

Life Science Course Activities: Theory and Practice from Preservice Teachers' Perspective

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Abstract

The aim of this study was to compare preservice primary school teachers' theoretical life science lesson plans during undergraduate education and their observation of life science lessons performed by primary school teachers in real learning environments. This was a case study, which is a qualitative research design. The study sample consisted of 20 third-year students of the department of basic education of classroom education of a university in Turkey the academic year 2018-2019. Observation was conducted in first-, second- and third-grade primary school life science lessons of primary school teachers who agreed to participate in the study. According to results, primary school teachers failed to adhere to learning outcomes, were unaware of the basic skills in the syllabus, misused methods and techniques, and did not pay much attention to the evaluation phase. Therefore, primary school teachers should keep up with the literature of interest (culture, art, science etc.) and participate in social and cultural activities (seeing plays, going to the movies, etc.) to develop themselves in order to be able to link the life science course with other fields and day-to-day life.

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Introduction

The exact date remains unknown, but it seems that the life science course is theoretically based on integrity and self-knowledge, "which are the principles of Plato" (Tay, 2017, p. 23). Life science underwent rapid development with the Renaissance and Reform movements. "Comenius designed the life science course for first graders" (Sağlam, 2015, p. 5). In his work *Emile*, Rousseau emphasized the significance of experimentation, observation, and real-life and child-centered teaching practices (Kaya, 2018). Lock concentrated on naturalist education. Pastelozzi argued that life science education should be based on the immediate surroundings of children (Brown, 1986; Soëtard, 1994) while "Hebart stated that education should focus on children's activities" (Bastık, 2019, p.12). All these efforts have brought the life science course to its current form. Young children have a tendency to process stimuli as an undifferentiated whole in early years of education (Kaya, 2018). Therefore, the life science course is designed in such a way that it responds to the totality of life

and involves interdisciplinary practices (Akyol, 2018; Kılıç, 2018). Putting consolidation into practice in education, the life science course consists of four areas: natural sciences (human, nature, and society), social sciences, art and thought, and values. The course syllabus of the life science course included not only curricular but also extra-curricular activities in the early years of the 1900s. However, "the trip-observation method was removed from the syllabus in 2005" (Tiryaki, 2018, p. 9). Along with the constructivist approach, it is seen that different methods and techniques and learning models are put into practice in learning environments. It is stated that teachers' ability to prepare and implement lesson plans are effective in providing an effective learning environment (Aşıroğlu & Koç-Akran, 2018). The 5E model, which is one of the content that can be used in lesson plans, allows students to learn via making a connection between old and new knowledge. Bybee claims (1997) that this model allows students to focus on the subject, discover, organize and classify knowledge, apply it to new situations, conceptualize it. The life science course is seen as a course in which

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5E model applications can be used since it is oriented to unify the whole in terms of structure and forms the basis for interdisciplinary courses (Science, Social Studies, etc.) (Kara, 2021). Therefore, lesson plans for the 5E model are important in the learning environment to be created for this lesson. Primary school teachers and preservice primary school teachers have numerous responsibilities in applying the life science syllabus. Classroom activities can provide much information about the effectiveness of the life science syllabus. What is more, observing primary school teachers during life science classes allows preservice teachers to compare classroom activities and follow the teaching process on site, and therefore, can help them develop professional skills.

Research on the life science course addresses different methods, techniques, and practices (Akaydın, 2016; Av-Hartuç, 2015; Bal, 2019; Bülbül-Hüner, 2018; Bütün, 2015; Ceylan, 2016; Çatalbaş & Semerci, Doğanay, 2019; Durmuş, 2017; Erbil, 2014; Gündoğan, 2017; Kahriman, 2014; Kuru, 2018; Sargın, 2016; Sucu, 2014; Tosun, 2015; Ütkür, 2016; Yavuz, 2017; 2016; Yılmaz, 2019), course syllabus development, implementation and analysis, and textbook review (Akay, 2017; Aydın, 2015; Bayırlı, 2018; Demirel-Balık, 2016; Fidan, 2019; Hızlı-Alkan, 2016; Kale, 2015; Kalender, 2018; Kılıç, 2018; Karatay, 2017; Özkan, 2017; Tezcan, 2016; Topcubaşı, 2015; Toprak, 2019; Uzunkol, 2014), teachers', students', and parents' views (Ak-Tefek, 2016; Akyol, 2018; Arık, 2016; Barlas, 2015; Bastık, 2019; Çetinkaya, 2019; Gedik, 2017; Gözel, 2018; Hazır, 2018; Kalafatçı, 2017; Kutanoğlu, 2014; Sever, 2015; Subramaniam, 2019; Şahan, 2017; Şenay, 2015; Türköz, 2018; Yıldırım, 2015); preservice primary school teachers' views and attitudes towards undergraduate life science education and value education in life science (Çetin, 2018; Gündoğan, 2020; Kılınç & Uygun, 2015; Ütkür, 2018), preservice teachers' views of course syllabus revision (Demir, 2016), and preservice primary school teachers comprehension of basic life science concepts (Akyıldız, Altun & Kasım, 2018), investigation of texts and images in life science textbooks in terms of values (Öztürk & Özkan, 2018).

