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Investigation of Physics Teachers' Perceptions of Life-Based Semantic Towards 2022 BPT Physics Questions

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Abstract

This study investigates physics teachers' perceptions of life-based semantics towards the 2022 Basic Proficiency Test (BPT) physics questions. The study participants consisted of 30 physics teachers working in schools affiliated with the Ministry of National Education in various provinces in Turkey in the spring term of the 2022-2023 academic year. Case study was preferred as the research method. The life-based semantic perception form developed by the researchers and applied through Google Forms was used as a data collection tool. Descriptive analysis was used to analyze the data from the data collection tool. Comprehensible, original, and current for the first question; comprehensible and distracting for the second question; comprehensible and reflecting learning outcomes for the third question; current, reflecting learning outcomes; and challenging for the fourth question; original, comprehensible, and current for the fifth question; comprehensible, reflecting learning outcomes, and distracting for the sixth question; comprehensible and life-based features for the seventh question of physics were determined. Suggestions were made to determine semantic perceptions in the development process of the questions and their use in other fields.

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Introduction

Within the framework of the 21st century, there is a clear requirement for individuals who can engage in rigorous research, challenge existing ideas, think critically and creatively, and solve complex problems (Faber et al., 2013; Tohani & Aulia, 2022). The acquisition of these skills is aligned with the educational objectives. However, reviewing the knowledge generated in schooling this century points to several important roadblocks. These include failing to convey to students the value of the knowledge they acquire based on their experiences and failing to link the content presented to its real-world applications (Choi, 2021). When the results obtained in the studies carried out at the primary and secondary education levels are examined, it is determined that students generally have difficulty in two branches, science at the primary education level and physics at the secondary education level, have difficulty in understanding and are shown among the unpopular and unsuccessful courses (Howe et al., 1990; Puspitarini et al., 2020; Senyigit, 2021). However, it is seen that an effective physics education that can be integrated with daily life, rather than memorizing the subjects and concepts of the course, enables one to obtain information about what the subjects are used for and where they are used in daily life and increases the interest in the course (Ayvaci & Yamacli, 2023; Ozcan & Gercek, 2015; Tural, 2013; Ultay, 2017). Concordantly, it would not be wrong to say that the teaching approach and model that will contribute to the activities of associating the physics course with daily life, basing daily life problems, and making sense of the semantic and conceptual concepts in the discipline should be used (Bigozzi et al., 2018; Cahyadi, 2007; Chen, 2004).

Life-based teaching is an approach defined as giving examples from daily life during the learning of scientific knowledge (Tekbiyik & Akdeniz, 2010; Uwizeyimana et al., 2018), making sense of facts, scientific events, and concepts (De Jong, 2008), and knowing how to learn by using prior knowledge in the physical-social environment in which the individual lives (Lotulunget al., 2018). In addition to the development of cognitive, psychomotor, and affective skills (Bennett et al., 2006), it is also known as a teaching method that aims to increase students' interest and enthusiasm in learning physics course subjects that include many abstract concepts (Gilbertet al., 2011), provides new information based on previous experiences and enables the individual to learn through his/her own experiences (Rannikmäeet al., 2010; Waddington, 2005). The effects of life-based teaching have been reflected in the Physics Curricula in recent years, and the curricula have been reorganized by considering the life-based approach (Korsacilar & Caliskan, 2015). The transfer of the scientific knowledge and concepts given with sample contexts from daily life revealed the necessity of moving to the level of life-based assessment and evaluation and the questions that should be asked to students should be life-based questions (Avargilet al., 2012; Ayvaci & Yamacli, 2023; Bellocchiet al., 2016). Ahmed and Pollitt (2007) attribute the necessity of using life-based questions within the scope of measurement and evaluation to three reasons list these reasons such as the effect of providing the opportunity to use cognitive skills on permanent learning, concretizing abstract concepts, better understanding of subjects that are difficult to understand by students, and adopting problem situations by feeling. In this regard, it is important to know that life-based questions should have some qualities, the features that should be considered in creating these questions, and the contexts selected (Taasoobshirazi & Carr, 2008). For this reason, the preferred contexts should be chosen from situations known by the students, should be appropriate to the age levels of the students, should not distract the attention of the students from the related concept, and should not be complex to understand and confusing for the students (De Jong, 2008).

In the literature review, it was found that there were various studies in which life (context) based questions or activities were developed, and the effectiveness of the developed activities in the context of a subject was analyzed (Degermenci, 2009; Tekbiyik, 2010; Ulgeret al., 2022). In addition, it is seen that seven studies conducted between 2010-2018 provided information within the scope of life-based question preparation (Elmas & Eryilmaz, 2015; Ilhan & Hosgoren, 2017; Kurnaz, 2013; Sak, 2018; Tekbiyik & Akdeniz, 2010; Tural, 2012; Ultay & Donmez-Usta, 2016). In the review of studies that provide information flow in the direction of context-based question preparation, determining the context (Tekbiyik & Akdeniz, 2010; Ultay & Donmez-Usta, 2016), establishing a problem by combining the subject and the relevant context (Elmas & Eryilmaz, 2015; Ilhan & Hosgoren, 2017), the established problem has a connection with real life (Sak, 2018; Tural, 2012), the problem situation includes an event, story or scenario in which the student takes part (Elmas & Eryilmaz, 2015; Tekbiyik & Akdeniz, 2010; Ultay & Donmez-Usta, 2016), comparing the problem situation with problems that require higher-order thinking skills in the solution process (Elmas & Eryilmaz, 2015; Ilhan & Hosgoren, 2017; Kurnaz, 2013; Tekbiyik & Akdeniz, 2010; Tural, 2012), ending the problem situation with a qualitative question sentence (Kurnaz, 2013; Tekbiyik & Akdeniz, 2010; Tural, 2012).

In their study on determining the stages of creating context-based questions by compiling national and international studies on the subject, Ayvaci and Yamacli (2023) mention the stage of creating life-based questions and set out seven criteria that should be included in context-based questions. These are shown in Figure 1.

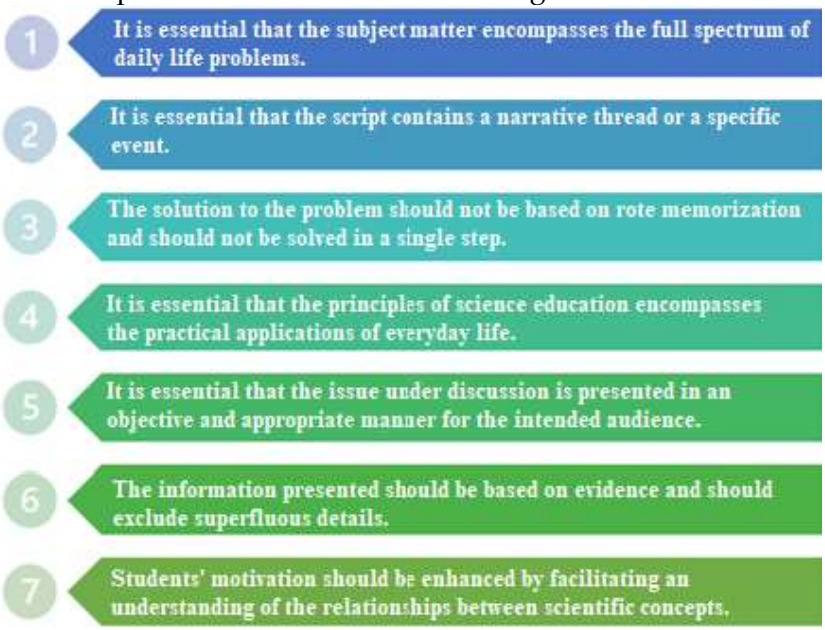

Figure 1. Seven criteria for a context-based question

In a manner consistent with the findings obtained from the studies in the literature, it is evident that the physics questions posed in the university examination, which represents a significant juncture in students' academic careers, such as the Basic Proficiency Test [BPT] examination, are not evaluated by the life-based dimension and the criteria for life-based question creation. This is even though the stages of context-based question creation have been presented, and context-based question creation studies have been included in the literature. Concordantly, physics teachers must evaluate the 2022 BPT physics questions by the following criteria: (i) traditional or life-based, (ii) reflecting learning outcomes or not reflecting outcomes,

(iii) comprehensible or elusive, (iv) original or ordinary, (v) current or noncurrent, (vi) complex or straightforward and (vii) distracting or standard of question items. Furthermore, the assessment of the 2022 BPT physics questions by physics educators is anticipated to be instrumental in addressing a significant gap in the existing literature. This will contribute to the evaluation of physics questions in forthcoming examinations and be an effective tool for physics educators to use as a basis for the questions they will develop in teaching activities, in addition to supporting the question development phase.

