Pre-service Teachers' Teaching Applications
Based on 5E Learning Cycle

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ABSTRACT The purpose of this paper is to determine the appropriateness of activities prepared based on the 5E learning cycle model and performed by pre-service teachers in elementary school classrooms. During their Pre-service Teaching Practicum Course, participants utilized the 5E learning cycle model to prepare several lesson plans and carry out the prepared lessons. For data collection purposes the pre-service teachers' practice lessons were observed and video recorded. The data obtained from these observations was descriptively analyzed. Analysis of the videotaped observations revealed that the stages of the 5E learning cycle most widely utilized were the engage and explain stages.

INTRODUCTION

Today, in the modern world, it has become much easier to access all kinds of information. Any individual with an interest in learning about a subject can access a plethora of information in a variety of ways. So, nowadays, the important question is not how much information a person knows, but whether people know how to access information and whether they use and transfer this knowledge in diverse situations. When educating students, the students who benefit the most are those students who best understand how to access information, distinguish factual from false information, and utilize scientific knowledge to solve problems. In education, constructivism is one popular approach for training students to develop and use these skills.

Constructivism, defined as an epistemology describing the nature of learning or a philosophical explanation, in recent years has deeply affected research studies in the field of education (Matthews 1998; Richardson 1997; Simpson 2002; Tsai 1998). According to Yager (1991), some studies indicate that even students with high test scores are not necessarily successful in integrating or comparing what they have learned, as well as, adopting what they have learned to their everyday lives. Due to findings from kinds of research, various countries have attempted to determine solutions for problems regarding quality education. Eventually, constructivism emerged as the approach which many believe can positively influence educational practices.

Theorists working on constructivist theory reject that there is a scientific truth and this truth is waiting to be confirmed. They state that information cannot be transferred to others' mind from outside. Instead, knowledge is formed in individuals' minds (Schunk 2004). In other words, information is generated based on the individual's own life experiences (Driver et al. 1994; Fensham et al. 1994).

The aim of constructivist learning is not to help learners reach goals based on pre-determined and certain hierarchy. Instead, its goal is to provide learning opportunities for learners so that they can construct information cognitively (Wilson 1996). The constructivist approach basically emphasizes the role of previous information, the importance of multiple forms of knowledge, and the social nature of learning (Leinhardt 1992). In constructivist classrooms, students take an active role in knowledge construction by establishing links between new information and prior learning. Therefore, the main task of teachers is to help students consider and utilize alternative conceptualizations of knowledge in order to better understand their world (Carr et al. 1994).

Constructivist teachers do not see themselves as the sole source of information and will guide students to discover a variety of information and learning resources. The teachers support student's autonomy, entrepreneurship, inquiry behaviour, and support participation in thought-provoking discussions. While providing options to their students the teachers also

work cooperatively with them. Students are also encouraged to communicate with each other in their learning exploration, as well as, gaining their own first-hand experiences. Constructivist teachers also take into consideration students' own life experiences and use this knowledge to relate the intended learning content. As a result, teachers work to provide a learning environment in which students can reconfigure, format, and build upon their existing knowledge. In addition, constructivist teachers organize the necessary resources and materials for students to conduct research, for teachers to monitor and evaluate student learning, as well as, for various assessment strategies to be used to provide feedback not only about the product but also about the process. A goal is to ensure students collaborate, have access to technology, express their understanding and comprehension in a variety of ways, and experience the process of discovery when dealing with relevant and interesting problems related to their assigned topics. Teachers create opportunities for students to engage in complex, meaningful, and problem-based activities. Moreover, they reveal their own thinking processes and encourage students to express their thoughts through discussion, prose, art work, and in any other relevant way. Finally, constructivist teachers ask students to apply learned information to unique and real world environments, explain their ideas, interpret texts, infer events and have discussion based on evidence. They also encourage students to think reflectively and independently (Brooks and Brooks 1993; Vermette et al. 2001; Windschitl 2002).

In the constructivist approach, while letting students actively participate in the learning process teachers can utilize a variety of learning cycle models. One of these models is the 5E learning cycle which encourages learners to explore, experience, and discover various subjects and as a result it can be considered an effective method for teaching (Connor et al. 2010; Yadigaroglu and Demircioglu 2012). In other words, it allows students to discover and learn concepts, such as in science, through their own questioning, inquiries, previous knowledge and also the experiences in their daily life (Acisli et al. 2012).