There are, however, no studies that compare preservice primary school teachers' observation of life science classes in real learning

environments with lesson plans that they prepare during undergraduate education. On the other hand, in a study in which studies on life science course are examined in the literature, it is recommended to focus on qualitative studies in this field and to conduct more in-depth studies (Şimşek, 2019). This is, therefore, the first study to address the issue from a comparative perspective. In this context, the main research question was "How did preservice primary school teachers compare the theoretical and practical aspects of life science course education?" The study sought answers to the following sub-questions:

- What kind of theoretical lesson plans did preservice primary school teachers prepare based on the 5E Model (Engagement, Explore, Explain, Elaborate, and Evaluate) within the scope of undergraduate life science course?
- What was the general assessment concerning preservice teachers' observation notes?

Method

This section addressed research model, participants, data collection tools, data collection and analysis, credibility and consistency and limitations.

Research model

The aim of this study was to compare preservice primary school teachers' theoretical life science lesson plans during undergraduate education and their observation of life science lessons in real learning environments. This was a case study, which is a qualitative research design. Case study was the research design of choice because "it is a convenient method for studies seeking to find out the "what," "how," and "why" of a phenomenon" (Yin, 2018, p. 40). Single case-holistic design was used in this study.

Participants

The study sample consisted of 20 third-year students (19 women and 1 man) of the department of basic education of classroom education of Muş Alparslan University in the academic year 2018-2019. Participants were recruited using criterion sampling, "which is

generally employed in studies that are information-rich” (Patton, 2014, p. 238). The inclusion criteria were as follows: (1) taking the life science course, (2) having prepared a lesson plan, and (3) having agreed to participate in the study. Participants observed first-, second- and third-grade primary school life science lessons, whose teachers also voluntarily participated in the study. Of the twenty observation classrooms, 19 were in Urban/Muş while one was in Solhan/Bingöl. These are two different cities in Turkey.

Data collection tools

Data were collected from participants’ life science lesson plans, class observation notes, and their views of their observation. “Using more than one data collection tool allows us to approach a phenomenon from different perspectives and understand it better” (Maxwell, 2018, p. 104). Participants’ documents and field observation notes were used to ensure data diversity. Observation is used for triangulation, in other words, “it is one of the integral components of triangulation assessment together with interview and document analysis used to prove findings”

(Merriam, 2015, p. 113). Participants' lesson plans, observation notes, and views were used for analysis.

Participants' lesson plans were based on the 5E model, which is a constructivist approach. Participants observed lessons as participant observers and took notes once a week for three months on certain dates.

Data collection and analysis

Participants consulted experts from different disciplines (science teachers, social studies teachers, and Dr. faculty members of classroom education, science and social studies education of the faculty of education) and received feedback from one of the researchers every week to develop lesson plans between September and November 2018.

Participant observation was conducted over the course of three months (September to November 2018) in first-, second- and third-grade primary school classrooms in Muş and Bingöl. Participants made observation in different grade levels and classrooms of the same schools. Table 1 provides detailed information on the observation process.

Table 1.
General information on observation.

Participant Observer	Dates	City / District	School	Classroom	Length
Aylin	29/11/2018 25/10/2018 27/09/2018	Muş/Urban	B	2	40'+40'+40'
Ada	26/11/2018 29/10/2018 24/09/2018	Muş/Urban	A	3	40'+40'+40'
Aydanur	23/11/2018 25/10/2018 24/09/2018	Muş/Urban	C	3	40'+40'+40'
Aynur	29/11/2018 25/10/2018 27/19/2018	Muş/Urban	D	2	40'+40'+40'
Burcu	16/11/2018 22/10/2018 01/10/2018	Bingöl/Solhan	E	3	40'+40'+40'
Ceyda	31/11/2018 04/10/2018 28/09/2018	Muş/Urban	C	3	40'+40'+40'
Didem	16/11/2018 22/10/2018 01/10/2018	Muş/Urban	C	3	40'+40'+40'

Duru	16/11/2018 19/10/2018 28/09/2018	Muş/Urban	F	3	40'+40'+40'
Deniz	02/11/2018 22/10/2018 01/10/2018	Muş/Urban	F	2	40'+40'+40'
Eda	30/11/2018 22/10/2018 01/10/2018	Muş/Urban	C	2	40'+40'+40'
Ela	07/12/2018 02/11/2018 22/10/2018	Muş/Urban	D	2	40'+40'+40'
Efsun	23/11/2018 22/10/2018 01/10/2018	Muş/Urban	D	1	40'+40'+40'
Filiz	06/12/2018 23/11/2018 22/10/2018	Muş/Urban	G	3	40'+40'+40'
Gamze	06/12/2018 02/11/2018 19/10/2018	Muş/Urban	C	2	40'+40'+40'
Hande	06/12/2018 16/11/2018 22/10/2018	Muş/Urban	B	1	40'+40'+40'
İlsu	05/12/2018 23/11/2018 01/10/2018	Muş/Urban	B	1	40'+40'+40'
İnanç	30.11.2018 04/10/2018 28/09/2018	Muş/Urban	C	3	40'+40'+40'
Kevser	05/12/2018 23/11/2018 26/10/2018	Muş/Urban	C	1	40'+40'+40'
Melike	05/12/2018 23/11/2018 26/10/2018	Muş/Urban	F	2	40'+40'+40'
Nihan	06/12/2018 23/11/2018 01/10/2018	Muş/Urban	A	3	40'+40'+40'

Data were analyzed using inductive content analysis, which “involves data categorization and theme development and interaction with data” (Patton, 2014, p. 453). In this study, first, lesson plans and then observational data were coded. Themes and categories were developed by one of the researchers based on consensus with the other. A third independent expert working in the field of classroom education was consulted, and the themes and categories were finalized based on her feedback.

