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Research Article

Determining the Understandings and Misconceptions of Science Teacher Candidates on the Buoyancy Force of Liquids

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Abstract – Among science educators, it is widely accepted that teachers play a crucial role in the correct understanding and development of scientific concepts. Therefore, the importance of teacher training in enabling students to acquire scientifically accurate concepts cannot be denied. Misconceptions, on the other hand, are mental models or schemas that do not align with scientific facts. At the same time, these are one of the invisible barriers in the meaningful and effective learning process. The aim of this research is to determine the understandings and misconceptions of Science Teacher Candidates regarding the buoyancy of liquids. For this purpose, the Predict-Observe-Explain (POE) technique was used. The research has a qualitative research design and falls into the category of thematic content analysis. The study group consists of 48 science teacher candidates studying at a state university. Data were obtained from the answers given to written open-ended questions. As a result of the research, it was determined that most of the understandings of science teacher (65%) candidates about the buoyancy of liquids do not in accordance with scientific facts. In addition, six different misconceptions about the buoyancy of liquids were identified among the teacher candidates. Finally, the research is concluded with discussions and recommendations within the framework of the findings.

Keywords: Science teacher candidate, buoyancy of liquids, understanding, misconceptions.

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Introduction

It is widely accepted among science educators that teachers play a crucial role in the correct understanding and development of scientific concepts (Harrell et al., 2022; Van Driel et al., 2001). Therefore, it is clear that deficiencies in teacher training are a barrier to students learning scientifically correct concepts (Kennedy et al., 2014). While teacher candidates may have developed an acceptable understanding of density, many are known to struggle to relate this understanding to closely related concepts such as buoyancy. Therefore, it is argued that university science educators should carefully examine teacher candidates' understanding of buoyancy (Dawkins et al., 2008).

Misconceptions are mental models or schemas that do not match scientific facts (Taslidere, 2016). In terms of science education, students' misconceptions are one of the most important obstacles to meaningful learning (Meyer & Land, 2005; Sharif, 2018). If misconceptions have occurred, correctly diagnosing and determining them is a basic requirement for conceptual change (Ecevit & Özdemir Şimşek, 2017; Kember, 1991). The process of replacing misconceptions with scientific truths is called the conceptual change process. In conceptual change, creating doubt and discontent in the student about their own misconceptions is seen as the basic step of this process (diSessa & Sherin, 1998; Vosniadou, 2007). In this process, which the student will carry out with active and intellectual difficulty, intrinsic motivation, questioning skills and critical thinking play an active role (Kim & Kendeou, 2021). However, what is desired in the teaching processes is for the student not to acquire misconceptions (Russell & Martin, 2023). If there is suspicion of misconceptions, the first step in correcting these misconceptions is the process of identification and diagnosis (Kuo et al., 2018; Modell et al., 2005; Resbiantoro & Setiani, 2022).

Buoyancy is one of the most basic phenomena that individuals can directly observe. We often see ships and other vehicles (ferry, boat, sailboat, etc.) moving through water. Especially in the first stages of the formal learning process, formal or informal experiments are frequently conducted regarding swimming, sinking and floating things. However, despite many daily experiences, it is quite difficult to make a scientifically sound explanation of buoyancy (Minogue & Borland, 2016). The scientific truth underlying sinking and floating requires a sophisticated knowledge of the concepts of density, fluid, force, gravity, mass, weight, and buoyancy (Hardy et al., 2006). This is probably why there are many misconceptions about this concept at many levels from preschool to undergraduate students (Halford et al., 1986; Loverude et al., 2003; Kohn, 1993). Libarkin et al. (2003) suggested

that density misconceptions in middle school students are often the result of overgeneralizations about size and shape. They showed that students with size misconceptions believe that all large objects sink in water and small objects float. Yin et al. (2008) identified common misconceptions about sinking and floating in middle school students. The most prominent of these are: big/heavy things sink and small/light things float, hollow things float and things with air inside float, things with holes sink, flat things float, a sharp edge of an object sinks it, vertical things sink and horizontal things float, hard things sink and soft things float, large amounts of water float objects, and sticky liquids float objects. When the research on buoyancy is examined holistically, it is observed that individuals of all ages generally focus on only one dimension of the phenomenon of sinking and floating (e.g. Ginns & Watters 1995; Hardy et al., 2006; Kohn, 1993).