The original Learning Cycle was created by Karplus over 40 years ago and considered especially useful for science lessons. The learning cycle consists of three phases; exploration, concept introduction, and concept application. Thus, students should experience these three stages for the learning cycle to occur. These stages allow students to explore content through first-hand experiences, learn content via interaction with teachers, peers and learning materials, as well as, using these experiences and gained knowledge in new learning situations (Karplus 1980). Following the initial research by Karplus (1980) which established these three learning stages, other researchers then introduced similar proposed learning processes which had different numbers of stages. However, the most popular learning cycle that was developed was the 5E learning cycle which included five stages; engage, explore, explain, elaborate and evaluate (Bybee 1997).

The 5E learning cycle model provides a framework for teachers. In the engagement phase, the purpose is to engage learners' curiosity regarding the intended subject, to check learners' previous knowledge, and to create connections between previous knowledge and the present learning experiences. The aim of the exploration phase is for students to use their previous knowledge in order to generate new ideas and discover answers to their own inquiries. In the explanation phase the focus is placed on learners reflecting on their conceptual understanding, process skills, and/or behaviours, as well as, the teacher providing explanations if needed. Next, the elaboration phase allows teachers to provide students with opportunities to utilize their gained knowledge in new learning environments. Thus, students' conceptual understanding, process skills, and/or behaviours related to the learning of new content can be deeper and more longstanding. In the evaluation phase, both students and teachers can assess their learning and determine whether the learning outcomes have been accomplished (Bybee et al. 2006; Boddy et al. 2003).

Objectives

In this paper, pre-service teachers are asked to reflect on their experiences related to incorporating the 5E learning cycle method into their teaching practices. The primary impetus for researching this topic is the fact that in Turkey emphasis has been placed on implementing and utilizing the constructivist approach in elementary school education. In the Republic of Turkey, education programs based on constructiv-

ist approach are determined by the Ministry of National Education (MONE), Board of Education. On July 12, 2004, laws numbered 114, 115, 116, 117, and 118 for grades 1 through 5 were enacted and implemented for Literacy, Mathematics, Life Science, Social Studies, and Science and Technology courses. Thus, since the 2005-2006 academic year, courses' in these areas at the elementary level were revised and developed in accordance with the constructivist teaching approach. Another research motivation is that investigations of the 5E learning cycle model based on constructivist approach have demonstrated that it has a positive impact on students' achievement, higher-level cognitive skills, and creative thinking skills (Abdi 2014; Acisli et al. 2012; Al Majali 2013; Aydin and Yilmaz 2010; Connor et al. 2010; Dikici et al. 2010; Kolomuc et al. 2012; ErNas et al. 2010; Pandey et al. 2011; Yadigaroglu and Demircioglu 2012). Related literature shows that most of research studies investigated the impact of 5E learning methods on students' science learning and achievement (Abdi 2014; Acisli et al. 2012; Kolomuc et al. 2012; Pandey et al. 2011; Yadigaroglu and Demircioglu 2012), and very few studies researched its effects on teaching language arts (Al Majali 2013; Ulas et al. 2012). However, a majority of past research on this topic has focused on the outcomes of 5E learning cycle and has not placed attention on what occurs in the process of instruction when using the 5E learning cycle in diverse subjects. It is important to clearly understand how teachers perceive the 5E learning cycle because their perceptions ultimately affect their teaching styles and the activities they present to students.