Credibility and consistency

The study was approved by the Provincial Directorates of National Education of Muş and Bingöl and conducted over the course of four months from September to December 2018. Participation was voluntary. Table 1 provides detailed information on the observation process. A third area expert was consulted to reach consensus during qualitative data analysis. To this, some categories were named. For example, “recognizing basic life skills in syllabus” was reworded to “being aware of basic life skills in syllabus” (Figure 1) and “drawing students' attention appropriately” to “drawing students' attention effectively” (Figure 2). Similar

modifications were made throughout all Tables. Participants were assigned pseudonyms (Aylin, Ada, Aydanur, etc.) and observation schools were assigned codes (A, B, C etc.) to ensure confidentiality and to protect their anonymity. Participants observed lessons without any intervention. Participants' documents, observation notes, and views were used to ensure data diversity.

Findings

This section addressed participants' lesson plans (5E Model) and observation notes.

Findings regarding participants' 5E model lesson plans

This subsection discussed the results regarding the first sub-question "What was the general assessment concerning preservice teachers' lesson plans?". Figure 1 presents the general evaluation of participants' lesson plans.

Categories	Criteria	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Ganize	Hande	İlgu	İnanç	Keyser	Melike	Nihan	
	Adherence to learning outcomes	Yes	X	X	X	X		X				X	X	X	X	X	X	X	X	X	X	
No						X		X	X	X							X					X
Being aware of basic life skills in syllabus	No	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		
	Yes													X	X		X					X
Using methods and techniques correctly	No			X	X	X	X	X			X				X		X	X	X			X
	Yes	X	X						X	X		X	X	X		X					X	
Using tools and materials	Yes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	No																					
Paying attention to the evaluation phase	Yes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	No																					

Figure 1. General evaluation of participants' lesson plans.

In their lesson plans, participants adhered to the learning outcomes of the life science course but were unaware of the basic skills in the syllabus and failed to use the methods and techniques properly. However, they all used tools and materials properly and placed emphasis on evaluation. For example, Deniz designed the activity below in the exploration phase of her lesson plan for the learning outcome of "LS.2.2.7 Reaching out to those in need:"

The teacher divides the class into groups for "Six Thinking Hats" activities and gives each group a hat and asks them to think about a problem from the perspective that the hat represents. As the discussion question, the teacher asks, "Should we help someone we do

not know?" Each group thinks about the question and then the spokesperson goes up to the board and presents the opinion of the group. Hande designed the activity below for the learning outcome of "LS.1.1.6. Learning how to behave during a flag ceremony:"

The teacher gets the students out, and they perform a drama activity together. Some students play with their phones, some play games, and some talk. The National Anthem starts playing. The teacher turns up the volume slowly. The students, hearing the anthem, take a moment of silence and listen to it quietly.

Figure 2 presents the results regarding the engagement phase of participants' lesson plans.

Categories		Criteria	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlusu	İnanç	Kevser	Melike	Nihan		
Engagement phase	Drawing students' attention effectively	Yes	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
		No												X										
Engagement phase	Motivating students	Yes	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X
		No											X	X										
Engagement phase	Informing students of the objective	Yes	X	X			X	X			X			X			X					X	X	
		No			X	X			X	X		X	X		X	X		X	X	X				

Figure 2. Engagement phase of participants' lesson plans

In the engagement phase, participants were able to attract students' attention and motivate them, but were not good at informing students of the objective.

Aylin designed the activity below in the engagement phase of her lesson plan for the learning outcome of "1.2.7 Distinguishing between wishes and needs:"

In the engagement phase, students are asked where they live, what they eat, what they wear etc. and are allowed to answer them. We show them a movie to get their attention. They are given some ideas about the video, but not the whole content.

Aynur designed the activity below in the engagement phase of her lesson plan for the

learning outcome of "Separating recyclable materials from non-recyclable trash:"

The teacher enters the classroom before the students and puts items like glass bottles, paper, pet bottles, caps under the desks and leaves the classroom. Students enter the classroom and are surprised to see those items under their desks. The teacher then comes back into the classroom with four boxes in her hand and puts a plastic bag on her desk and asks the students to throw the items in the bag.

Figure 3 presents the results regarding the exploration phase of participants' lesson plans.

Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Ganize	Hande	İhsan	İnanç	Kevser	Melike	Nihan
Using question-answer method			X				X		X	X			X			X		X		
Using materials for activity engagement	X	X			X							X								X
Using technology				X										X	X		X			
Using drama method						X					X									
Using experiment and observation methods								X											X	

Figure 3. Exploration phase of participants' lesson plans

Participants used the question-answer method and got students involved in activities by using the materials that they prepared. Two participants used the drama, and experiment and observation methods.

Nihan designed the activity below in the exploration phase of her lesson plan for the learning outcome of “LS.1.6.2. Observing different animals in the immediate environment:”

The teacher says to the students “Kids, let’s play a game.” Then, she divides them into two groups and gives them cardboard puzzle pieces of sheep, chicken, dog, cow etc. She then starts playing a song and asks the students to put the pieces in their right place before the song finishes. The group that finishes the task first, wins.