Methods

This study investigates physics teachers' perceptions of life-based semantics toward 2022 BFT physics questions. The case study method, one of the qualitative research designs, was preferred as the research method. Case studies are qualitative research designs in which one or more events, social groups, or interconnected systems are examined in depth (Cepni, 2016). It is also known as a research approach in which researchers collect in-depth information and describe the situation through audio-visual material, documents, or observation about current situations or situations within a specific time interval (Creswell, 2013). The research project encompassed two key areas: (i) determining the situation of physics teachers about the subject in a specific time interval (2022 BPT physics questions) and (ii) deepening the data collection process with the help of a tool for the subject area (semantic perception form). Concordantly, the most suitable methodology was identified.

Participants

The study group's research consisted of 30 physics teachers working in schools affiliated with the Ministry of National Education in various provinces in Turkey in the spring term of the 2022-2023 academic year. Physics teachers participated in the study based on the factors of voluntariness and willingness toward the research topic. The demographic characteristics of the physics teachers who participated in the study are presented in Table 1.

Table 1
Information on Demographic Characteristics of Participants (n=30)

Variable		n	%	Variable		n	%
Incumbency	10 – 15	3	10,00	Gender	Female	9	30,00
	16 – 21	15	50,00		Male	21	70,00
	22 – 27	7	23,33	Province	Adiyaman	3	10,00
	28 – 33	5	16,66		Kocaeli	1	3,33
Age	31 – 40	2	6,66		Amasya	1	3,33
	41 – 46	7	23,33		Ankara	5	16,66
	47 – 52	10	33,33		Aydin	1	3,33
	53 – 58	11	36,66		Konya	3	10,00
Institution	Anatolian High School	18	60,00		Balikesir	1	3,33
	Science High School	5	16,66		Mersin	1	3,33

	Vocational High School	3	10,00	Nevsehir	1	3,33
	Religious V. High School	2	6,66	Trabzon	9	30,00
	Project High School	1	3,33	Samsun	2	6,66
	Nonformal High School	1	3,33	İzmir	2	6,66

When Table 1 is analyzed, information about the participants' demographic characteristics, such as incumbency, age, institution, gender, and province, is presented. When the distribution of the participants according to incumbency is analyzed, it is seen that 10% of the participants have 10-15 years of experience (n=3), 50% have 16-21 years of experience (n=15), 23.33% have 22-27 years of experience (n=7) and 16.66% have 28-33 years of experience. When the participants were evaluated according to the age variable ranging between 35 and 58 years old, 6.66% of the participants were between 35-40 years old (n=2), 23.33% were between 41-46 years old (n=7), 33.33% were between 47-52 years old (n=10) and 36.66% were between 53-58 years old. When the distribution of the participants, who were evaluated on six different qualifications, according to the institution they work in, is examined, 60% of the participants work in Anatolian high schools (n=18), 16,66% in science high schools (n=5), 10% in vocational high schools (n=3), 6,66% in religious vocational high schools (n=2), 3,33% in project high schools (n=1) and 3,33% in nonformal high school (n=1). When the distribution of the participants according to gender is analyzed, it is seen that 30% of the participants are female (n=9) and 70% are male (n=21). When the distribution of the participants according to the province of work variable was analyzed, 10% of the participants were in Adiyaman (n=3), 3.33% in Kocaeli (n=1), 3.33% in Amasya (n=1), 16.66% in Ankara (n=5), 3,33% work in Aydin (n=1), 10% in Konya (n=3), 3.33% in Balikesir (n=1), 3.33% in Mersin (n=1), 3.33% in Nevsehir (n=1), 30% in Trabzon (n=3), 6.66% in Samsun (n=2) and 6.66% in İzmir (n=2).

Data Collection Tools

The 'Life-Based Semantic Perception Form' developed by researchers and applied via Google Forms was used as a data collection tool in the study. The 2022 BPT perception form, developed by the researchers to examine the life-based semantic perceptions of physics teachers towards physics questions and used as a data collection tool, consists of two parts. The first part of the form consists of five open-ended and optional questions to determine the demographic characteristics of physics teachers. The second part of the form consists of seven questions in the 2022 BPT physics section. Physics teachers were asked to evaluate the life-based dimensions of the physics questions in the form. Moreover, the teachers were asked to tick the score value box between 1 and 10 according to their closeness to the statements under the BPT questions. The development process of the data collection tool is presented in Figure 2.

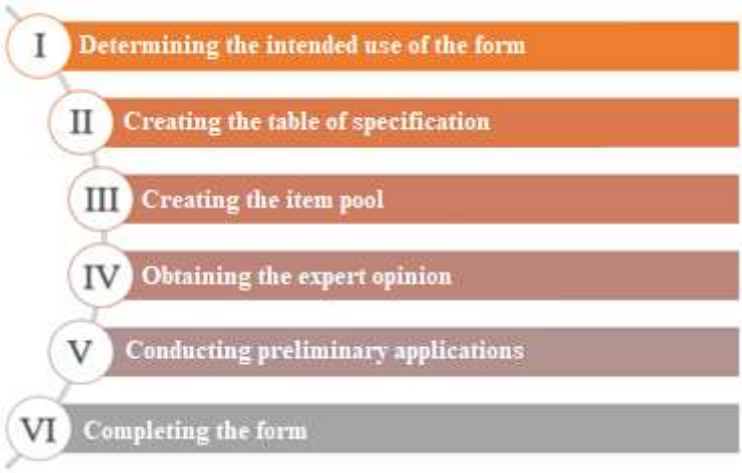

Figure 2. Development of the data collection tool

Upon examining Figure 2, it is seen that the life-based semantic perception form was developed due to a data collection process consisting of six steps. The first step of the form development process is related to determining the intended use of the form. The life-based semantic perception form was developed to examine the life-based semantic perceptions of physics teachers toward the 2022 BPT physics questions. For the related purpose, seven questions in the 2022 BPT physics section were presented to the participants, and it was aimed to determine their semantic perceptions towards the questions. The second step of the form development process is creating the specifications table. By creating a table of specifications with life-based question qualities, an evaluation was provided for which qualities could be included in the form. After the evaluation process, the third step of the form development process, creating the item pool, was started. The items that could be included in the semantic perception form were determined by considering the purpose of use of the form and the qualities in the table of specification. The related items were grouped according to their similarities and differences and presented to the expert opinion. In the process of obtaining expert opinion, which is the fourth step of the form development, the draft semantic perception form was created by bringing together the items with similarities and differences according to their qualities in line with the experts' opinions.

Data Collection Process

The 'Life-Based Semantic Perception Form' developed by researchers was collected from physics teachers via Google Forms. Seven questions in the 2022 BPT physics section were presented to the participants, and they were asked to score the qualities in the semantic perception form developed for each question. In the items in the life-based semantic perception form, the highest score is 10, and the lowest is 1.

