

Levels of prospective science teachers' ability to structure 5E model

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Abstract. The research was conducted with 3rd year prospective science students, who study at the science teaching department of a university in İstanbul province. For that purpose, 34 prospective science teachers cooperated and participated in the study. In the study, the prospective teachers were asked to select a certain subject and plan that subject in accordance with the 5E model. Therefore, the objective of the study is to determine the levels of prospective science teachers' ability to structure the 5E model. The data retrieved from the study were analyzed and compared through content analysis and percentages. The results of the study suggest that some prospective teachers are not sufficient at each phase of the 5E model, thereby the researchers made suggestions for that situation.

Keywords: research and investigation based learning, science education, prospective teacher, 5E model

1 Introduction

Science education has a significant place in the educational cycle of the world and our country. Considering where science education is in countries in the world, the results of certain studies prove that in our country it is our responsibility to provide our children with a more attentive science education. Of course, this change is not something that can be done immediately through magic, but needs to be done through a consistent process. In fact, this change is about enabling students to have experiences that are suitable for them, not about conducting activities that are cliché and against the nature of science. One of the most effective ways to do so is placing the learning based on research and investigation in the center and bringing students to the backstage of the work.

Today's 5E model is accepted as an effective and significant model in learning, which is based on research and investigation. Therefore, the ability to structure and implement 5E model is of importance in terms of education. Especially from the perspective of science education, research and investigation-based learning exists in the nature of science. However, various teaching models and strategies must be applied in order to reveal,

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implement, and structure that potential. One of these effective teaching methods is, with no doubt, 5E model. 5E model is a learning model that consists of five phases including engaging, exploring, explaining, extending, and evaluation. In the engaging phase of the 5E model, activities that could grab the attention of students are conducted; in the exploring phase, certain experience processes are carried out; in the phase of explaining, students are promoted to define and to infer; in the phase of extending, the students are expected to make new transfers to the existing knowledge; finally in the phase of evaluation, the reflections of the process on the students are evaluated.

In our country, 5E model is a research field that has just started to be studied in the science education field in the recent years [1, 2, 3]. Reviewing the studies carried out in this field, 5E model appears to be an effective teaching model.

Considering all of these facts, the importance of the study is focused on raising efficient prospective science teachers, who will provide a good science education.

2 Method

2.1 Participants

The research was conducted with 3rd year prospective science students, who study at the science teaching department of a university in Istanbul province. For that purpose, 34 prospective science teachers cooperated and participated in the study.

2.2 Procedure

In the study, the prospective teachers were asked to select a certain subject and plan that subject in accordance with the 5E model. Therefore, the objective of the study is to determine the levels of prospective teachers' ability to structure the 5E model after studying science. The engaging, exploring, explaining, extending, and evaluation phases of those plans were examined. The phases of the 5E model were prepared by the researchers, evaluated through evaluation criteria and eventually interpreted. In this study, each phase of the 5E model plans prepared by the prospective teachers was evaluated according to two categories which are sufficient and insufficient.

The pattern of the study is 'case study'. Case study can be defined as a system, in which one or multiple cases, environments, programs, social groups or other interdependent systems are thoroughly examined [4]. The data retrieved from the study were analyzed and compared through content analysis and percentages. The content analysis is implemented as a technique, in which information can be elaborately examined through codings and categories. The data collected from the open-ended questions were evaluated through content analysis. According to the researchers, content analysis is a systematical and iterable technique, through which certain words of a text can be summarized in smaller content categories via codings [4].

3 Findings

The data obtained from the study are divided into two headings. The first section consists of the evaluation of the plans prepared by the prospective teachers according to 5E model, in sufficient and insufficient categories, whereas; the second section involves the examples created by the prospective teachers on the phases of 5E model.

3.1 Prospective teachers' competency of 5E model

The data obtained from the research are displayed in Table 1. Table 1 displays frequencies in two categories including Sufficient and Insufficient, which are related to prospective science teachers' ability to structure the processes of the 5E model.

Table 1. The prospective science teachers are generally able to structure the 5E model

5E model	Sufficient	Insufficient
Engage	31	3
Exploration	17	17
Explanation	11	23
Elaboration	10	24
Evaluation	18	16

As demonstrated in Table 1, the prospective science teachers are generally able to structure the 5E model, they have difficulty with the explanation and elaboration processes, and they mostly succeed at the engage phase.

3.2 Examples created by prospective teachers on 5E model

The tables in this section demonstrates the examples of the plans created by the prospective teachers on the phases of 5E model.

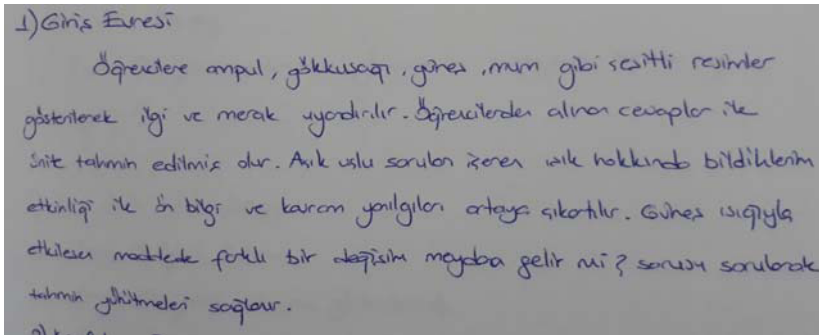


Fig. 1. An example on the engage phase

Examining the example displayed in the Figure1, it is observed that the prospective science teacher is quite sufficient at the engage phase.