Therefore, this research focused on observing the activities and lesson plans prepared and performed by pre-service teachers according to the 5E learning cycle during the practice lessons of their Pre-Service Teaching Practicum course, as well as, determining the problems and successes that these pre-service teachers had during these practice lessons. Students in their final year of study in teacher education at Ankara University, Department of Elementary Education were the participants of this paper. Previously, these students had received instruction through their university lessons regarding the constructivist approach and the 5E learning cycle model. This instruction came especially through their Teaching Practicum courses I and

II where examples of the constructivist approach and 5E learning cycle were examined and pre-service teachers were also expected to prepare lesson plans based on what they had learned. The teacher candidates were expected to prepare their lesson plans and teaching activities in accordance with the constructivist approach and 5E learning cycle. Later, the teacher candidates utilized their prepared lessons in real-world elementary school classrooms during their practice teaching. In this respect, the following research questions were investigated;

a) What types of activities do pre-service teachers use in each stage of the 5E learning cycle model?

b) In which stages of the 5E learning cycle do pre-service teachers experience any problems when teaching their lesson plans?

c) In what stages of the 5E learning cycle do pre-service teachers successfully perform their lesson plans?

METHODOLOGY

In this descriptive qualitative study, pre-service teachers' teaching practices were observed and video recorded in order to analyze their appropriateness with the 5E learning cycle method. The recorded teaching videos were analyzed according to an observation form prepared by the researchers which was based on related literature, as well as, experts' recommendations. The first two authors, with the observation form in hand, conducted pilot coding on some of the observation videos. Based on the pilot coding any necessary additions and/or revisions were made and the observation form was finalized for use in observation coding (Table 1).

In order to assess whether the pre-service teachers, including 14 female and 1 male, followed the guidelines of the 5E learning cycle method, a total of 440 minutes of teaching videos were independently coded by the first two researchers. The use of the constructivist approach in the teaching-learning process by pre-service teachers was evaluated according to the 5E learning cycle model; *engagement, exploration, explanation, elaboration, and evaluation*. As part of the evaluation process the frequencies of each key 5E learning cycle behaviour was documented. In order to answer the paper's questions, the data obtained through evaluation was summarized according to the 5E learning cycle

Table 1: Observation form based on 5E learning cycle model

Stages		Key behaviours
Engage	1.	Improves curiosity/interest in the subject.
	2.	Performs activities to improve the learner's motivation.
	3.	Exposes the learner's prior knowledge.
	4.	Determines prior knowledge and corrects missing or false facts.
Explore	1.	Prepares activities in which students use prior knowledge to create new thoughts via activities (experiments, concept maps, case studies, problem solving, visual analysis, questions, etc.).
	2.	Encourages learners to interact in the classroom.
	3.	Observes learners' study habits and directs them when needed.
	4.	Queries students when needed to direct, provide tips, and encourage thinking.
	5.	Provides opportunities to develop creative thinking and problem-solving skills.
	6.	Leads learners to question their misconceptions and incomplete information/knowledge.
	7.	Ensures learners consider new concepts by creating conflicting situations and discussion of learners' ideas from certain concepts.
	8.	Encourages students to query and dialogue with peers.
	9.	Guides students to access alternative/supplemental resources.
	10.	Allows learners to compare information.
Explain	1.	Wants learners to explain the causes of their opinions.
	2.	Explains new information and concepts about the subject.
	3.	Establishes a connection with learners' previous knowledge.
	4.	Removes misconceptions to ensure students are learning new concepts.
	5.	Helps learners to correct and complete missing information.
	6.	Repeats, summarizes, and re-reads subject information for learners.
Elaborate	1.	Ensures learners transfer their learning to new situations via proper practices (deciding, finding solutions, producing, etc.)
	2.	Encourages learners to develop their knowledge and skills in new situations.
	3.	Directs learners to question their knowledge of new situations and to share this with classmates.
	4.	Makes sure that assigned homework and activities relate to learners' real lives.
	5.	Encourages learners to make their own decisions.
Evaluate	1.	Evaluates learners' gained knowledge and skills.
	2.	Gives opportunities to learners for self-evaluation.
	3.	Gives opportunities to learners for peer-assessment.

themes, and then supported with corresponding citations.

RESULTS

In this paper, pre-service teachers' activities in teaching diverse subjects were investigated for whether their lesson preparation and teaching activities were in line with 5E learning cycle. Research questions were answered according to the appropriate themes which were based on 5E learning cycle.

Following viewing and analysis of the classroom videos, the researchers determined that a majority of the pre-service teachers utilized the 5E learning cycle when teaching social studies (6 times), life studies (5 times), mathematics (3 times) and language arts (1 time). Evaluation indicated that according to the 5E learning cycle model, the two stages that were observed with all the key behaviours were the engage and explains stages. The findings regarding the engage stage are given in Table 2.