FEATURES	FREQUENCY										FEATURES
	1	2	3	4	5	6	7	8	9	10	
Traditional										(X)	Life-Based

Figure 3. Sample evaluation process

A BPT question was marked with 10 points for being life-based regarding the traditional or life-based dimension of the question. The score value of the marked item was accepted as 10 points. The 2022 BPT physics questions evaluated within the scope of the research are presented in Figure 4.

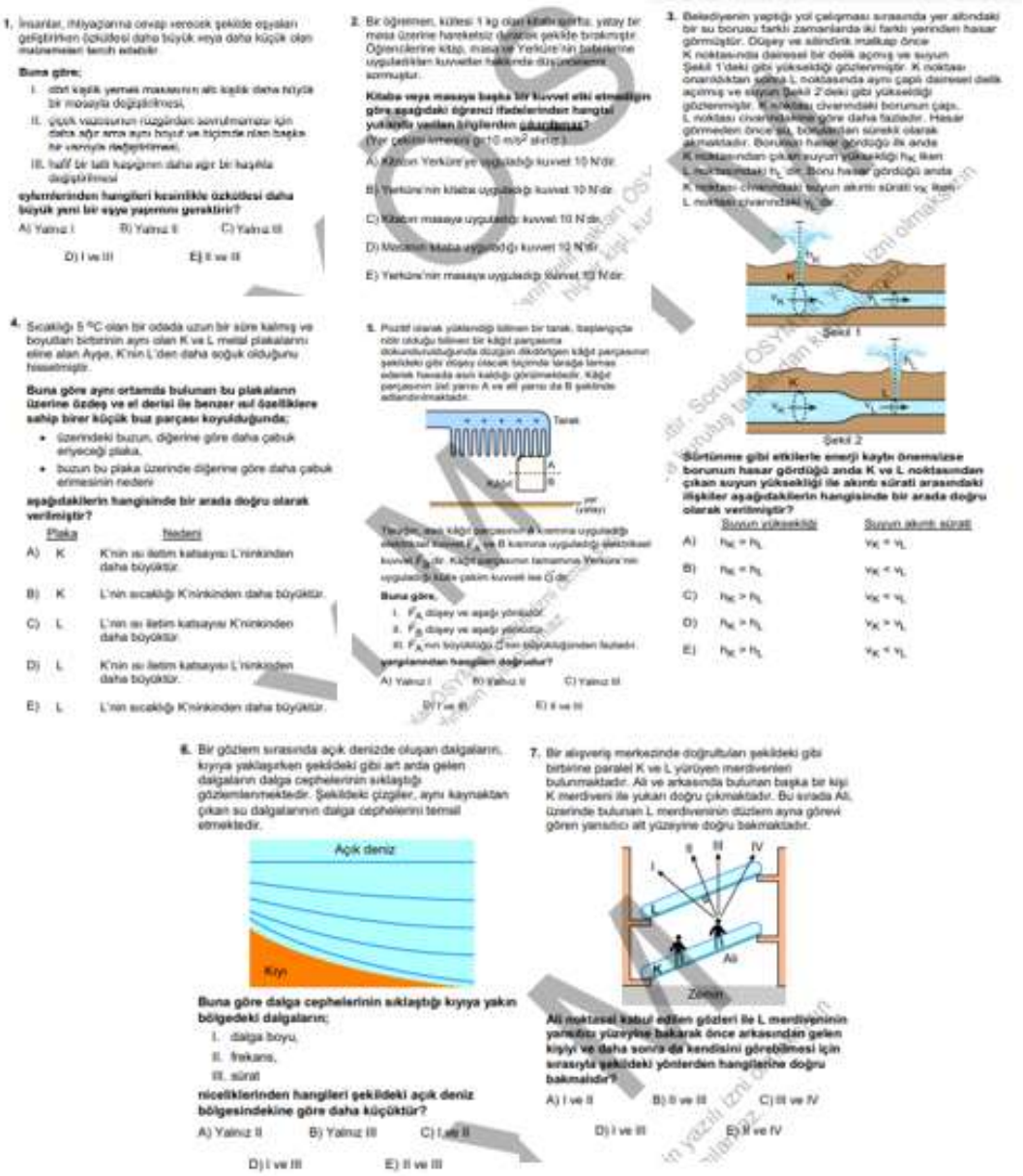

Figure 4. Evaluated 2022 BPT Physics Questions

Data Analysis

The data were analyzed descriptively within the framework of the findings of the research titled 'Context-Based Question Formulation Stages; National and International Approaches' conducted by Ayvaci and Yamacli (2023). Descriptive analysis consists of summarizing and interpreting the data obtained from the research under predetermined headings (Yildirim & Simsek, 2008). Descriptive analysis consists of four stages: (1) creating a framework for analysis, (2) processing the data by the thematic framework, (3) defining the findings obtained, and (4) interpreting the findings obtained. These four steps were followed in this study.

Findings

The BPT physics questions addressed within the research scope are presented separately under headings depending on the concept they relate to and the data obtained from the participants.

Findings Regarding the First Question

Figure 5 presents the distribution of semantic perceptions obtained from physics teachers for the first question of 2022 BPT physics, which deals with the concept of **density**.

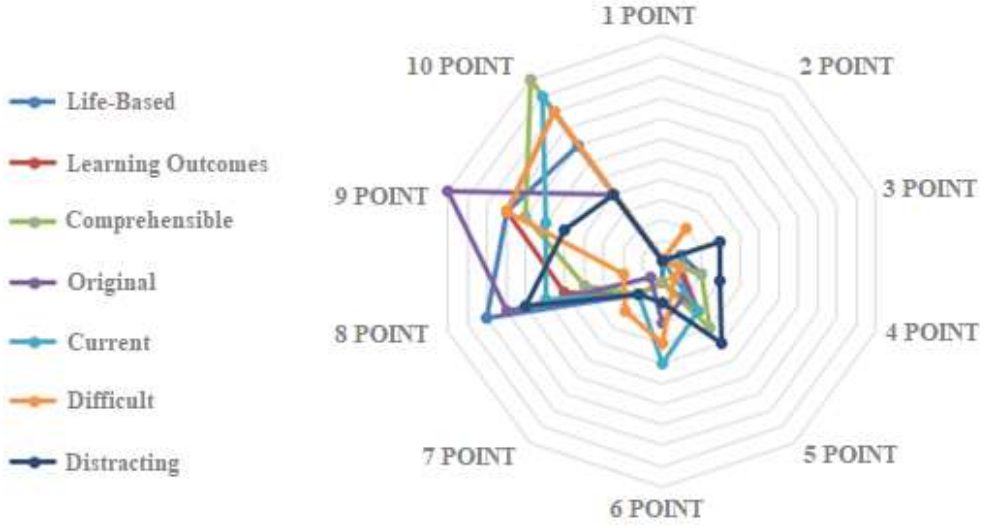

Figure 5. Distribution of participants' semantic perception of the first question

Figure 5 shows that the 2022 BPT physics first question was evaluated as 8 points for 'Life-Based,' 10 points for 'Learning Outcomes', 10 points for 'Comprehensible,' 9 points for 'Original,' 10 points for 'Current,' 10 points for 'Difficult,' and 8 points for 'Distracting.' The frequency values of 30 physics teachers' semantic perceptions of the first question are presented in Table 2.