Melike designed the activity below in the exploration phase of her lesson plan for the learning outcome of “LS.1.5.1. Knowing where you live.”

The teacher organizes a small trip to get students to explore the historical, touristic and

natural attractions of their city, Muş. She first takes them to Tarihi Murat Köprüsü (Murat Historic Bridge) and asks them “Have you ever been here before?” “How do you feel now?” and “What caught your attention about this place?” Afterwards, the party makes a stop at a predetermined point to see the size of Muş Ovası (Mus Plain). There, the teacher groups the students into four and positions them in a way that they face North, South, East, and West. She gives them pen and paper and asks them to draw what they see in front of them. The students stand in a circle after they are done drawing and are asked about what they have drawn. Afterwards, the teacher takes them to Kale Parkı (Castle Park) and groups them into two to play “Can you guess where this is?” One of the groups picks a place and describes it without telling its name, and the other group tries to guess where it is. The group that answers correctly asks the next one.

Figure 4 presents the results regarding the explanation phase of participants' lesson plans.

Explanation phase	Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlsu	İnanç	Kevsir	Melike	Nihan
	Direct instruction		X			X		X	X	X	X			X		X	X	X		X	X
Brainstorming			X	X		X	X					X		X				X			X

Figure 4. Explanation phase of participants’ lesson plans

Participants used the direct instruction and brainstorming techniques in the explanation phase.

Ceyda designed the activity below in the explanation phase of her lesson plan for the learning outcome of “LS.1.1.4. Knowing where the classroom is:”

The teacher asks the students to close their eyes and imagine their school for one minute and then tells them to open their eyes. She asks them “How many floors does your school have?” “What floor are we on now?” and “What classroom is across ours?” She describes where the classroom is after the students answer

the questions. For example, she says “this is 1/D, it’s on the second floor, next to the teachers' room. On its right is 1/C, below 1/B, and above 2/B.

İlsu designed the activity below in the explanation phase of her lesson plan for the learning outcome of “LS.1.1.16. Developing positive feelings and thoughts about school:”

At this stage, the teacher briefed the students on the school to break down their prejudices against it

Figure 5 presents the results regarding the elaboration phase of participants’ lesson plans.

Elaboration phase	Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlsu	İnanç	Kevsir	Melike	Nihan
	Educational games							X	X	X	X	X			X					X	
Educational websites		X		X		X							X								
Drama method			X		X							X				X				X	

Figure 5. Elaboration phase of participants’ lesson plans

Participants used educational games and websites, and the drama method.

İnanç designed the activity below in the elaboration phase of her lesson plan for the learning outcome of “LS.1.4.3. Obeying traffic rules during commute to school.”

The teacher projects the slide-shows on the website okulistik.com to the blackboard at the elaboration phase of the lesson plan based on the 5E Model. After the presentation, the

teacher shows the “traffic police” video on the same website and interprets it together with the students.

Duru designed the activity below in the elaboration phase of her lesson plan for the learning outcome of “LS.1.6.6. Observing the Sun, the Moon, the Earth and the stars:”

The teacher asks the students to close their eyes and think about one day of their lives from morning till night. She gives them the

keywords of “sun,” “earth,” “moon,” and “stars” and tells them to draw a picture with those words in mind.

Figure 6 presents the results regarding the evaluation phase of participants’ lesson plans.

Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlusu	İnanç	Kevser	Melike	Nihan
Worksheets of multiple choice questions		X			X				X	X		X					X	X		X
Assigning tasks with teamwork	X		X	X			X	X			X									
Using materials for activities						X							X	X						X
Reading comprehension activities															X	X				

Figure 6. Evaluation phase of participants’ lesson plans

Participants used worksheets of multiple-choice questions, engaged students in teamwork to assign them tasks, incorporated materials in activities, and evaluated students’ comprehension skills in the evaluation phase. Ada designed the activity below in the evaluation phase of her lesson plan for the learning outcome of “LS.1.6.3. Protecting animals and plants in the immediate environment.”

The teacher hands out worksheets of animal and plant pictures to the students and asks them to paint them as they please to teach them about the animals and plants in their immediate environment.

Filiz designed the activity below in the evaluation phase of her lesson plan for the learning outcome of “LS.1.3.1. Maintaining a regular self-care routine:”

The teacher sticks models of Smurfette and Papa Smurf and self-care pictures on the board. The teacher tells the students that Smurfette should perform daily self-care before visiting Papa Smurf. The teacher chooses a student and reads a story to him, and he sticks pictures on the board where he thinks Smurfette should perform self-care, and thus, helps her reach Papa Smurf’s.

Findings regarding participants’ observation of primary school life science lessons

This subsection discussed the results regarding the second sub-question “What was preservice primary school teachers’ observation of primary school life science lessons?”. Figure 7 presents the general evaluation of participants’ observation.