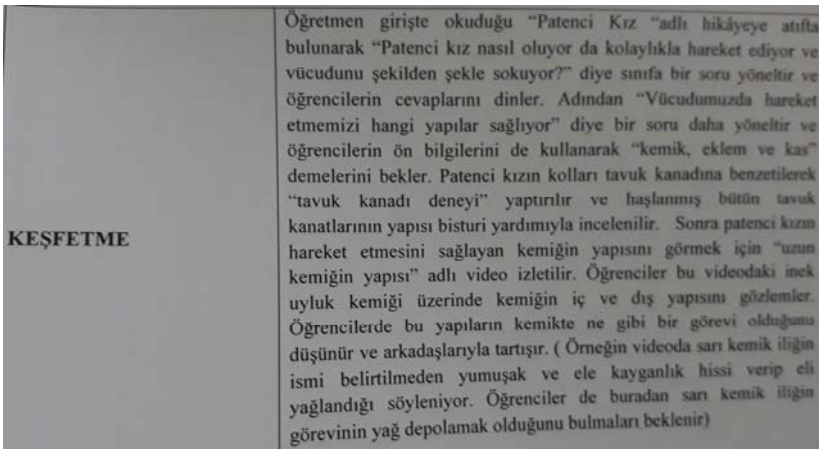


Fig. 2. An example on the exploration phase

Taking a look at the example demonstrated in the Figure 2, it is observed that the prospective science teacher is sufficient at the exploration phase.

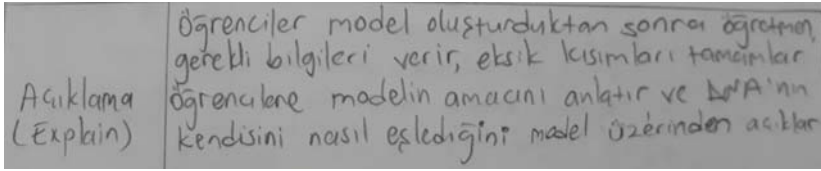


Fig. 3. An example on the explanation phase

Looking at the example displayed in the Figure 3, it is observed that the prospective science teacher is not quite sufficient at the explanation phase.

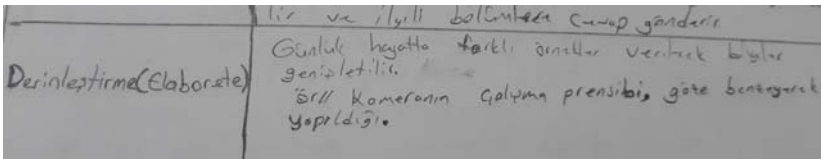


Fig. 4. An example on the elaboration phase

Examining the example shown in the Figure 4, it is observed that the prospective science teacher is not quite sufficient at the elaboration phase.

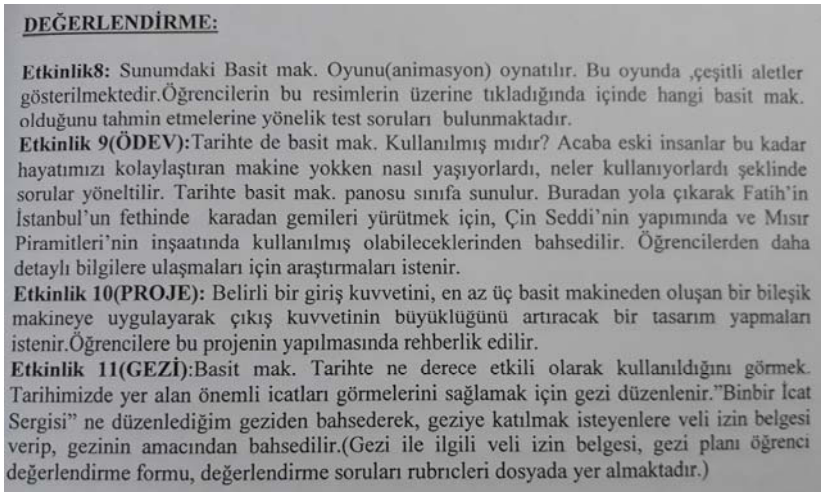


Fig. 5. An example on the evaluation phase

Taking a look at the example demonstrated in the Figure 5, it is observed that the prospective science teacher is sufficient at the evaluation phase.

4 Discussion and conclusion

5E learning cycle model was implemented by Robert Karplus at late 1950's and early 1960's for the first time [5] and by Bybee & Landes in the biology program in 1990 [6]. 5E model promotes children to discover, implement, and, structure concepts [7]. With its student-centered approach, 5E model supports children in taking more responsibility for their own learning [8].

The results of the study suggest that the prospective science teachers are generally able to structure the 5E model, however, some of the prospective science teachers are not completely sufficient at each stage of the 5E model. It was detected that the prospective teachers especially had difficulty with elaboration and explanation phases as well as organizing activities related to these phases. The deepening phase is of high importance for the 5E model, since the ability to transfer knowledge into other knowledge is regarded as one of the most significant steps in the science education.

5E model has also a significant place in query-based learning. As a matter of fact, this was revealed in the study carried out by the researchers [9, 11]. It is believed that in order to execute this learning method in an efficient manner, it is important to have a high number of experiences. Therefore, more studies must be conducted on the 5E model both at elementary school and faculty level. Within that context, this study tries to shed light on the importance of the learning process of prospective teachers, especially for science education as well as to take a step towards enabling others to conduct new studies in future.

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