Table 2: Frequencies of observed behaviours for the engagement stage

Target behaviour	Frequency
Exposes the learner's prior knowledge.	41
Improves curiosity / interest in the subject.	31
Determines prior knowledge and corrects missing or false facts.	12
Performs activities to improve the learner's motivation.	7

The Engagement Stage

During the engagement stage the pre-service teachers conducted many activities to assess their students' previous knowledge (41 times),

as well as, to gain their attention (31 times). For example, in a math lesson, one pre-service teacher secretly puts some coins in her hand and began shaking the coins. She then asked students to guess what the noise they were hearing could be, and many students gave responses based on their guesses. Then, she says *"The answer is money, just like your friend said. Well, kids do you know where we use money?"* Through this small activity, the pre-service teacher was able to engage the students and grab their attention and interest for the particular lesson.

In most instances the students did not have false, incorrect, or missing information, as a result, the pre-service teachers provided limited corrections on only twelve occasions. As seen during the engagement phase, pre-service teachers mainly focused on assessing students' prior knowledge but also did conduct a limited number of activities for motivation (7 times). Some of these activities were: in order to express the role of money in everyday life a pre-service teacher told a cultural specific joke about Nasreddin Hodja, while, another pre-service teacher provided a short video when providing a lesson about traffic rules. Finally, another pre-service teacher asked open-ended questions for students to feel comfortable and better understand the importance of reforms in our lives, such as, *"How would our lives be if we would still use the old units of the measurement?"*

The Explore Stage

It was observed that one of the main stages of the 5E learning cycle model's, the explore stage, was not applied as often as expected. In the instances when attempts were made to apply the explore stage, unfortunately, the chosen activities did not assist students in discovering the subjects thus these activities were completed mostly through pre-service teachers explanations. The frequency of target behaviours performed by pre-service teachers in the exploration stage are provided in Table 3.

As seen in Table 3, the pre-service teachers' use of learners' prior knowledge in the process of exploring new ideas was the most frequently observed behaviour (50 times). For example, in one instance a pre-service teacher asked students to work in groups and organize a group of transportation vehicles into historical order from past to present, and then write features about each vehicle.

Table 3: Frequencies of observed behaviours for the exploration stage

Target behaviours	Frequency
Prepares activities in which students use prior knowledge to create new thoughts via activities (experiments, concept maps, case studies, problem solving, visual analysis, questions, etc.).	50
Queries students when needed to direct, provide tips, and encourage thinking.	23
Leads learners to question their misconceptions and incomplete information knowledge.	13
Allows learners to compare information.	4
Encourages learners to interact in the classroom.	2
Ensures learners consider new concepts by creating conflicting situations and discussion of learners' ideas from certain concepts.	2
Provide opportunity to develop creative thinking and problem-solving skills.	3
Observes learners' study habits and directs them when needed.	1
Encourages students to query and dialogue with peers.	0
Guides students to access alternatives/ supplemental resources	0

The second most frequently observed key behaviour by pre-service teachers during the explore stage was asking students questions in order to direct, give tips, and encourage thinking (23 times). Instances of these behaviours were observed when, for example, one pre-service teacher used a puppet while reading a case study about the weather, and then queried students to discuss how weather conditions affect the students' daily lives. Also, as seen above, the third most frequently observed key behaviour by pre-service teachers' was the pre-service teachers' encouraging students to consider and question their misconceptions and incomplete information (13 times).

While pre-service teachers did exhibit a high frequency of three key behaviours from the 5E learning cycle model, there were some other key behaviours from the 5E leaning cycle that were not exhibited at a sufficient frequency. For example, the pre-service teachers did not provide enough opportunities for their students to make comparisons (4 times), interact with others, discuss their ideas after conflicting situations, think creatively and/or solve problems (2 times). In terms of creative thinking, the researchers observed that during a life science course, a pre-service teacher asked students to work in groups

and write a slogan about the games they played in the past and present. In another life science course, a pre-service teacher asked students to illustrate various weather conditions in their own unique way. In terms of creating a conflicting scenario, a male pre-service teacher asked students whether cars should be considered living or non-living entities. When the students stated cars were non-living entities, he followed up with, *"Why?"* Then, students replied; *"Because, they do not show reaction to stimulation."* The pre-service again followed up with a question; *"How come? When we touch a car the alarm goes off, so it makes the alarm noise".* The pre-service teachers were observed on only one occasion when they were witnessed encouraging the students' learning and working processes. Furthermore, no pre-service teacher was witnessed encouraging students to interact in a student-to-student dialogue regarding class questions. Finally, no pre-service teachers were observed guiding students towards alternative and supplementary learning resources even though these were also key behaviours associated with the explore stage of the 5E learning cycle model.