The technique called predict-observe-explain (POE) is a technique consisting of three basic steps: predict, observe, and explain. Here, first, students are asked to make reasoned predictions about the outcome of the event to be observed before an observation. Then, the observation is comfortably observed by all students and notes are taken if necessary. In the explanation section, students are directed to explain the reason for the observed event and finally the teacher makes the explanation that is in line with scientific facts (Kearney, 2004). This strategy can be used to eliminate misconceptions and improve understanding during the learning process (Astiti et al., 2020; Gyeltshen & Wangchuk, 2025) as well as to identify misconceptions (Köse et al., 2003). In addition, the TGA technique is effective in terms of collecting students' explanations and understandings about the observation in an open-ended manner (Kala et al., 2013). In this study, the POE technique was used to identify misconceptions among teacher candidates.

What are the qualities of teachers that make them effective in their classes? This question has been an important topic of curiosity, especially in terms of science education (Stronge, 2018). In this context, today, teacher knowledge is grouped under three categories: subject matter knowledge, general pedagogical knowledge, and subject matter-specific pedagogical knowledge (Tamir, 1988). However, some educators claim that subject matter knowledge forms the basis of the others (Ball & Bass, 2003; Ball et al., 2001; Shulman, 1987). It is argued that primary school science teachers need to have a solid conceptual knowledge base in order to implement effective teaching in their classes. It is widely accepted that teaching science in primary schools is more important than other levels of education. For this reason, ensuring that Science Teacher Candidates (STC) develop a correct and

sophisticated understanding of the subject matter should be the basic motto of the teacher education process (Ginns & Watters, 1995).

In Türkiye, the understandings of middle school (Şahin, 2013) and high school students (Güneş et al., 2016; Karaçam & Gürsel, 2017) about the buoyancy force of liquids have been investigated. Kırtak Ad & Kocakülah (2018) examined the effect of the full studio model on the conceptual understanding of STC about the buoyancy force. However, no study has been found in the literature directly investigating the understandings and misconceptions of STC about the buoyancy force of liquids. In this sense, it is believed that the study will make a significant contribution to the literature.

In this context, the problem statements of the research are as follows:

• What are the understanding levels of STC about the buoyancy force of liquids?

• What are the misconceptions of STC about the buoyancy force of liquids?

Method

This study falls under the category of thematic content analysis. These analyses aim to reach conclusions based on data (e.g., open-ended survey responses). In these processes, themes are identified from the data, the details of the theme are explained, and the goal is to create definitions that are as clear as possible for each theme (Vaismoradi et al., 2013). In selecting the study group, the Typical Case Sampling method, a sampling method used in qualitative research, was preferred. In this sampling method, a group that is typical of a large number of cases in the population related to the research problem is selected and applied (Corbin & Strauss, 2015). The study group of the research is 48 STC studying at the faculty of education of a state university. 30 of the STC are in their 3rd year and 18 are in their 4th year.

Data Collection Process

In this study, the POE technique was used as a tool to reveal the understanding levels of STC regarding the buoyancy of liquids. The activity, which considered the POE processes, consisted of two separate parts. Since the POE technique was used as a data collection tool in this research, the explanation section was conducted in a discussion format. Before the activity, preparations were made in a visible environment for the whole class (a transparent container filled with water and playdough). At the beginning of the first part, a prediction question was asked: "Will the playdough float or sink?" This question constituted the first

step (prediction) of the POE technique. Then, the researcher distributed papers to the class and asked them to write reasoned answers to the question. Most teacher candidates (90%) predicted that the playdough would sink, while others predicted that it would float. In the observation section of the first part, the researcher placed a spherical piece of playdough into the water in the transparent container. It was observed that the spherical playdough sank. After the observation in the first section, the researcher did not provide any explanation, only posed a discussion question. The discussion question was: "Why does playdough sink or float?" The teacher candidates discussed this topic among themselves for a while. During this process, the researcher acted as an observer and gave no clues about the conditions and/or the buoyancy formula or what would happen next.