Table 2

The Frequency Values of the Participants' Semantic Perceptions of the First Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	0	1	2	0	1	2	9	8	7	Life-Based
Not Reflecting Learning Outcome	0	0	1	1	3	1	2	5	8	9	Reflecting Learning Outcome
Elusive	0	0	0	2	4	1	2	4	7	11	Comprehensible
Ordinary	0	0	0	1	2	3	1	8	11	4	Original
Noncurrent	0	0	1	0	3	2	2	6	6	10	Current
Simple	0	2	0	1	1	4	3	2	8	9	Difficult
Standard	0	0	3	3	5	2	2	7	5	4	Distracting

Table 2 showed that it is seen that seven teachers gave 10 points, eight teachers gave 9 points, nine teachers gave 8 points, two teachers gave 7 points, one teacher gave 6 points, two teachers gave 4 points, and one teacher gave 3 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics first question. The intensity is towards the life-based feature. For the expression reflecting learning outcome,

nine teachers gave 10 points, eight teachers gave 9 points, five teachers gave 8 points, two teachers gave 7 points, one teacher gave 6 points, three teachers gave 5 points, one teacher gave 4 points, and one teacher gave 3 points. It is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, eleven teachers gave 10 points, seven teachers gave 9 points, four teachers gave 8 points, two teachers gave 7 points, one teacher gave 6 points, four teachers gave 5 points, and two teachers gave 4 points. It is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, four teachers gave 10 points, eleven teachers gave 9 points, eight teachers gave 8 points, one teacher gave 7 points, three teachers gave 6 points, two teachers gave 5 points, and one teacher gave 4 points. It is seen that the intensity is towards the original feature. For the expression noncurrent/current, ten teachers gave 10 points, six teachers gave 9 points, six teachers gave 8 points, two teachers gave 7 points, two teachers gave 6 points, three teachers gave 5 points, and one teacher gave 3 points, and it is seen that the intensity is towards the current feature. For the expression simple/complex, nine teachers gave 10 points, eight teachers gave 9 points, two teachers gave 8 points, three teachers gave 7 points, four teachers gave 6 points, one teacher gave 5 points, one teacher gave 4 points, and two teachers gave 2 points. It is seen that the intensity is related to the problematic feature. For the expression standard/distracting, four teachers gave 10 points, five teachers gave 9 points, seven teachers gave 8 points, two teachers gave 7 points, two teachers gave 6 points, five teachers gave 5 points, three teachers gave 4 points, and three teachers gave 2 points, and it is seen that the intensity is towards the distracting feature.

Findings Regarding the Second Question

Figure 6 presents the distribution of semantic perceptions obtained from physics teachers for the second question of 2022 BPT physics, which deals with the concept of **force**.

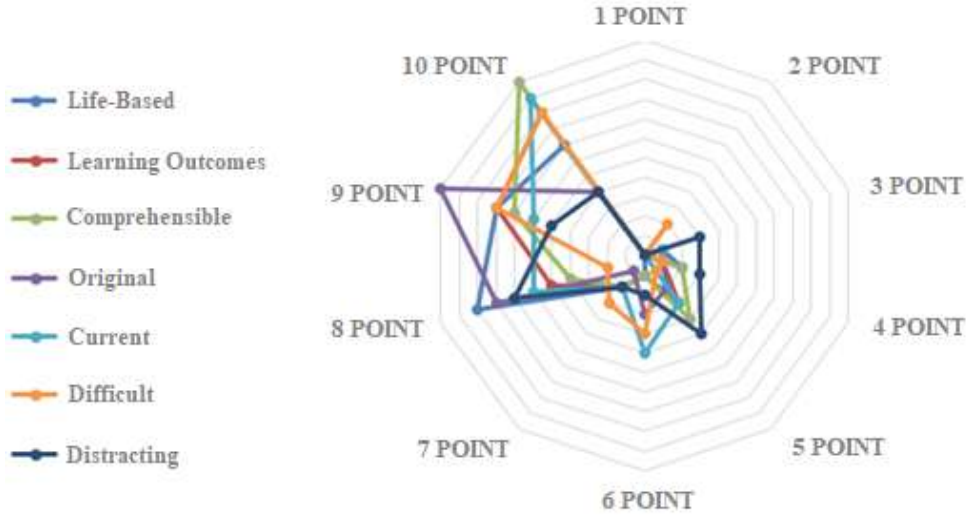

Figure 6. Distribution of participants' semantic perception of the second question

Figure 6 shows that the 2022 BPT physics second question was evaluated as 8 points for 'Life-Based', 10 points for 'Reflecting Learning Outcome', 10 points for 'Comprehensible,' 8 points for 'Original,' 10 points for 'Current,' 7 points for 'Difficult,' and 8 points for 'Distracting.' The frequency values of 30 physics teachers' semantic perceptions of the second question are presented in Table 3.

Table 3
The Frequency Values of the Participants' Semantic Perceptions of the Second Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	0	0	0	4	2	2	8	6	5	Life-Based
Not Reflecting Learning Outcome	0	0	0	1	3	2	1	7	5	8	Reflecting Learning Outcome
Elusive	0	0	1	0	0	5	0	6	6	9	Comprehensible
Ordinary	0	1	0	3	0	0	6	8	4	5	Original
Noncurrent	0	0	0	2	4	5	1	3	5	6	Current
Simple	0	0	1	1	5	4	6	5	5	0	Difficult
Standard	0	0	1	0	3	1	8	10	4	1	Distracting

Table 3 showed that it is seen that five teachers gave 10 points, six teachers gave 9 points, eight teachers gave 8 points, two teachers gave 7 points, two teachers gave 6 points, and four teachers gave 5 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics second question. The intensity is towards the life-based feature. For the expression reflecting learning outcome, eight teachers gave 10 points, five teachers gave 9 points, seven teachers gave 8 points, one teacher gave 7 points, two teachers gave 6 points, three teachers gave 5 points, and one teacher gave 4 points. It is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, nine teachers gave 10 points, six teachers gave 9 points, six teachers gave 8 points, five teachers gave 6 points, and one teacher gave 3 points. It is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, five teachers gave 10 points, four teachers gave 9 points, eight teachers gave 8 points, six teachers gave 7 points, three teachers gave 4 points, and one teacher gave 2 points, and it is seen that the intensity is towards the original feature. For the expression noncurrent/current, six teachers gave 10 points, five teachers gave 9 points, three teachers gave 8 points, one teacher gave 7 points, five teachers gave 6 points, four teachers gave 5 points, and two teachers gave 4 points, and it is seen that the intensity is towards the current feature. For the expression simple/complex, five teachers gave 9 points, five teachers gave 8 points, six teachers gave 7 points, four teachers gave 6 points, five teachers gave 5 points, one teacher gave 4 points, and two teachers gave 3 points. For the expression standard/distracting, one teacher gave 10 points, four teachers gave 9 points, ten teachers gave 8 points, eight teachers gave 7 points, one teacher gave 6 points, three teachers gave 5 points, and one teacher gave 3 points, and it is seen that the intensity is towards the distracting feature.

Findings Regarding the Third Question

Figure 7 presents the distribution of semantic perceptions obtained from physics teachers for the third question of 2022 BPT physics, which deals with the concept of **pressure**.

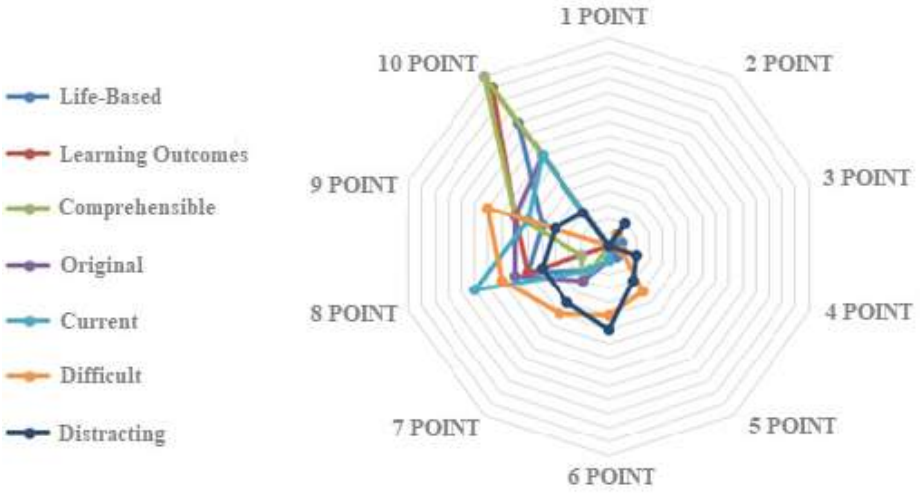

Figure 7. Distribution of participants' semantic perception of the third question

Figure 7 shows that the 2022 BPT physics third question was evaluated as 10 points for 'Life-Based', 10 points for 'Reflecting Learning Outcome', 10 points for 'Comprehensible', 10 points for 'Original', 8 points for 'Current,' 9 points for 'Difficult,' and 6 points for 'Distracting.' The frequency values of 30 physics teachers' semantic perceptions of the third question are presented in Table 4.