Categories	Criteria	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Ganize	Hande	İlisu	İnanç	Keyser	Melike	Nihan
	Taking into account learning outcomes	No	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X		X
Yes				X	X											X			X		X
Being aware of basic life skills in syllabus	No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Yes																				
Using tools and materials correctly	No		X	X	X	X	X	X		X	X	X	X		X	X	X	X			X
	Yes	X							X				X						X	X	
Using tools and materials properly	No		X	X	X		X	X	X	X	X				X		X	X			
	Yes	X				X							X	X		X			X	X	X
Paying attention to the evaluation phase	No	X			X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
	Yes		X	X		X											X				

Figure 7. General evaluation of participants’ observation of primary school life science lessons

According to participants’ observation notes, primary school teachers failed to adhere to learning outcomes, were unaware of the basic skills in the syllabus, misused methods and techniques, and did not pay much attention to the evaluation phase. The following are direct quotes from participants’ observation notes:

On her observation note, Didem stated the following:

...The teacher asked the students; “How do we choose our profession?” The students said, for example, that one wants to be a teacher because one can keep everything in mind and loves kids. The teacher asked, “Why would someone choose to be a teacher or a doctor?” and then went on and said, “you’re good with your hands, you can become a carpenter, so, what does it take to be an astronaut?” and the students answered, “an astronaut should not be afraid of the dark.” The teacher went on asking questions about jobs, like “What does a butcher do? etc....”

On her evaluation, Didem stated the following:

The classroom teacher was able to communicate with her students and use body language effectively. She asked the students questions and allowed them to answer them, which was fun. Although she only used the

question-answer and narration technique, not only did the students understand the topic well but also tried to answer her questions. She had some shortcomings, too. If she had used materials or pictures to describe the jobs, the students would have learned better, but she did not...

On her observation note, Ela stated the following:

The teacher kept on checking the assignments and then made those who did not do their homework stand in front of the whiteboard and asked them why they did not do their homework. The students said that they had forgotten to do it, so the teacher made them stand on one foot and then she turned to other students and told them to open their books. She asked one of the students to read the first question, and the student read the question, which was “Whom do you help with what?” The teacher asked the question again. The students started talking all at once, which was too loud. The teacher told them to be quiet but they kept talking, so, she shouted at them to be quiet and allowed only those who raised their hands to answer. One of the students said; ‘Ma’am, I help my mom set the table.’”

On her evaluation, Ela stated the following:

The classroom teacher was not very good at managing the class. There was too much noise in the classroom. She asked questions and let the students express their opinions. She always had eye contact with them but she had a hard time keeping them quiet, and so, it was too loud most of the time. I've noticed that most of

the students had some prior knowledge of the topic "helping each other," which was the topic of the day.

Figure 8 presents the results regarding the engagement phase in participants' observation notes.

Engagement phase	Categories	Criteria	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlsu	İnanç	Kevser	Melike	Nihan
			Draw students' attention properly	No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Yes	X							X											X		
Motivating students	No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Yes	X							X								X		X			
Informing them of the target	No	X	X	X	X		X	X			X	X	X	X		X		X				
	Yes					X			X	X					X		X		X	X	X	X

Figure 8. Engagement phase in participants' observation notes

According to participants' observation notes, primary school teachers were unable to get students' attention, unable to motivate them, and unable to inform them of the target. The following are direct quotes from participants' observation notes:

On her observation note, Kevser stated the following:

The teacher left the light of her phone on and asked the students whether it was appropriate. They said that it wasn't. She turned its light off and then left the cap off the toothpaste tube and asked whether it was appropriate. They said that it wasn't. She had a notebook with some pages written on it and asked whether it was okay to throw it away. After the students answered the questions, she gave words of advice, like, we shouldn't leave lights on, shouldn't waste paper and shouldn't leave the cap off the toothpaste tube.

According to Kevser's evaluation,

...We can use different activities to get students' attention and ensure learning retention. The students enjoyed doing activities. The teacher asked three students to get up to the whiteboard, it was interesting that most of the students raised their hands for that. I've noticed

that most of the students were interested in doing the activities...

On her observation note, Burcu stated the following:

...The teacher came into to the classroom and asked the students "What kind of people do you make friends with?," to which they replied as "helpful," "considerate," "honest," "reliable etc. and then she asked, "Would you want to see these qualities in your neighbors as well?," to which they replied as "yes." Afterwards, she asked "So, who is a neighbor?" They replied as "our parents' friends." She said "No they are not. Neighbors are those who live around us. For example, Medine and Ayşe live nearby, so they are neighbors." Afterwards, she told them to open their books and turn to the assigned page...

On her evaluation, Burcu stated the following:

The teacher managed to stick to the lesson plan. She gave examples from day-to-day life, which got the students' attention and ensured learning retention. She got them to do crossword, which is good for both mental and physical development, which was, therefore, a successful activity. She allowed them to research a proverb but, during the engagement

phase, she used the concept of friendship to teach a topic, which however confused the students. I think it would have been more appropriate if she had done it during the explanation or elaboration phase. I think I would show students a video or read a story during the engagement phase to explain the importance of neighborhood. I would talk about the fact that daily communication between neighbors is becoming much rarer and that we

don't even know our next-door neighbor, which is a huge problem, and that the bond between neighbors used to be stronger. In this way, I would elaborate on the topic and keep students' attention, which would ensure learning retention.

Figure 9 presents the results regarding the exploration phase in participants' observation notes.

Categories	Participants																			
	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlisu	İnanç	Kevser	Melike	Nihan
Question-answer	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X
Direct instruction						X	X													X

Figure 9. Exploration phase in participants' observation notes

According to participants' observation notes, primary school teachers used the direct instruction and question-answer techniques in the exploration phase. The following are direct quotes from participants' observation notes:

On her observation note, Aydanur stated the following:

...The teacher asked the students "What do you call your father's mother?" One of the students raised her hand and said "babaanne" (paternal grandmother). The teacher said, "You all already know that." However, some students said "anneanne" (maternal grandmother), so the teacher asked the question again and corrected their mistake. She asked, "What do you call your mother's mother?," to which the students replied as "anneanne" and then the teacher asked about other relatives...