In the second part, the researcher transformed the same spherical playdough into a boat shape, in front of the entire class. The prediction question for the second part was: "Will the boat-shaped playdough float or sink?" The teacher candidates were asked to write their reasoned predictions on the back of their papers along with the question. Like the first part, most of the teacher candidates (85%) predicted that the playdough would sink, while others predicted it would float. In the observation part of the second section, the same playdough, shaped like a boat by the researcher, was placed in a transparent container of water. At this stage, all participants were able to observe the boat-shaped playdough floating. Finally, participants were asked, "The playdough sank when it was a sphere, so why did it float when I shaped it like a boat?" They were asked to write their answers on the papers distributed with the question. In this study, only the answers to the question "The playdough sank when it was a sphere, so why did it float when I shaped it like a boat?" were considered as a data source. In this study, the POE technique was used only as a data collection tool; therefore, the researcher did not give any hints (or informative explanations) about the results at any stage of the process. No time limit was set for completing the activities and collecting the data, but the activities and data collection process were completed within an average of 45-50 minutes.

Data Analysis and Reliability

In this study, the three-category methodology developed by Doğan and Abd-El-Halick (2008) was adapted and used to evaluate the opinions of teacher candidates. Teacher candidates were categorized as categorized as "Accordance with scientific facts" if they provided accurate information about sinking/floating conditions and, in addition, explained with scientifically consistent reasoning why the same playdough, which sinks when spherical, floats when transformed into a boat. The teacher candidate was categorized as "Partially in

accordance with scientific facts" if they provided partially accurate information about the sinking/floating phenomenon but failed to explain with scientifically consistent reasoning why the same playdough, which sinks when spherical, floats when transformed into a boat. The third category is "Not in accordance with scientific facts." Here, the teacher candidate provided information about the sinking/floating phenomenon that did not conform to scientific facts and based their explanation for why the same spherical playdough floats when transformed into a boat on scientifically inconsistent reasoning (Table 1).

Table 1 The Rubric Used in Classifying the Teacher Candidate's Answer

Category	Explanation
Accordance with scientific facts	The teacher candidate was included in this category if they wrote information consistent with scientific facts about sinking/floating conditions and also explained, using logic entirely consistent with scientific facts, why playdough sinks when it is spherical but floats when it is boat-shaped.
Partially in accordance with scientific facts	The teacher candidate was included in this category if they provided partially correct information about sinking/floating conditions but could not explain, using logic consistent with scientific facts, why the spherical piece of playdough floated when transformed into a boat shape.
Not in accordance with scientific facts	The teacher candidate is included in this category if they have written information about sinking/floating conditions that do not align with scientific facts, and also based their explanation of why a spherical piece of playdough floats when transformed into a boat on justifications that do not support scientific facts.

When evaluating the teacher candidates' explanations, the researcher first categorized them according to the above criteria. Then, opinions were obtained from two different evaluators. A one-hour meeting was held with the evaluators, and the predetermined category headings were explained. Then, two evaluators independently classified the data under three separate category headings (Accordance with scientific facts, Partially in accordance with scientific facts, Not in accordance with scientific facts) consistent with scientific facts, partially consistent, and inconsistent). One evaluator was a physics academic with 25 years of experience, and the other was a physics teacher with 18 years of experience. Miles and Huberman (1994) consider 90% or more consistency sufficient to demonstrate the reliability of the study when comparing classifications made by two or more different evaluators (experts). Finally, the misconceptions, classified by the researcher under six separate categories, and the teacher candidate's explanations were shown to the two evaluators. With

complete agreement from both evaluators, the misconceptions, classified under the six separate categories, were found to be consistent.

Table 2 Consistency Table Between Evaluators and Researcher

	Evaluator 1	Evaluator 2
Number of statements that researchers and evaluators put in the same category (consensus)	45	47
Reliability	93.8%	97.9%

As a result of the reliability analysis conducted using Miles & Huberman's (1994, p. 64) formula (Reliability= (consensus)/(consensus + disagreement)×100), it was determined that there was a consistency rate of at least 93.8% (Table 2).