Table 4

The Frequency Values of the Participants' Semantic Perceptions of the Third Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	0	1	0	1	1	2	6	5	11	Life-Based
Not Reflecting Learning Outcome	0	0	0	1	0	0	0	6	7	14	Reflecting Learning Outcome
Elusive	0	1	0	0	0	0	3	2	7	15	Comprehensible
Ordinary	0	1	0	0	0	1	3	7	7	8	Original
Noncurrent	0	1	0	0	0	1	2	10	6	8	Current
Simple	0	1	0	1	4	5	6	8	9	0	Difficult
Standard	0	2	0	2	3	6	5	5	4	3	Distracting

Table 4 showed that it is seen that eleven teachers gave 10 points, five teachers gave 9 points, six teachers gave 8 points, two teachers gave 7 points, one teacher gave 6 points, one teacher gave 5 points, and one teacher gave 3 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics third question. The intensity is towards the life-based feature. For the expression reflecting learning outcome, fourteen teachers gave 10 points, seven teachers gave 9 points, six teachers gave 8 points, and one teacher gave 4 points. It is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, fifteen teachers gave 10 points, seven teachers gave 9 points, two teachers gave 8 points, three teachers gave 7 points, and one teacher gave 2 points. It is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, eight teachers gave 10 points, seven teachers gave 9 points, seven teachers gave 8 points, three teachers gave 7 points, one teacher gave 6 points, and one teacher gave 2 points. It is seen that the intensity is towards the original feature. For the expression noncurrent/current, eight teachers gave 10 points, six teachers gave 9 points, ten teachers gave

8 points, two teachers gave 7 points, one teacher gave 6 points, and two teachers gave 2 points, and it is seen that the intensity is towards the current feature. For the expression simple/complex, nine teachers gave 9 points, eight teachers gave 8 points, six teachers gave 7 points, five teachers gave 6 points, four teachers gave 5 points, one teacher gave 4 points, and two teachers gave 2 points, and it is seen that the intensity is towards the problematic feature. For the expression standard/distracting, three teachers gave 10 points, four teachers gave 9 points, five teachers gave 8 points, five teachers gave 7 points, six teachers gave 6 points, three teachers gave 5 points, two teachers gave 4 points, and two teachers gave 2 points. It is seen that the intensity is towards the distracting feature.

Findings Regarding the Fourth Question

Figure 8 presents the distribution of semantic perceptions obtained from physics teachers for the fourth question of 2022 BPT physics, which deals with the concept of **heat temperature**.

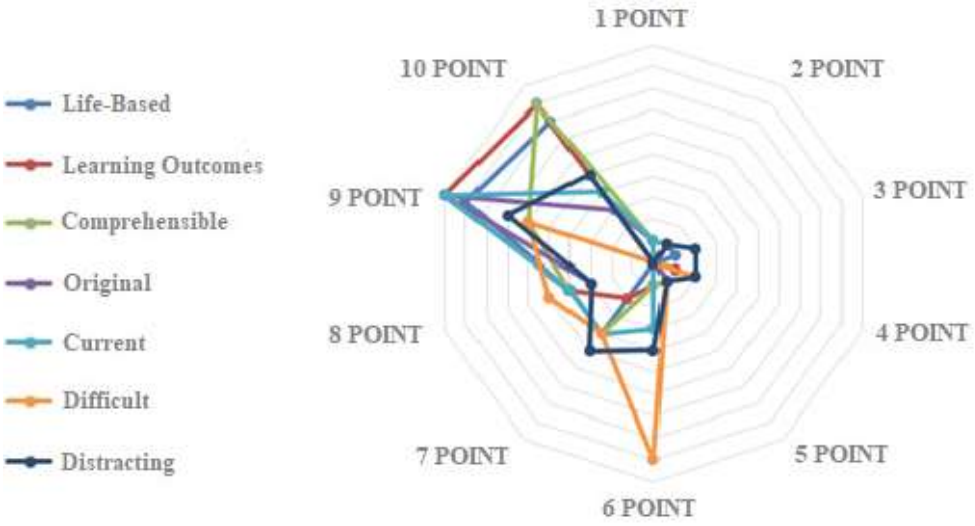

Figure 8. Distribution of participants' semantic perception of the fourth question

Figure 8 shows that the 2022 BPT physics fourth question was evaluated as 9 points for 'Life-Based', 9 points for 'Reflecting Learning Outcome', 10 points for 'Comprehensible', 9 points for 'Original', 9 points for 'Current', 9 points for 'Difficult,' and 6 points for 'Distracting.' The frequency values of 30 physics teachers' semantic perceptions of the fourth question are presented in Table 5.

Table 5

The Frequency Values of the Participants' Semantic Perceptions of the Fourth Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	1	1	0	0	0	4	4	9	8	Life-Based
Not Reflecting Learning Outcome	0	0	0	1	0	1	2	4	10	9	Reflecting Learning Outcome
Elusive	1	1	0	0	1	1	4	4	6	9	Comprehensible
Ordinary	1	0	0	0	1	4	5	3	10	3	Original
Noncurrent	1	0	0	0	0	3	4	4	10	4	Current
Simple	0	0	0	2	1	9	4	5	6	0	Difficult
Standard	0	1	2	2	1	4	5	3	7	5	Distracting

Table 5 showed that it is seen that eight teachers gave 10 points, nine teachers gave 9 points, four teachers gave 8 points, four teachers gave 7 points, three teachers gave 3 points, and one teacher gave 2 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics fourth question. The intensity is towards the life-based feature. For the expression reflecting learning outcome, nine teachers gave 10 points, ten teachers gave 9 points, four teachers gave 8 points, two teachers gave 7 points, one teacher gave 6 points, and one teacher gave 4 points. It is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, nine teachers gave 10 points, six teachers gave 9 points, four teachers gave 8 points, four teachers gave 7 points, one teacher gave 6 points, one teacher gave 5 points, one teacher gave 2 points, and one teacher gave 1 point, and it is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, three teachers gave 10 points, ten teachers gave 9 points, three teachers gave 8 points, five teachers gave 7 points, four teachers gave 6 points, one teacher gave 5 points, and one teacher gave 1 point. It is seen that the intensity is towards the original feature. For the expression noncurrent/current, four teachers gave 10 points, ten teachers gave 9 points, four teachers gave 8 points, four teachers gave 7 points, three teachers gave 6 points, and one teacher gave 1 point, and it is seen that the intensity is towards the current feature. For the expression simple/complex, six teachers gave 9 points, five teachers gave 8 points, four teachers gave 7 points, nine teachers gave 6 points, one teacher gave 5 points, and two teachers gave 4 points. For the expression standard/distracting, five teachers gave 10 points, seven teachers gave 9 points, three teachers gave 8 points, five teachers gave 7 points, four teachers gave 6 points, one teacher gave 5 points, two teachers gave 4 points, two teachers gave 3 points, and one teacher gave 2 points. It is seen that the intensity is towards the distracting feature.