On her evaluation, Aydanur stated the following:

... The teacher was ahead of the course schedule and so she did a good thing by going over the previous topics, allowing the students to learn them better. The students were doing fine in general. However, the teacher kept using the question-answer method, I'm not sure how effective that was. The students sometimes seemed a bit bored but sometimes enjoyed the

examples. The teacher managed to keep the classroom under control. She kindly dealt with those who were talking without permission or being disruptive in class.

On her observation note, Gamze stated the following:

...The teacher came into the classroom and greeted the students and had a chat with them and then asked them to open their life science books. The topic of the day was "Spending Money," which was the last topic of the unit "Life in Our School." The students opened their books and were ready for class. The teacher asked them "What does saving mean?" which some of the students answered. The teacher then defined it as "using money or anything carefully." She then asked them "Kids, do your parents buy you whatever you want?" and "Do you have a piggy bank?..."

On her evaluation, Gamze stated the following:

The teacher asked very nice questions during the engagement phase, the kind of questions that brought out the students' prior knowledge. She communicated well with them and managed to keep them under control. She defined the concepts and explained the topic

well and used examples that matched the students' level.

Figure 10 presents the results regarding the explanation phase in participants' observation notes.

Explanation phase	Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlisu	İnanç	Keşer	Melike	Nihan
	Direct instruction		X	X	X	X	X	X			X	X	X	X	X	X	X	X			X
Brainstorming		X							X										X		

Figure 10. Explanation phase in participants' observation notes

According to participants' observation notes, primary school teachers used the direct instruction and brainstorming techniques during the explanation phase. The following are direct quotes from participants' observation notes:

On her observation note, Efsun stated the following:

Apparently, the first hour was reading hour but today the teacher said that she was going to do life science because the students asked her to. "Open your books and turn to page 75, page 74 is your assignment, write 'homework' on that page and don't forget to do it" she said to them. She projected the book on the board too. She asked a student to read the first question and then read it herself. Some students raised their hands to answer it. One of the students said that he helped his dad to wash their car; another said that she helped a friend who tripped and fell; and another said that she picked up her mom's grocery bags. The teacher then got each student to read one of the illustrations.

On her evaluation, Efsun stated the following:

The students had different characteristics. They had a low level although they were in second grade, so the teacher should keep that in mind. She should have gone over the topic of the last week because she tried to remind the students of it but they failed to remember. Besides, she should have used a simpler language. The enactment technique had worked better, so she should have used it more. She was mostly sitting at her desk, so I think she should do more walking to assert control over

the classroom, besides, it would keep the students more active and engaged.

On her observation note, Eda stated the following:

... The teacher asked the students "What is a budget?" One of the students answered as "not wasting money" and another as "putting some of our Money aside." The teacher said "Yes, you all are right, but my question is 'what is a budget?'" One of the students said, "it's the balance between income and expense." The teacher agreed with it and said, "A budget is a balance between your income and expenses, so, the latter should not be more than the former." She also added "Our basic needs are food, shelter, and clothes. We should allocate a substantial portion of our budget to our basic needs."

On her evaluation, Eda stated the following:

At some point, the teacher made a comparison between paternal and maternal grandmothers and portrayed the former as worse than the latter, which was a very insensitive remark because it will change the students' attitudes towards their paternal grandmothers negatively and make them love them less. Maybe, they will never love them again because of her remark.

Figure 11 presents the results regarding the elaboration phase in participants' observation notes.

Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filliz	Gamze	Hande	İlisu	İnanç	Kevser	Melike	Nihan
	Direct instruction				X		X	X	X	X	X				X			X		
Question-answer		X	X			X					X		X			X				X
Elaboration phase																				
Education al websites or activities	X				X							X			X			X	X	

Figure 11. Elaboration phase in participants' observation notes

According to participants' observation notes, primary school teachers used the direct instruction and question-answer methods, and educational websites and activities during the elaboration phase. The following are direct quotes from participants' observation notes:

On her observation notes, Aylin stated the following:

The teacher explained transparent, translucent and opaque forms and then compared a wooden pencil and a thin pencil to explain hardness and brittleness. She asked, "which one breaks more easily?" and then asked, "what kind of objects do magnets attract?" to which some students responded as "metals." Then she asked, "what objects are made of metals?," to which none of the students responded. She then asked, "what kind of objects do magnets not attract?" The students started talking all at once, so she silenced them and told them to raise their hands before speaking up. They gave examples of "stone, wood, glass etc." She said, "Good answer, magnets attract coins, batteries etc. by the way..." and then moved onto the next topic; which was buoyancy. She asked them to give examples of objects that float and sink. One of the examples of floating objects was plastic bottles while some of the examples of floating objects were stone, paper etc. She said "why don't we go over the properties of matter? Meanwhile I'm going to glue your examples and so we can hang them up." She wrote on the board the properties that the students reiterated. She used cork to explain buoyancy and took out

the spring of the pen and pointed at it to explain flexibility.