Research Ethics Permits

In this study, research ethics principles were observed and the necessary ethics committee permissions were obtained. Ethics committee permission was obtained from Süleyman Demirel University Social and Human Sciences Ethics Committee with the decision dated 06/05/2025 and numbered 170/14. During the research process, consent for voluntary participation was obtained and ethical principles were followed during the acquisition of data.

Findings

In this section, firstly, the understanding levels of STC on the buoyancy force of liquids are presented in tables and figures. Then, the misconceptions of STC on the buoyancy force of liquids are listed. Finally, an example of the understanding levels of STC on the buoyancy force of liquids is shown.

Table 3 Understanding Levels of STC Regarding Buoyancy.

Category	Number of teacher candidates (n)	Percentage of teacher candidates (%)
Accordance with scientific facts	1	2.1
Partially in accordance with scientific facts	16	33.3
Not in accordance with scientific facts	31	64.6

The percentage distribution of the categorized status of the teacher candidates' answers is also presented in Figure 1. Here, it is seen that only 2% of the teacher candidates can provide explanations that are in accordance with scientific facts. It is also seen that a significant proportion (33%) provide explanations that are partially in accordance with

scientific facts. More than half of the STC (65%) provided explanations that are not in accordance with scientific facts.

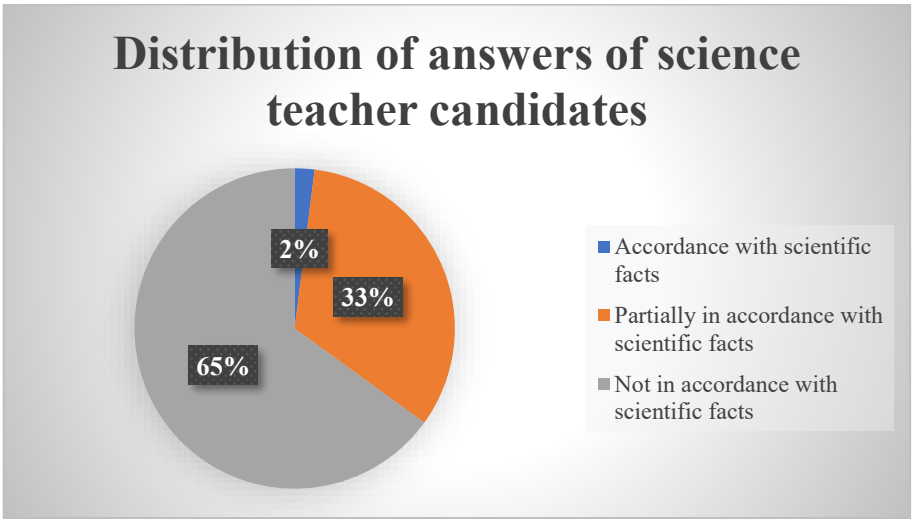


Figure 1 Graph of the Distribution of STC' Responses by Category

The distribution of the answers of the STC above into the predetermined categories is also shown in Figure 1 with a pie chart. As can be seen more clearly in Figure 1, a significant portion of the STC (65%) explained the reason why the play dough shaped like a boat floated in a way that was not in accordance with scientific facts. Table 3 shows the categorized status of the STC' misconceptions about the buoyancy of liquids.

Table 4 shows the misconceptions about buoyancy force that are not in line with scientific facts from the explanations of STC regarding the floating of play dough shaped like a boat. The six different misconceptions determined are presented in Table 4. A significant number of STC have the misconception that *"Increasing the surface area of an object increases its volume and decreases its density. This, in turn, increases buoyancy."* This misconception was the most observed misconception among STC (f=14). This is followed by the misconception that "*Increasing the surface area leads to an increase in buoyancy."* observed in 10 teacher candidates. The misconception that "*An increase in surface area creates air pockets around the object, reducing its overall density. This, in turn, increases buoyancy*" was seen in seven STC. "*Increasing the surface area of an object reduces its pressure on the liquid, which increases buoyancy.*" and "*Increasing the surface area of an object increases the surface tension force of the liquid. This force, in turn, increases the buoyant force*" are misconceptions seen in six different STC. Lastly, there is the misconception "*As the surface area of an object increases, it exerts more pressure on the fluid*

it is in, which increases the buoyant force." seen in four STC. As a result, it was determined in this study that STC have six different misconceptions about the buoyant force of liquids.