The Explanation Stage

The activities which were coded as explanation behaviours primarily focused on the pre-service teachers' reiterating answers and summarizing already read texts to the students. The frequencies for key behaviours which were observed during the explanation stage are provided in Table 4.

Table 4: Frequencies of observed behaviours for the explanation stage

Target behaviour	Frequency
Repeats, summarizes, and re-reads subject information for learners.	35
Explains new information and concepts about the subject.	28
Wants learners to explain the causes of their opinions.	24
Helps learners to correct and complete missing information.	16
Establishes a connection with the learners' previous knowledge.	12
Removes misconceptions to ensure students are learning new concepts.	2

In the explanation stage, removing misconceptions about the subject material in order to enable students to more readily learn new concepts was the least frequently observed behaviour performed by pre-service teachers (2 times). Instead, many pre-service teachers' preferred using reinforcing behaviours (35 times). Other behaviours observed during this stage, according the frequency of times the behaviour was witnessed, were as follows; explaining new information and concepts about a topic (28 times), asking students to explain the reasoning behind their suggested ideas (24 times), helping students truly configure and complete the information (16 times),and creating connections with students' prior knowledge (12 times).

The Elaboration Stage

Five target behaviours were identified during observation of the elaboration stage. However, only three of these behaviours were witnessed during observations; developing knowledge and skills in new situations, questioning information in new learning environments, and encouraging students to make their own decisions. The frequencies of the observed behaviours are provided in Table 5.

Table 5: Frequencies of observed behaviours for the elaboration stage

Target behaviour	Frequency
Ensures learners transfer their learning to new situations via proper practices (deciding, finding solutions, producing, etc.)	7
Makes sure that assigned homework and activities relate to learners' real lives.	1

Observations revealed that up to one half of the pre-service teachers (8 pre-service teachers) did not provide the appropriate time during their lessons for the elaboration stage. The pre-service teachers which did include the elaboration stage in their lessons mainly ensured that learners transferred their learning to new situations (7 times). In some instances, the pre-service teachers utilized an activity called the "six-hat thinking method" .When instructing a lesson related to traffic rules pre-service teachers provided worksheets to the students and asked students to write down their opinions for each colour of

hat. The activity did not progress as it was intended in each instance. The students did not clearly understand the role of each hat or what information to provide for each colour of the hat, and as a result, the discussions did not proceed correctly.

It was observed that the pre-service teachers also did not plan activities which related to the students' real lives. Only one pre-service teacher was witnessed on only one occasion allowing students to engage in a real life related activity. During a math lesson activity the pre-service teacher provided her students with paper money in order to shop. Also, included in the lesson were items which could be purchased. The students were asked to purchase gifts for a fellow student's birthday. As part of the lesson, students' purchases were restrained by the amount they were able to spend on the gifts. Only a certain amount of money was allocated to the students and their task was to purchase gifts within their budget.

The Evaluation Stage

The evaluation stage was the least observed stage during the 5E learning cycle model. One of the three target behaviors of the evaluation stage, self-assessment behavior, was not observed during any activity which was prepared and/or presented by pre-service teachers during the evaluation stage. Frequencies of the observed behaviours are provided in Table 6.

Table 6: Frequencies of observed behaviours from the evaluation stage

Target behaviour	Frequency
Evaluates learners' gained knowledge and skills.	5
Gives opportunities to learners for peer-assessment.	2

Pre-service teachers rarely assessed learners' knowledge and skills (5 times). In order to evaluate students' knowledge pre-service teachers mainly used true-false and matching questions prepared in written form on worksheets. In addition, learners were provided very few opportunities for peer evaluation (2 times). In an example of one of these occurrences students worked in groups preparing posters. Later, the students were asked to assess the work of other groups' and to determine which poster was the best.