On her evaluation, Aylin stated the following:

The teacher was successful in classroom management in general but there was a bit of a problem during the activity because she was duct taping the items one by one, which was time consuming. If I were her, I would take a printout of the pictures of the items and stick adhesive pads on their backs before class. In that way, I would save some time, and the students would not be distracted. It would also help me do the activity while teaching the properties of matter at the beginning of the class, and so I wouldn't have to waste time going over them again.

On her observation notes, Nihan stated the following:

The teacher said, "We had learned the rules of speaking and listening, let's go over them again." The students explained the rules (When someone is talking we should listen and have eye contact and should not interrupt.) The teacher then asked "So kids, Do you like playing games? What games do you like playing?," to which they replied as "blind man's buff, rope jumping, dodgeball etc.

On her evaluation, Nihan stated the following:

If I were the teacher, I would bring a ball with me to class to get students' attention. I would then have an activity to briefly go over the topic of the last week. I would then ask such questions as "Kids, do you know why I have a ball in my hand right now?" or "What do you

think we are going to do with this ball today?” I would tell them that we were going to play dodgeball, so I would take them out to the garden and explain the rules of the game and then I would let them play it and then evaluate the activity. I would pose them such questions as “What are the right and wrong moves in the

game?” or “Did something bother you during the game?” So, I would use the game as the exploration phase and get the students to explore the rules of the game by themselves.

Figure 12 presents the results regarding the evaluation phase in participants’ observation notes.

Categories	Aylin	Ada	Aydanur	Aynur	Burcu	Ceyda	Didem	Duru	Deniz	Eda	Ela	Efsun	Filiz	Gamze	Hande	İlsu	İnanç	Kevser	Melike	Nihan
No evaluation				X			X	X	X	X			X		X				X	
Giving assignments		X				X					X	X				X				X
Handing out worksheets	X		X		X									X			X	X		

Figure 12. Evaluation phase in participants’ observation notes

According to participants’ observation notes, most primary school teachers did not do any evaluation whatsoever, and those who did it, did it mostly by giving assignments and handing out worksheets. The following are direct quotes from participants’ observation notes:

On her observation notes, Didem stated the following:

The students said “A bohçacı sells beads” and the teacher said “Yes, there used to be bohçacı in the past but today there are none because we buy such things at variety stores these days.” Afterwards, the bell rang, and the teacher said that they would continue next week.

On her evaluation, Didem stated the following:

The teacher had some weaknesses. The students would have learned the professions better if she had used materials or pictures, but she didn’t. She had the active students in the front row move to the back and had the passive ones move to the front row to get them more engaged. They knew why she did that. She said that some students even asked her when she would let them sit at the back. I think it would be better if the students didn’t know why she reseated them because it might make them a target for other students to make fun of them. Those who have been moved to the front row

might think that it’s because they talk too much or those who have been moved to the back row might think that they are better than their classmates. Other than that, the class was fun and effective.

On her observation notes, İhsan stated the following:

After the students were done answering the questions, the teacher said, “let’s check what we know” and handed out evaluation forms. She filled out the class roster to prepare for the next class while they were taking the test. The students who finished the test, handed it either to me or to the teacher. We evaluated their performance, and then the teacher asked those who answered all questions correctly to get up to the whiteboard and took photos of them and texted the photos to their parents on WhatsApp. She then solved all the questions and explained them on the board.

On her evaluation, İhsan stated the following:

It’s great that the teacher went over the topic again and that she filled out the class roster and prepared for the next class while the students were taking the test. However, she got the successful students up to the whiteboard and took photos of them and texted them to their parents on WhatsApp, which to me doesn’t feel

right, I mean, even having a WhatsApp group of parents feels wrong. If I were her, I would never take photos of students in the middle of the classroom; if I wanted to take photos of students, I'd do it during recess so that the other students wouldn't feel bad.

Discussion and Conclusion

This study compared the life science lesson plans that preservice primary school teachers prepared during undergraduate education and their observation of life science lessons performed by real primary school teachers in real learning environments. Participants adhered to learning outcomes, used tools and materials properly, and placed emphasis on evaluation in their life science lesson plans but were unaware of the basic skills in the syllabus and misused methods and techniques. In the engagement phase, participants were able to attract students' attention and motivate them, but were not good at informing students of the objective. In the exploration phase, they used the question-answer method and got students involved in activities by using the materials that they prepared. Two participants used the drama and experiment and observation methods. Participants used the direct instruction and brainstorming techniques in the explanation phase and educational games and websites, and the drama method in the elaboration phase. They used worksheets (with multiple choice questions), engaged students in teamwork to assign them tasks, incorporated materials in activities, and evaluated students' comprehension skills in the evaluation phase. Çatalbaş and Semerci (2016) reported that students took more responsibility for their learning and studying when different methods were used to implement activities in lesson plans. Fredrick (2008), and Kılıç and Gültekin (2015) found that students transformed the skills they developed using effective learning methods into behavior. Research shows that teachers think that the curriculum of the life science course is moderately enough to help them develop basic skills but that it should be revised and enriched with more activities (Öztürk, 2015) and should be more related to real-life situations promoting teacher-parent collaboration (Barlas, 2015). Our results suggest that participants might have difficulty associating research, examination, experiment and observation strategies and methods with the

exploration phase of the life science course. However, some participants incorporated the drama and experiment-observation methods into their lesson plans, indicating that they are interested in different methods and techniques. They used the direct instruction and brainstorming techniques in the explanation phase, suggesting that they do not know that that phase should also involve eliminating misconceptions and filling knowledge gaps. They incorporated educational games and the drama method in the elaboration phase probably because primary school students enjoy them very much. They used multiple choice tests in the evaluation phase of their lesson plans probably because they are influenced by evaluation test-based practices that are used in schools to prepare students for placement tests.