Table 4 STC' Misconceptions About the Buoyancy Force of Liquids

Number of teacher candidates with misconceptions	f (Number of STC (STC)	Misconceptions
10	STC 1, STC 3, STC 6, STC 7, STC 10, STC 34, STC 35, STC 37, STC 38, STC 48	Increasing the surface area leads to an increase in buoyancy.
4	STC 4, STC 11, STC 15, STC 16	As the surface area of an object increases, it exerts more pressure on the fluid it is in, which increases the buoyant force.
14	STC 5, STC 14, STC 17, STC 20, STC 22, STC 23, STC 24, STC 25, STC 26, STC 27, STC 28, STC 29, STC 41, STC 45	Increasing the surface area of an object increases its volume and decreases its density. This, in turn, increases buoyancy.
6	STC 8, STC 9, STC 13, STC 19, STC 21, STC 32	Increasing the surface area of an object reduces its pressure on the liquid, which increases buoyancy.
6	STC 9, STC 12, STC 18, STC 20, STC 30, STC 31	Increasing the surface area of an object increases the surface tension force of the liquid. This force, in turn, increases the buoyant force.
7	STC 36, STC 39, STC 40, STC 43, STC 44, STC 46, STC 47	An increase in surface area creates air pockets around the object, reducing its overall density. This, in turn, increases buoyancy.

Finally, an example was presented for each of the answers of STC included in three different categories. STC 7 whose explanation falls into the category of "*not in accordance with scientific facts*" explained how the same play dough that sinks in water while being spherical in shape floats when given the shape of a boat as follows:

"When we compare play dough to a boat, its density decreases because its surface area increases, that is, its volume increases. Thus, play dough floats in water. When the surface area of the play dough increases, the buoyant force acting on the dough also increases.

The science teacher candidate who made this explanation first made the wrong inference that the volume would increase because of the increase in surface area. He also made the mistake of thinking that the buoyant force is related to the surface area.

The explanation of STC 20 whose explanation falls into the category of "*partially in accordance with scientific facts*" is as follows:

"The reason is that air fills the boat. The density of air is less than water. As in ships, the air-filled compartment prevents it from sinking. It is also related to surface tension. If we leave a pin upright, it sinks, but when it is horizontal, it does not sink because the surface tension increases due to the increase in surface area."

In this explanation, the science teacher candidate stated that the density of objects filled with air would decrease. However, when the same play dough is shaped like a boat while it is in the shape of a solid sphere, he could not explain where and how the air fills. He also attributed floating to surface tension and fell into another misperception.

The explanation of STC 42, whose explanation falls into the category of "in accordance with scientific facts", is as follows:

"When the play dough is in the shape of a ball, it sinks because its density is higher than water. When it is shaped like a boat, more water volume is displaced in the water it is in. This increases the buoyancy force. When the buoyancy force is greater than the weight of the play dough, the play dough floats."

In this explanation, the science teacher candidate attributed the sinking of the same play dough in the shape of a ball (solid sphere) to its density being higher than water. When the same play dough is shaped like a boat, he attributed its ability to float to the increase in buoyancy force in accordance with scientific facts. In fact, this is what happens. The buoyancy force of liquids depends on two variables: the density of the liquid and the immersed volume of the object (Oğuz & Yürümezoğlu, 2008). Here, since the liquid (water in the container) does not change, what actually happens is the increase in the immersed volume of the object. As the amount of water displaced by the object increases, the buoyant force also increases. Because the buoyant force acting on the object becomes greater than its weight, the playdough, shaped like a boat, floats. In short, whether an object sinks or floats is not determined solely by its mass or volume. It depends on the balance between the weight of the water it displaces (buoyant force) and the object's own weight. If the object's weight is dominant, it sinks; otherwise, it floats (She, 2002).