Findings Regarding the Fifth Question

Figure 9 presents the distribution of semantic perceptions obtained from physics teachers for the fifth question of 2022 BPT physics, which deals with the concept of **electrical force**.

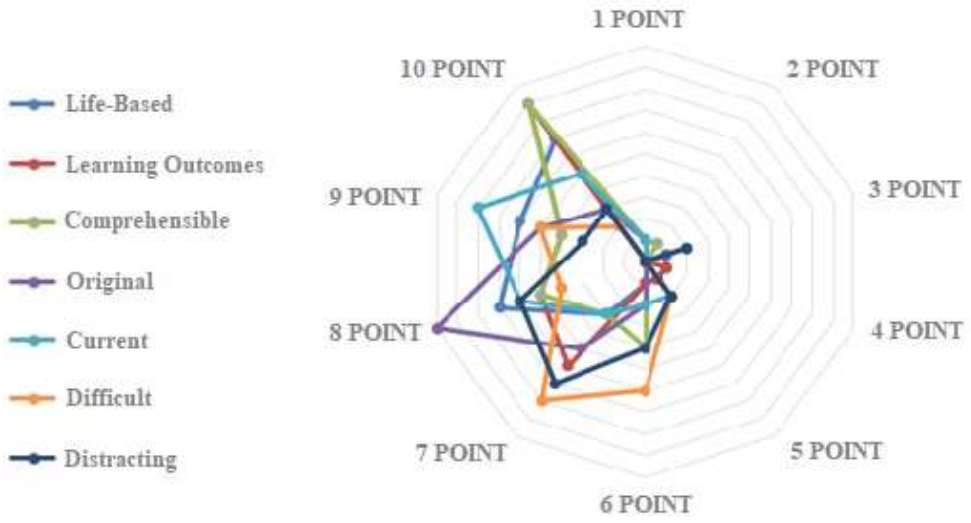

Figure 9. Distribution of participants' semantic perception of the fifth question

Figure 9 shows that the 2022 BPT physics fifth question was evaluated as 10 points for 'Life-Based', 10 points for 'Reflecting Learning Outcome', 10 points for 'Comprehensible', 8 points for 'Original', 9 points for 'Current', 7 points for 'Difficult,' and 7 points for 'Distracting'. The frequency values of 30 physics teachers' semantic perceptions of the fifth question are presented in Table 6.

Table 6
The Frequency Values of the Participants' Semantic Perceptions of the Fifth Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	0	1	1	1	1	3	7	6	7	Life-Based
Not Reflecting Learning Outcome	0	0	0	1	1	1	6	5	4	9	Reflecting Learning Outcome
Elusive	1	1	0	0	0	4	3	5	4	9	Comprehensible
Ordinary	1	0	1	0	0	2	5	10	5	3	Original
Noncurrent	1	0	0	0	2	2	3	6	8	5	Current
Simple	0	0	0	0	2	6	8	4	5	2	Difficult
Standard	0	0	2	0	2	4	7	6	3	3	Distracting

Table 6 showed that it is seen that seven teachers gave 10 points, six teachers gave 9 points, seven teachers gave 8 points, three teachers gave 7 points, one teacher gave 3 points, one teacher gave 5 points, one teacher gave 4 points, and one teacher gave 3 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics fifth question. The intensity is towards the life-based feature. For the expression reflecting learning outcome, nine teachers gave 10 points, four teachers gave 9 points, five teachers gave 8 points, six teachers gave 7 points, one teacher gave 6 points, one teacher gave 5 points, and one teacher gave 4 points. It is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, nine teachers gave 10 points, four teachers gave 9 points, five teachers gave 8 points, three teachers gave 7 points, four teachers gave 6 points, one teacher gave 2 points, and one teacher gave 1 point. It is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, three teachers gave 10 points, five teachers gave 9 points, ten teachers gave 8 points, five teachers gave 7 points, two teachers gave 6 points, one teacher gave 3 points, and one teacher gave 1 point, and it is seen that the intensity is towards the original feature. For the expression noncurrent/current, five teachers gave 10 points, eight teachers gave 9 points, six teachers gave 8 points, three teachers gave 7 points, two teachers gave 6 points, two teachers gave 5 points, and one teacher gave 1 point, and it is seen that the intensity is towards the current feature. For the expression simple/complex, two teachers gave 10 points, five teachers gave 9 points, four teachers gave 8 points, eight teachers gave 7 points, six teachers gave 6 points, and two teachers gave 4 points, and it is seen that the intensity is towards the problematic feature. For the expression standard/distracting, three teachers gave 10 points, three teachers gave 9 points, six teachers gave 8 points, seven teachers gave 7 points, four teachers gave 6 points, two teachers gave 5 points, and two teachers gave 3 points. It is seen that the intensity is towards the distracting feature.

Findings Regarding the Sixth Question

Figure 10 presents the distribution of semantic perceptions obtained from physics teachers for the sixth question of 2022 BPT physics, which deals with the concept of **wave**s.

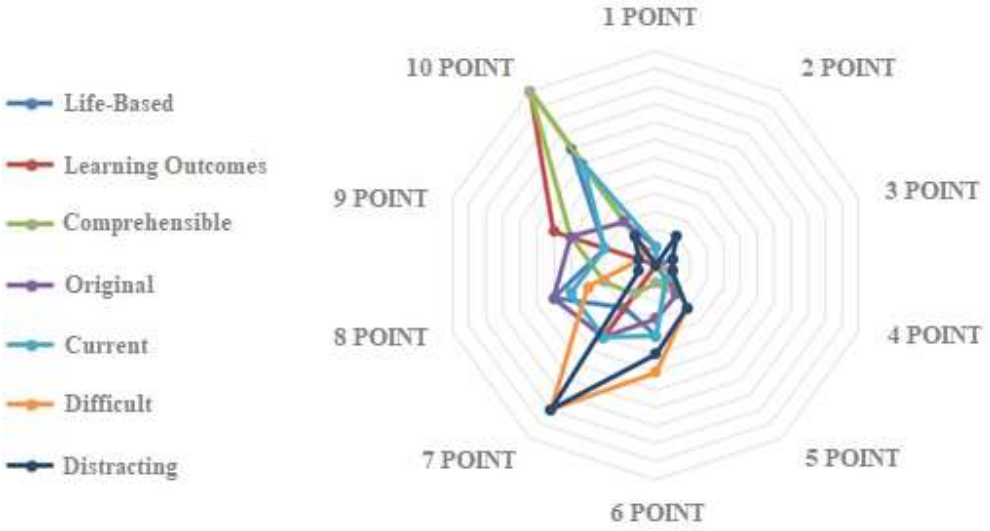

Figure 10. Distribution of participants' semantic perception of the sixth question

Figure 10 shows that the 2022 BPT physics sixth question was evaluated as 10 points for 'Life-Based', 10 points for 'Reflecting Learning Outcome', 10 points for 'Comprehensible', 8 points for 'Original', 10 points for 'Current', 7 points for 'Difficult,' and 7 points for 'Distracting'. The frequency values of 30 physics teachers' semantic perceptions of the sixth question are presented in Table 7.