According to participants' observation, primary school teachers failed to adhere to learning outcomes and to use tools and materials properly, were unaware of the basic skills in the curriculum, misused methods and techniques, and did not pay much attention to the evaluation phase. They were unable to draw students' attention, unable to motivate them, and unable to inform them of the target. Some primary school teachers used the direct instruction and question-answer techniques in the exploration phase. Primary school teachers used the direct instruction and brainstorming techniques during the explanation phase and the direct instruction and question-answer methods and educational websites or activities during the elaboration phase. Most primary school teachers did not do any evaluation whatsoever, and those who did it, did it mostly by giving assignments and handing out worksheets. Our results are similar to those reported by previous studies. Learning outcomes are rarely put into practice (Kurşun, 2013; Öztürk & Kalafatçı, 2016); the direct instruction and question-answer methods are used most in the learning-teaching process (Alak, 2011; Öztürk & Kalafatçı, 2016; Şahin & Güven, 2016; Turan, 2012; Türköz, 2018); some methods and techniques cannot be used due to lack of equipment (Küçükkaragöz & Av-Hartuç, 2015) students transform the skills they develop using effective learning methods into behavior, increasing their academic achievement and improving their attitudes towards the lesson, however, methods and techniques cannot be used effectively, negatively affecting skill acquisition (Bastık, 2018; Güven & Kılıç, 2017;

Kılıç, 2015). Öztürk and Kalafatçı (2016) argue that measurement and evaluation methods are too often confused with teaching methods. For our participants, measurement and evaluation was the most difficult part of the model, which has also been reported previously (Özçetin, 2000). According to participants' observation, primary school teachers failed to attract students' attention in the engagement phase. This might be due to the fact that they do not improve their general knowledge (keeping up with the literature of interest, reading books and poems, seeing plays etc.) and have difficulty putting their skills into practice. Primary school teachers do not use the direct instruction method throughout their classes probably because they are unprepared and do not have any plans to implement learning outcomes effectively and also because smart board applications (morpa campus etc.) affect their creativity (developing their own activities) negatively. Primary school teachers only gave assignments in the evaluation phase probably because they had doubts about whether they would be able to teach the learning outcomes as scheduled. The first subquestion addressed participants' life science lesson plans in theory while the second subquestion addressed their observation of life science lesson performed by real primary school teachers in real learning environments.

In their observation notes, participants criticized teachers for the methods and techniques they used, however, they also used the question-answer and direct instruction methods the most in their lesson plans. According to participants, most primary school teachers did not do any evaluation whatsoever, and those who did it, did it mostly by giving assignments and handing out worksheets. On the other hand, participants also used multiple choice tests in their lesson plans for student evaluation. This means that participants planned doing the things they criticized primary school teachers for, which might be due to the fact that preservice teachers observe primary school teachers. After all, preservice teachers' experience with the applied life science course is limited to their observation of primary school teachers, causing a gap in their knowledge of the implementation of the life science course in real learning settings.

Limitations and Future Research

The study has two limitations: (1) participants made observation only once a month and only in primary schools in two cities and, (2) the study sample consisted only of third-year students of the department of basic education of classroom education of Muş Alparslan University.

Conclusion and Recommendations

Participants based the engagement phase of their lesson plans on drawing students' attention and increasing their motivation; however, they were not good at informing students of the objective. They used the direct instruction and brainstorming techniques as well as different methods and techniques and used activities with multiple choice tests for class evaluation. It is, therefore, recommended that preservice primary school teachers focus on special teaching methods to prepare lesson plans for the life science course. The life science course is an interdisciplinary course, and therefore, it is recommended that preservice teachers design lesson plans in learning environments together with other preservice teachers in the same faculty (science, mathematics, Turkish, social studies etc.). Preservice teachers can also integrate authentic evaluation activities in the evaluation phase of their lesson plans for the life science course. These results indicate that the life science course in education faculties should strike the right balance between theory and practice.

According to participants' observation notes, primary school teachers failed to adhere to learning outcomes, were unaware of the basic skills in the syllabus, misused methods and techniques, and did not pay much attention to the evaluation phase. Therefore, primary school teachers should keep up with the literature of interest (culture, art, science etc.) and participate in social and cultural activities (seeing plays, going to the movies, etc.) to develop themselves in order to be able to link the life science course with other fields and day-to-day life. They should also be assigned to other schools every ten years for a semester or a year so that they can improve themselves and exchange ideas with other teachers in their field. They should be encouraged to attend innovative education conferences on different methods and techniques. Projects should be designed to allow academics, preservice teachers, and primary school teachers to collaborate to

develop innovative educational activities. The curriculum should be designed in such a way that it allows primary school teachers to write learning outcomes for the life science course themselves so that they can become aware of life skills, teach in line with learning outcomes and in due course. Primary school teachers should also do activities to better understand the concept of “teacher agency.” Therefore, education faculties should design educational environments that provide preservice teachers with the opportunity to develop necessary skills needed for curriculum development.

Conflict of Interest

The authors declare that they have no conflict of interest.

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