Conclusion, Discussion and Recommendations

Firstly, the research sought to answer the question "What is the level of understanding of STC regarding the buoyancy of liquids?" As a result, it was observed that most of the teacher candidates (65%) made explanations that were not in accordance with scientific facts (Table 3). Harrell et al. (2022) examined the concepts of buoyancy held by primary school

teacher candidates. Concept maps were used in the analyses. Similar to the findings of this study, it was determined that the majority of participants (66%) had incomplete understandings of how weight relates to buoyancy and the role it plays in floating and sinking.

Secondly, the question “What are the misconceptions of STC regarding the buoyancy of liquids?” was answered. As a result, it was determined that teacher candidates had six different misconceptions regarding the buoyancy of liquids (Table 4). The most common misconception (f=14) identified in this study is "Increasing the surface area of an object increases its volume and decreases its density. This increases its buoyancy." Similarly, Ünal and Coştu (2005) identified the misconception among eighth-grade students that "changes in the volume of an object are the primary determinant of whether it floats or sinks." Zhang et al. (2004) reported that eighth-grade students in China have a misconception that "the magnitude of buoyancy depends on the volume and shape of the object." These misconceptions are consistent with each other. She (2002) determined that middle school students in Taiwan believed that solid and rigid objects would hold more water than boat-shaped objects. Önen (2005) determined that seventh-grade students in Türkiye perceived and used the concepts of pressure and force interchangeably. The above results are similar to the misconceptions observed in teacher candidates in this study ("As the surface area of an object increases, it exerts more pressure on the liquid it is in, which increases the buoyant force" and "Increasing the surface area of an object reduces the pressure it exerts on the liquid, which also increases the buoyant force.").

Şahin (2013) encountered misconceptions among eighth-grade students in Türkiye regarding buoyancy, such as "if the weight of an object increases, it sinks; weight is measured the same in liquid and air; air has no buoyancy; wherever an object is in equilibrium, it displaces an amount of liquid equal to its weight." These findings show that eighth-grade students are unable to establish correct relationships between concepts related to buoyancy. Similarly, teacher candidates are also unable to establish correct relationships between concepts related to buoyancy (Table 4).

In Türkiye, the topic of surface tension is not included in the science curriculum (grades 3-8) (MoNE, 2018; MoNE, 2024a). This topic is first mentioned in the ninth-grade physics curriculum (MoNE, 2024b). Six STC exhibited the misconception: “Increasing the surface area of an object increases the surface tension force of the liquid. This force, in turn, increases the buoyant force.” (Table 4). The absence of similar misconceptions in the literature before

the ninth-grade level suggests that the concept of surface tension, learned after the eighth grade, is added to existing misconceptions about the buoyant force of liquids.

Karaçam and Gürsel (2017) reported that high school students in Türkiye have stereotypical images of buoyancy in liquids. According to them, this stereotypical mindset is the most important factor preventing in-depth learning of the subject. According to Hardy et al. (2006), the superficial perception of the basic concepts of buoyancy (density, liquid, force, gravity, mass, weight) at all levels of education prevents the acquisition of the desired advanced understanding of buoyancy. In addition, Karaçam and Gürsel (2017) imply that stereotypical examples in textbooks and classroom practices lacking inquiry processes also contribute to this. In this context, a review of textbooks is recommended. Astiti et al. (2020) reported that the TGA strategy can reduce misconceptions among primary school students. In this context, enriching the educational processes of science teacher candidates in terms of the TGA strategy can eliminate their misconceptions about the buoyancy of liquids. Similarly, Çakır and Baydere (2022) concluded that laboratory applications based on scientific process skills positively influenced teacher candidates' better understanding of the concept of buoyancy. In this context, focusing on laboratory applications where the student is more active and based on scientific process skills in the educational processes of teacher candidates can develop a deeper understanding of this issue. Çepni and Şahin (2012) conducted an experimental study with a control group of eighth-grade students. In the application, they implemented an enriched teaching application for the experimental group within the framework of the 5E teaching method, using TGA, concept cartoons, conceptual change texts, computer animations, and worksheets. As a result, significant improvements were recorded in students' misconceptions about the buoyancy of gases and liquids. In this context, increasing similar practices in the training processes of teacher candidates seems to contribute to improving their understanding of the buoyancy of liquids.

