler, 2004). Hubber and Tytler refer these as constructivist or conceptual change approaches.

Constructivist approach to learning emphasis that the students construct the meanings from their experiences and influenced by their existing knowledge, and the meanings might be different from those expected (Tytler, n.d.). According to Duit, conceptual change is learning science from the perspectives of constructivist (1999, cited in Duit and Treagust, 2003). Throughout 1980s and 1990s, conceptual change received significant support from researchers, because the researchers realize that there is parallelism between the idea of scientific revolution in scientists and conceptual change in students (Tytler, n.d.). Duit and Treagust classify conceptual change approach into two types, namely: “weak knowledge restructuring, assimilation or conceptual capture and strong radical knowledge restructuring, accommodation or conceptual exchange” (2003).

According to Hubber and Tytler, the roles of teacher in constructivist/conceptual change approach is different with the roles of teacher in traditional classroom which provide and explain the knowledge to the students, in constructivist/conceptual change approach, the teacher have more complex roles, they have roles as ‘stimulator of curiosity’, ‘challenger of the ideas’, ‘resources person’, ‘senior co-investigator’, and ‘discussant’ (2004).

Hubber and Tytler suggested that there are various model of teaching and learning can be used in adopting constructivist/conceptual change approach to learning and teaching, namely, Lawson’s ‘learning cycle’, Glasson’s ‘learning cycle, generative learning model, interactive approach, children’s learning in science (CLIS) model, 5 E’s model. In general, students’ prior knowledge and ideas are explored and challenged by all these models (2004). However, this essay only discusses 5 E’s model.

3. 5 E’S INSTRUCTIONAL MODEL

The 5 E’s model was developed from SICS learning cycle by Bybee and his colleagues from Biological science curriculum study (BSCS) in the mid of 1980s. It has five phases, namely, ‘engagement, exploration, explanation, elaboration, and evaluation’. The middle three phases of 5 E’s model; exploration, explanation, and elaboration are basically equivalent to three phases of SCIS learning cycle; ‘exploration’, ‘invention (term introduction)’, and ‘discovery (concept application)’ (Bybee et al., 2006). In addition, Tytler, Darby, and Peterson stated that each phase in 5 E’s instructional model have specific purposes (n.d.). The following paragraphs discuss and

explain about each phase and advantages of 5E instructional model.

1. Engagement

The first phase is engaging students to learn. According to Bybee et al., there are several ways that can be used to engage students in this phase, namely; “asking a question, defining a problem, showing a discrepant event, and acting out a problematic situation” (2006, p. 8). They also added that the roles of teaches in this phases is “to present the situation and identify the instructional task. The teacher also sets the rules and procedures for establishing the task” (p. 9). Moreover, in this phase the teacher has an opportunity to identify students’ misconception or alternative conception (MCPS Science Office, 2001). Tytler, Darby, and Peterson (n.d.) also added that the assessment framework in this stage is diagnostic assessment.

In accordance to Bybee et al., Liu et al. stated that in this phase the teacher should determine students’ prior knowledge and encourages students’ curiosity in learning the new concept. The teacher also should facilitate students in connecting their prior and present conceptions or knowledge, and stimulate students to understand the objective of present activities or learning (2009). Hackling, Smith and Murcia added that the communicative approach uses in this phase is interactive dialogic communicative approach (2010). There are interactions between teachers and students in this communicative approach, in the interactions the teachers listen to and take account of students ideas, even though students ideas are different with teacher expected (Mortimer and Scott, 2003).

2. Exploration

Bybee et al. stated that the purpose of this stage is to explore the activities; the experiences in these activities later can be used by the teacher and the students for introduction and discussion of concepts, processes, and skills. They added that in these activities students have time and opportunity to explore the objects, events, and/or situations. As consequences the students might involve mentally and physically in the activities, they connect relationships, determine patterns recognize variables, and question events. In this phase, a teacher has roles as a facilitator or a coach (2006).