DISCUSSION

In classrooms in which the constructivist approach is utilized the value of instruction is not given to repetition of information, as might be found in traditional classrooms, but instead to the transfer of knowledge, the conversion of that knowledge to new situations, the implementation of new knowledge and in short, the restructuring of knowledge (Llewellyn 2005; Un Acikgoz 2005). The purpose of instruction is not to have students obtain information solely by reading books and/or listening to their teachers lecture. Instead, the purpose of instruction should be for students to play an active role in the classroom through activities such as discussion, explanation, and the questioning of their ideas and the sharing of their knowledge with peers (Aydin and Yilmaz 2007; Taylor et al. 2007). In other words, using the methods and techniques which allow for students to be actively involved within the learning process is the ultimate goal of instruction (Aykac 2007). In such an approach, teachers actively assist students in reproducing and transfer of their knowledge into any new situation they encounter, as well as, to create a synthesis through collaboration (Aydin 2005). As a result, classrooms promoting the constructivist learning approach should enable students to examine their knowledge, and relate that knowledge to their previous knowledge and to their daily lives (Bybee 2002; Oguncand Tarhan 2006). The role of the teacher in this process is to provide as many opportunities as possible for students to express their viewpoints both verbally and in-writing. Also, the teachers' role is to encourage students to reveal their insights, as well as, to provide students' further opportunities for contemplation of they have learned (Fosnot 2007; Gould 2007).

In a study conducted by Gokce et al. (2012) pre-service teachers assessed classroom teachers' teaching practices according to the constructivist approach, and the issues experienced by pre-service teachers that were highlighted as problematic were also observed as problematic for pre-service teachers in this study. Also, the research revealed that the classroom teachers in the study did not come adequately prepared to the classroom for a constructivist approach to

learning. For example, in order for the classroom teachers to gain the students' attention they most often used a questioning strategy, showed visuals, read stories, and/or sang songs which were related to the target subject. Findings from the study revealed that the participating classroom teachers were not skilled in the stages of exploration or elaboration. During the explanation stage the teachers were found to be providing students detailed descriptions of topics instead of students being more involved in leading their learning activity. Furthermore, primarily product-based assessments were carried out in the evaluation stage. In this current paper the main research objective was to assess the teaching practices of pre-service teachers. Analyses of data from this study illustrated that the pre-service teachers observed also experienced similar difficulties and shortcomings with their teaching practices. These findings are considered to be important and need further evaluation.

The study conducted by Metin and Ozmen (2009) also provided similar results. In their study, the researchers investigated pre-service teachers' teaching practices and discovered that the pre-service teachers in their study were not successful at time management as it related to instruction. In addition, the pre-service teachers also failed at implementing parts of the 5E learning cycle model. These pre-service were not skilled at classroom management and also could not relate their students' previous knowledge into students' daily lives and real world experiences.

YildizFeyzioglu and Demirci (2013) investigated a total of 36 teachers, including 20 elementary and 16 in science, regarding information and ideas relating to the 5E learning cycle model. Based on the research interviews with these 36 teachers, the researchers determined that the teachers had either misconceptions or were missing crucial information regarding strategies for presenting specific stages of the 5E learning cycle including; the stages of engagement, explore, explain, and elaborate. According to the teachers statements they commented that the reason for their lack of knowledge regarding how to properly present some aspects of the 5E learning cycle was that they were only exposed to theoretical courses during their undergraduate education and lacked the experience that comes from applied education. These comments point out the importance of providing in-service training to all teachers so that they can gain useful real-world experience before they begin their teaching career.

In addition, studies investigating pre-service teachers' level of self-efficacy towards 5E learning cycle model and the constructivist approach revealed that pre-service teachers had high levels of self-efficacy towards implementing the constructivist approach in the classroom. These pre-service teachers also believed themselves competent in preparing and implementing lesson plans and using teaching and evaluation methods and techniques (Demir et al. 2012). In another study, which was prepared by 32 pre-service teachers using content analyses techniques and in line with investigating 5E learning cycle teaching methods and the constructivist learning theory, Acisli et al. (2011) recognized that these pre-service teachers did not have a full understanding competence in the nature of 5E learning cycle. The findings of this paper also demonstrated that pre-service teachers were unable to reflect their strong levels of self-efficacy regarding the 5E learning cycle and constructivist theory into real-world classroom applications.