Furthermore, Soyibo (1995) identifies textbooks, other resource books, and teachers as the main sources of students' misunderstandings. Yates & Marek (2014) also emphasize the role of teachers as a source of misunderstandings. In this sense, the role of teachers candidates in eliminating misunderstandings about the buoyancy of liquids encountered in pre-university education becomes more prominent. Consequently, focusing more on identifying and eliminating existing misunderstandings among teacher candidates seems more important for meaningful and efficient learning in this area. Radovanović et al. (2019) reported that teaching lessons using the active learning model significantly contributed to overcoming

misconceptions about this topic in thirteen-year-old students. In this sense, it can be suggested that more intensive use of active learning model-based lessons be incorporated into teacher training processes.

Finally, since this study is qualitative, the data was obtained from a relatively small and narrow sample. This limits the generalizability of the study's results. In the future, studies could be conducted to develop and use quantitative measurement tools (e.g., multi-stage diagnostic tests) in this area. Also, future studies with more participants and more diverse data (drawings, audio and video recordings, etc.) will allow us to gain deeper insights into this subject.

Compliance with Ethical Standards

Disclosure of potential conflicts of interest

The author declares that this study and none of the processes involved in conducting it have any potential conflict of interest.

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CRediT author statement

Author: Conceived and designed the study, collected and analysed the data, and wrote the original draft of the manuscript.

Research involving Human Participants and/or Animals

This study was reviewed and approved by the Social and Human Sciences Ethics Committee at Süleyman Demirel University, Türkiye. with the decision dated 06/05/2025 and numbered 170/14. All procedures followed national ethical guide-lines, and informed consent was obtained from all participants prior to their involvement in the study.

Fen Bilimleri Öğretmen Adaylarının Sıvıların Kaldırma Kuvveti Konusundaki Anlayış ve Kavram Yanılgılarının Belirlenmesi

Özet:

Fen bilimleri eğitimcileri arasında, öğretmenlerin bilimsel kavramların doğru anlaşılması ve geliştirilmesinde çok önemli bir rol oynadığı yaygın olarak kabul edilmektedir. Bu nedenle, öğrencilerin bilimsel olarak doğru kavramlar edinmelerini sağlamada öğretmen eğitiminin önemi yadsınamaz. Öte yandan, yanlış kavramlar, bilimsel gerçeklerle örtüşmeyen zihinsel modeller veya şemalardır. Aynı zamanda, bunlar anlamlı ve etkili öğrenme sürecindeki görünmez engellerden biridir. Bu araştırmanın amacı, fen bilimleri öğretmen adaylarının sıvıların kaldırma kuvveti hakkındaki anlayışlarını ve yanlış kavramlarını belirlemektir. Bu amaçla, Tahmin Et-Gözlemle-Açıkla (POE) tekniği kullanılmıştır. Araştırma nitel bir araştırma tasarımına sahiptir ve tematik içerik analizi kategorisine girmektedir. Çalışma grubu, bir devlet üniversitesinde öğrenim gören 48 fen bilimleri öğretmen adayından oluşmaktadır. Veriler, yazılı açık uçlu sorulara verilen cevaplardan elde edilmiştir. Araştırma sonucunda, fen bilimleri öğretmen adaylarının çoğunun (%65) sıvıların kaldırma kuvveti hakkındaki anlayışlarının bilimsel gerçeklerle örtüşmediği belirlenmiştir. Ayrıca, öğretmen adayları arasında sıvıların kaldırma kuvvetiyle ilgili altı farklı yanlış anlama tespit edilmiştir. Son olarak, araştırma bulgular çerçevesinde tartışmalar ve önerilerle sonuçlandırılmıştır.

Anahtar kelimeler: Fen bilimleri öğretmen adayları, sıvıların kaldırma kuvveti, anlayış, kavram yanılgısı.

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