Liu et al. suggest that in this phase the teacher should provide the activities for the students, and the activities should present concepts, processes, and skills (2009). Similar to engagement phase, communicative approach use in this phase is interactive dialogic communicative approach (Hackling, Smith and Murcia, 2010). In addition,

assessment framework in this phase is formative assessment (Tytler, Darby, and Peterson, n.d.).

3. Explanation

Bybee et al. said that in this phase, the teacher encourages students' attention into a specific aspect of engagement and explanation activities. First of all, the teacher gives an opportunity for the students to explain their explanations of the activities in engagement and exploration phases; normally the explanations are based on their prior and present knowledge. Later, scientific and technological explanations are introduced by the teacher to the students in a direct, explicit, and formal ways. There are several ways and strategies that can be used by the teacher to develop students' explanation in this phase, namely: using verbal explanation, video, film and courseware (2006).

Moreover, in order to ensure students have deeper understanding in the concept, direct guide can be used by the teacher in this phase (Liu et al., 2009). Hackling, Smith and Murcia suggested that communicative approach use in this phase is interactive dialogic, interactive authoritative and non-interactive authoritative communicative approach (2010). According Mortimer and Scott, interactive authoritative communicative approach is the communicative approach where there are interactions between teacher and students, but in the interactions teacher only encourage students to answer in specific point of view. In contrast, non-interactive authoritative communicative approach is communicative approach where there are no interactions between a teacher and students, and the teacher only express his/her ideas in the explanations (2003). Moreover, Tytler, Darby, and Peterson said, the assessment framework in this phase is formative assessment, but sometimes formative assessment also involve in this phase (n.d.).

4. Elaboration

According to Bybee et al., after students have the scientific and technological explanations of their learning tasks, it is crucial for the students to involve in other experiences to elaborate their concepts, processes and skills. In this phase, students are facilitated to apply the concepts, processes, and skills that they have understood from the previous phases to a new situation, because there is a possibility that students still have misconception and/or only able to apply the concepts, processes and skill in term of activities in exploration phase (2006).

Liu et al. stated that in this phase, "the teacher challenges and extends students' conceptual understanding and skills. Students learn to develop broader and deeper understanding and skills, through the above three phases" (2009, p. 345). Hackling, Smith and Murcia added that the communicative approach use in this phase is interactive dialogic and interactive authoritative communicative approach (2010). The assessment framework in this phase is formative assessment (Tytler, Darby, and Peterson, n.d.).

5. Evaluation

Bybee et al. stated that in this phase, students have an opportunity to apply the skills they have mastered and the express their understanding of the concept. The students should receive the feedback from their teacher in this phase. In fact, the teacher can evaluate the students from the beginning and throughout the sequences of all phases in informal ways. In addition, in this phase the teacher able to assesses students understanding of the concepts in formal ways. Overall, the teacher can determine the level of students understanding in this phase (2006).

In agreement to Bybee et al., Liu et al. stated, in this phase "the teacher evaluates students' progress toward achieving the instructional goals. Students learn to assess their understanding and abilities" (2009, p. 345). The communicative approach use in this phase is interactive dialogic and interactive authoritative communicative approach (Hackling, Smith and Murcia). Tytler, Darby, and Peterson stated, the assessment framework in this phase is summative assessment (n.d.).

4. THE BENEFITS OF 5 E'S INSTRUCTIONAL MODEL

There are some advantages in implementing 5 E's instructional model in teaching and learning activity. Firstly, this model can be applied in variety grades level (Liu et al., 2009). Secondly, 5 E's model able to elicit student's prior knowledge and help to shift students' misconception. Finally, students can argue and debate their idea, and that is important for the students in extending conceptual understanding (Balci, Cakiroglu, and Tekkaya, 2006, cited in Liu et al., 2009). In addition to these advantages, the teacher also satisfied to the outcomes that students achieve after learning in 5 E's instructional model (Beffa-Negrini et al, 2007, cited in Liu et al, 2009).

5. CONCLUSION

The 5 E's instructional model is a constructivist/conceptual change approach to learning and teaching. Considering to the benefits that may be gained from 5 E's instructional model, it might be a solution to the critiques of traditional approach to teaching and learning.

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Penulis:

Rahmi

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