Even though pre-service teachers who participated in this study acquired theoretical knowledge on 5E learning cycle model and had experiences on writing lesson plans before the study was conducted, they could not transfer their knowledge and experiences into their teaching practices and it is quite thought provoking. However, similar research also shows this problem. Rainer et al. (2000) conducted a study with preschool teachers and first and second grade primary school teachers. They stated that their six teacher participants have been trained in accordance with the constructivist approach. The researchers found that three of these teachers followed and used the traditional approach. Again Aykac and Ulubey (2012) found out that teachers could not effectively implement activities; could not choose context and content-appropriate methods and techniques; and did not select appropriate assessment techniques to measure learning outcomes. In another study, the teachers expressed that they saw themselves insufficient particularly in assessment (Battal 2008; Karadag et al. 2008). The pre-service teachers in this current study gave a very little space to assessment and primarily evaluated students' learning and achievement solely by information seeking questions. Thus, the results of this study also coincided with previous studies' findings.

Other studies investigating teachers' levels of self-efficacy towards the constructivist approach yielded that teachers have a positive attitude towards constructivist approach and their levels of self-efficacy beliefs are high. However, studies also showed that like our pre-service teachers the teachers in service are not completely and truly following the constructivist approach and instead they prefer using traditional methods (Pinar 2013; Kaya 2013).

CONCLUSION

The findings from this paper revealed that the most commonly used stages from the 5E learning model were the engagement and explanation stages. During the engagement stage, pre-service teachers primarily worked on uncovering students' previous knowledge and at the same time performed enhancing motivation activities only in a limited number. Also, the explore stage was applied very infrequently. In cases when it was applied the activities failed to bring about discovery. Unfortunately, these activities were completed for the most part through teachers' descriptions and explanations. Removing misconceptions for students to ensure that students were learning new concepts was the behaviour observed the least. While the behaviours of repeating, summarizing, and re-reading were observed most frequently during the explanation stage. The target behaviours from the elaborate stage were not often observed. The pre-service teachers rarely evaluated students and the students also had few opportunities to assess their peers. Furthermore, none of the pre-service teachers encouraged their students to carry out self-assessment.

In this paper, the pre-service teachers failed at implementing parts of the 5E learning cycle model. These pre-service were not skilled at classroom management and also could not relate their students' previous knowledge into students' daily lives and real world experiences. The findings of this paper also demonstrated that pre-service teachers were unable to reflect their strong levels of self-efficacy regarding the 5E learning cycle and constructivist theory into real-world classroom applications. Even though pre-service teachers who participated in this study acquired theoretical knowledge on 5E learning cycle model and had experiences on writing lesson plans before the study was conducted, they could not transfer their knowledge and experiences into their teaching practices and it is quite thought provoking.The pre-service teachers in this current study gave a very little space to assessment and primarily evaluated students' learning and achievement solely by information seeking questions.

RECOMMENDATIONS

Depending on the findings of this paperfurther recommendations are given to educators and researchers. The planned paper on this issue can be conducted with students from different teaching programs, departments and educational faculties. Additionally, interviews can be conducted with participants at the beginning and at the end of studies. Students from different faculties of education groups, supported by classroom practices carried out before and after the interview. Furthermore, pre-service teachers' applications can be recorded in different courses so comparisons can be made among teaching different subjects.

In terms of teaching practicum courses, pre-service teachers should be trained well about using 5E learning cycles and classroom teachers should have chances to participate in-service training in order to better help students learning, achievement, attitudes etc. via using 5E learning cycles in their courses. Pre-service teachers should be reminded that they are not the sole source of information. Their main role should be the facilitator during the learning process. So, pre-service teachers should encourage students involved in inquiry and exploration, should provide adequate materials, should monitor and assess learning. Students also need to engage in diverse techniques and activities in order to reflect and argue their experiences and learning.

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