Table 7

The Frequency Values of the Participants' Semantic Perceptions of the Sixth Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	0	1	0	1	4	3	6	3	8	Life-Based
Not Reflecting Learning Outcome	0	0	0	1	2	0	5	0	6	12	Reflecting Learning Outcome
Elusive	0	0	0	1	2	1	2	3	5	12	Comprehensible
Ordinary	1	0	0	1	2	3	5	6	5	3	Original
Noncurrent	1	0	0	0	1	4	5	5	3	7	Current
Simple	0	0	0	1	3	6	10	4	1	1	Difficult
Standard	0	2	1	1	3	5	10	1	1	2	Distracting

Table 7 showed that it is seen that eight teachers gave 10 points, three teachers gave 9 points, six teachers gave 8 points, three teachers gave 7 points, four teachers gave 6 points, one teacher gave 5 points, and one teacher gave 3 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics sixth question. The intensity is towards the life-based feature. For the expression reflecting learning outcome, twelve teachers gave 10 points, six teachers gave 9 points, five teachers gave 7 points, two teachers gave 5 points, and one teacher gave 4 points, and it is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, twelve teachers gave 10 points, five teachers gave 9 points, three teachers gave 8 points, two teachers gave 7 points, one teacher gave 6 points, two teachers gave 5 points, and one teacher gave 4

points. It is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, three teachers gave 10 points, five teachers gave 9 points, six teachers gave 8 points, five teachers gave 7 points, three teachers gave 6 points, two teachers gave 5 points, one teacher gave 4 points, and one teacher gave 1 point. It is seen that the intensity is towards the original feature. For the expression noncurrent/current, seven teachers gave 10 points, three teachers gave 9 points, five teachers gave 8 points, five teachers gave 7 points, four teachers gave 6 points, one teacher gave 5 points, and one teacher gave 1 point, and it is seen that the intensity is towards the current feature. For the expression simple/complex, one teacher gave 10 points, one teacher gave 9 points, four teachers gave 8 points, ten teachers gave 10 points, six teachers gave 6 points, three teachers gave 5 points, and one teacher gave 4 points, and it is seen that the intensity is towards the problematic feature. For the expression standard/distracting, two teachers gave 10 points, one teacher gave 9 points, one teacher gave 8 points, ten teachers gave 7 points, five teachers gave 6 points, three teachers gave 5 points, one teacher gave 4 points, one teacher gave 3 points, and two teachers gave 2 points. It is seen that the intensity is towards the distracting feature.

Findings Regarding the Seventh Question

Figure 11 presents the distribution of semantic perceptions obtained from physics teachers for the seventh question of 2022 BPT physics, which deals with the concept of **reverberation**.

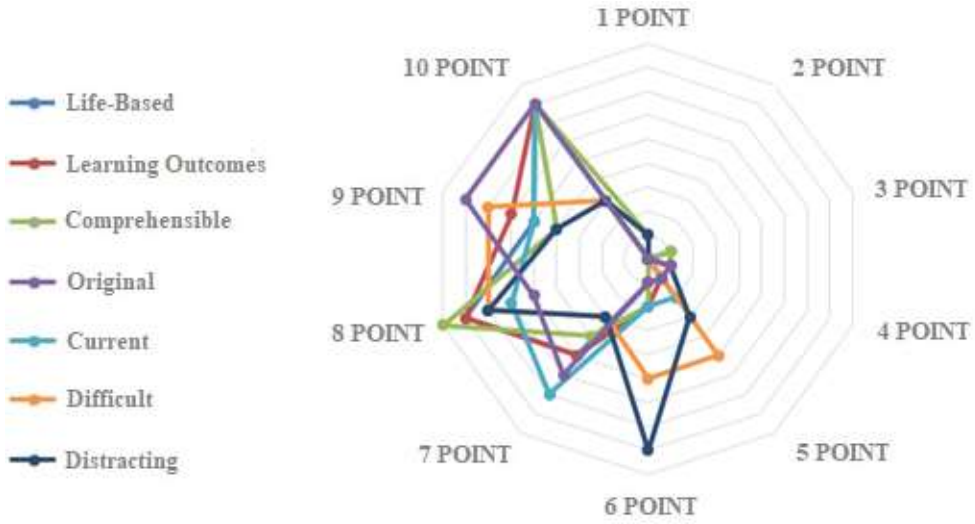

Figure 11. Distribution of participants' semantic perception of the seventh question

Figure 11 shows that the 2022 BPT physics seventh question was evaluated as 8 and 10 points for 'Life-Based', 8 and 10 points for 'Reflecting Learning Outcome', 8 points for 'Comprehensible', 9 and 10 points for 'Original', 10 points for 'Current', 8 and 9 points for 'Difficult,' and 6 points for 'Distracting'. The frequency values of 30 physics teachers' semantic perceptions of the seventh question are presented in Table 8.

Table 8

The Frequency Values of the Participants' Semantic Perceptions of the Seventh Question

Features	*Frequency*										*Features*
	1	2	3	4	5	6	7	8	9	10	
Traditional	0	0	1	1	1	1	5	8	5	8	Life-Based
Not Reflecting Learning Outcome	0	0	0	0	1	2	5	8	6	8	Reflecting Learning Outcome
Elusive	1	0	1	1	0	2	4	9	4	8	Comprehensible
Ordinary	0	0	0	1	1	1	6	5	8	8	Original
Noncurrent	0	0	0	0	2	2	7	6	5	8	Current
Simple	0	0	0	0	5	5	3	7	7	3	Difficult
Standard	1	0	0	1	3	8	3	7	4	3	Distracting

Table 8 showed that it is seen that eight teachers gave 10 points, five teachers gave 9 points, eight teachers gave 8 points, five teachers gave 7 points, one teacher gave 6 points, one teacher gave 5 points, one teacher gave 4 points, and one teacher gave 3 points for the traditional/life-based statement in the semantic perceptions of physics teachers towards the 2022 BPT physics seventh question. The intensity is towards the life-based feature. For the expression reflecting learning outcome, eight teachers gave 10 points, six teachers gave 9 points, eight teachers gave 8 points, five teachers gave 7 points, two teachers gave 6 points, and one teacher gave 5 points, and it is seen that the intensity is towards the feature reflecting learning outcome. For the expression elusive/comprehensible, eight teachers gave 10 points, four teachers gave 9 points, nine teachers gave 8 points, four teachers gave 7 points, two teachers gave 6 points, one teacher gave 4 points, one teacher gave 3 points, and one teacher gave 1 point. It is seen that the intensity is towards the comprehensible feature. For the expression ordinary/original, eight teachers gave 10 points, eight teachers gave 9 points, five teachers gave 8 points, six teachers gave 7 points, one teacher gave 6 points, one teacher gave 5 points, and one teacher gave 4 points. It is seen that the intensity is towards the original feature. For the expression noncurrent/current, eight teachers gave 10 points, five teachers gave 9 points, six teachers gave 8 points, seven teachers gave 7 points, two teachers gave 6 points, and two teachers gave 5 points, and it is seen that the intensity is towards the current feature. For the expression simple/complex, three teachers gave 10 points, seven teachers gave 9 points, seven teachers gave 8 points, three teachers gave 7 points, five teachers gave 6 points, and five teachers gave 5 points. It is seen that the intensity is related to the problematic feature. For the expression standard/distracting, three teachers gave 10 points, four teachers gave 9 points, seven teachers gave 8 points, three teachers gave 7 points, eight teachers gave 6 points, three teachers gave 5 points, one teacher gave 4 points, and one teacher gave 1 point. It is seen that the intensity is towards the distracting feature.

Discussion and Conclusions

Many changes have been made in the evaluation criteria of the central exam (Karakaya et al., 2019), which is carried out at every stage of the Turkish National Education System and plays a decisive role in determining the school success levels by placing students who meet the necessary conditions in different programs in line with the fields they want and monitoring their educational progress (Dinc et al., 2014). It is important to determine the situations that are important for students to be able to shape their future. In the examinations carried out, it is seen that the exam practices in the transition to secondary education (Demirbilek & Levent,

2019) are carried out due to the different programs in the education systems and receiving student applications above the determined capacity in educational institutions (Atila & Ozeken, 2015). As this situation affects the supply-demand balance, the changes made over the years also include the evaluation criteria of the examination systems. Among the questions directed to students in the transition exams from secondary to higher education level, some questions include Turkish, history, mathematics subjects, science subjects, and acquisitions. Since it is known that the use of life-based questions within the scope of measurement and evaluation in the field of physics within the science course provides benefits to daily life (Ayvaci & Yamacli, 2023), it is important to examine the semantic perceptions of the participants regarding the life-based dimension of these questions. Among the participants' criteria for evaluating the questions, there are seven criteria with the highest intensity distribution. These are traditional or life-based, reflecting learning outcomes or not reflecting outcomes, comprehensible or elusive, original or ordinary, current or noncurrent, complex or straightforward, and distracting or standard. It is important to take into account what is required to be taught to students in the knowledge dimension of the knowledge dimension from the dimensions of Bloom's taxonomy and what needs to be done to realize active participation and meaningful learning in the cognitive process dimension (Zorluoglu et al., 2017) that are reconciled with the criteria of being life-based.

As can be seen in Graph 1, where the answers given by the participants regarding the first question of the 2022 BPT physics are presented, comprehensible, original, and current features draw attention. In the explanation given in the question, referring to the situation of larger or smaller gravity of the substances to be used in the construction of the items to be developed in line with the need, including sample expressions from daily life in the premises of the question and the comprehensible, original, and current features. It is known that using life-based questions in courses that students have difficulty understanding, such as physics courses, is beneficial in perceiving the problems clearly and conveying the necessary information at an adequate level (Ayvaci & Yamacli, 2023). For this reason, it is thought that it is necessary to diversify the questions with examples of daily life contexts that do not contain unnecessary information to comply with the currency criteria (Park & Lee, 2004). Life-based teaching, which aims to provide students with the skills to apply the knowledge they have learned daily (Bennett et al., 2007), creates the infrastructure for permanent learning and mediates the individual to come up with original ideas through experimentation practices by doing and experiencing. Creating questions from original content will help the student develop a different perspective on problem situations that the student has not encountered before.

As can be seen in Graph 2, where the answers given by the participants to the second question of the 2022 BPT physics are presented, comprehensible and distracting features draw attention. Among the criteria that should be included in life-based questions is the feature,' It should be based on precise, realistic data and should not have unnecessary details' (Ayvaci & Yamacli, 2023). This feature needs to be paid significant attention to in terms of the comprehensibility of the questions. It is necessary to consider that the expressions given in the questions should not be values that students may have difficulty imagining, and the numerical values should not be extreme. In addition to the correct answers, distracting expressions related to the question prompt cognitive thinking. The student should not encounter situations that affect the basis of life between the correct answer and the distractors. The distraction should be used at the student's level to acquire the question. In the statement, '*The force exerted by the Earth on the table is 10 N*,' which is not the correct answer in the options given in the

question, this force must be greater than 10 N. The reason for this is that adding the table's weight to the object's weight will cause the table to take a value greater than 10 N due to the contact of the table with the Earth. If it is assumed that the students accept the statement among the answers to the question as correct, the distraction feature will arise.

As can be seen in Graph 3, where the answers given by the participants to the third question of the 2022 TYT physics are presented, comprehensible, and reflecting learning outcome features draw attention. The fact that the physics course, which is intertwined with daily life, is perceived as one of the problematic courses to understand is due to the decrease in student interest in the course due to insufficient connection with life (Yaman et al., 2004). In the statement in the question, the presentation of the problem situation in the form of *'changes in the flow of water as a result of the pipe damaged during the works carried out by the municipality*' with an example in daily life coincides with the comprehensibility feature. When the question is analyzed in line with the objectives of the physics course, it is associated with the objective '*10.2.1.2. Establishes a relationship between flow velocity and fluid pressure in fluids.*' It is associated with the learning outcome. In general, the velocity of the fluid in a pipe increases where the cross-section of the pipe narrows, but in Bernoulli's principle, the pressure decreases where the fluid velocity increases (Yucel et al., 2018). It is seen that the problem to be solved is directly related to the relevant outcome of the physics course. The feature related to the outcome in the answers given by physics teachers is more remarkable than other features because it meets the outcome. It is considered necessary to teach physics course objectives by associating them with daily life to realize permanent learning in students.

As can be seen in Graph 4, where the answers given by the participants for the fourth question of the 2022 BPT physics exam are presented, current, reflecting learning outcomes, and complex features draw attention. When the explanations and premises given in the question are examined, it meets the feature of being up-to-date among the answers given by physics teachers since the questions related to heat/temperature conduction rate acquisitions remain up-to-date and are one of the indispensable question styles. It can be concluded that the plates in question reach thermal equilibrium due to staying in the same environment for a long time. However, it is seen that the K plate, one of the plates in thermal equilibrium, feels colder than the L plate due to the heat conduction coefficient. Since it meets the physics learning outcome '*9.5.3.1, analyze the relationship between the concept of thermal equilibrium and temperature difference and heat*. It coincides with the features of the learning outcome among the answers given by physics teachers. Because the question involves cognitive thinking activities and the students confuse the concept of heat with the concept of temperature, which is included in the acquisitions of the heated subject, it is seen that it also covers the feature of being difficult.

As can be seen in Graph 5, where the answers given by the participants regarding the fifth question of the 2022 BPT physics are presented, original, comprehensible, and current features draw attention. When the statements given in the question are examined, it is seen that what is desired in terms of comprehensibility is achieved by avoiding unnecessary sentences in the explanation section. Sak and Gurel (2019) mentioned that it is important for the student to understand the questions and to concretize the information. In the science course covering physics, some findings support that asking questions in a clear, understandable, and conceivable way increases students' interest in the course. The interaction in the figure can be explained when it is assumed that the materials from which the comb and paper given in the question are made are considered based on the positive charges on the

comb. Thus, the importance of including original questions to stimulate the student's cognitive thinking activities is emphasized with the question asked.

As can be seen in Graph 6, where the answers given by the participants for the sixth question of the 2022 BPT physics are presented, comprehensible, reflecting learning outcome, and distracting features draw attention. When the statements given in the question are analyzed, information about where the waves formed in the open sea is not given clearly in terms of appearance. Therefore, the way of making the student think cognitively was followed. The question asked about the wave, '*10.3.1.1. Explains the concepts of vibration, wave motion, wavelength, period, frequency, speed, and amplitude*.' It is seen that it meets the learning outcome. In line with the knowledge of the explanations of the concepts in the learning outcome, the question can be answered correctly. Therefore, this situation coincides with physics teachers' statement about the attainment that draws attention.

As can be seen in Graph 7, where the answers given by the participants for the seventh question of 2022 BPT physics are presented, comprehensible and life-based features draw attention. The question includes statements about reflective surfaces that act as plane mirrors in escalators encountered in shopping centers in daily life. The fact that the question includes context examples from daily life coincides with the life-based feature that draws attention to the answers given by physics teachers. Moreover, the question meets the comprehensibility feature due to the absence of unnecessary expressions in the question, its suitability to the level of the students, and the clarity of the problem situation.

Based on the results obtained,

The literature can be enriched in this context by conducting various studies with qualitative approaches and data collection processes, in which the semantic perceptions of physics teachers can be determined, the reasons for these perceptions can be explained in detail, and the opinions of physics teachers can be revealed to reveal the suggestions for the questions or various perspectives.

In addition to determining the semantic perceptions of physics teachers towards the life-based dimension of 2022 BPT physics questions, BPT questions in various fields, such as chemistry and biology, can be examined. In this way, a holistic evaluation of physics, chemistry, and biology questions specific to the field of science can be provided.

Following the determination of the semantic perceptions of the 2022 BPT physics questions on the life-business dimension with physics teachers, the transformation in the questions can be revealed by evaluating the BPT physics questions in 2023 and 2024 and comparing the exams held in these years. This way, the effects of changing curricula and differentiated learning outcomes on questions and teachers can be determined.

In addition to determining the semantic perceptions of physics teachers about the life-baseness dimension of 2022 BPT physics questions, it is predicted that conducting similar studies for students and revealing student views on BPT physics questions will contribute to the literature.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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