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Fen Bilimleri Öğretmenlerinin Yapılandırmacı Öğrenme Yaklaşımına Yönelik Görüşleri: Boylamsal Bir Çalışma*

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Öz

Bu çalışmanın temel amacı, 2012 ve 2022 yıllarındaki fen bilimleri öğretmenlerinin yapılandırmacı öğrenme yaklaşımına dair sınıf içi uygulamalarını karşılaştırmaktır. Araştırma, 2012'de Diyarbakır'da görev yapan 30 öğretmen ile 2022'de aynı öğretmenlerden ulaşılan 22 öğretmenle gerçekleştirilmiştir. Veriler yarı yapılandırılmış görüşme formları ile toplanmış ve betimsel analiz yöntemiyle değerlendirilmiştir. Analiz sonuçlarına göre, 2012'de yapılandırmacı öğrenme yaklaşımının uygulanmasını engelleyen başlıca faktörler; fiziki koşullardaki eksiklikler, öğrencilerin düşük hazır bulunuşluk düzeyleri, coğrafi etkenler, veli ilgisizliği ve öğretmenlerin deneyim yetersizliğidir. 2022'de ise uzaktan eğitimle ilgili yeni zorluklar, zaman yönetimi sorunları, etkileşim sınırlamaları ve müfredat yoğunluğu gibi problemlere yol açmıştır. 2012'de öğretmenler, kalabalık sınıflar ve düşük hazır bulunuşluk düzeyleri nedeniyle genellikle düz anlatım yöntemini kullanmışlardır. Ancak, 2022'de öğretmenlerin öğretim yöntemlerini çeşitlendirmeye çalıştıkları görülmüştür. Laboratuvar kullanımı konusunda 2012'de yetersiz olanaklar ve öğrenci kontrolü zorlukları varken, 2022'de laboratuvar malzemelerine erişimde çeşitlilik gözlemlenmiştir. Ölçme araçları konusunda ise, 2012'de yazılı sınavlar tercih edilirken, 2022'de öğretmenlerin değerlendirme yöntemlerinde çeşitlilik artmıştır.
Anahtar Kelimeler: Fen bilimleri öğretmeni, yapılandırmacı öğrenme yaklaşımı, öğretmen görüşleri

Science Teachers' Opinions On The Constructive Learning Approach: A Longitudinal Qualitative Study

Abstract

The primary aim of this study is to compare the classroom practices of science teachers regarding the constructivist learning approach in 2012 and 2022. The research involved 30 teachers working in Diyarbakır in 2012 and 22 of the same teachers reached in 2022. Data were collected through semi-structured interview forms and analyzed using descriptive analysis. According to the analysis results, the main factors hindering the implementation of the constructivist learning approach in 2012 were inadequate physical conditions, low student readiness levels, geographical factors, lack of parental interest, and insufficient teacher experience. In 2022, new challenges related to distance education, time management issues, interaction limitations, and curriculum density emerged. In 2012, teachers primarily used lecture methods due to large class sizes and low student readiness levels. However, in 2022, efforts to diversify teaching methods were observed. Regarding laboratory use, 2012 saw inadequate facilities and difficulties in student control, whereas in 2022, there was greater access to laboratory materials. In terms of assessment tools, written exams were preferred in 2012, while in 2022, there was increased diversity in teachers' assessment methods.
Key Words: Science teacher, constructive learning approach, teachers' opinions

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Introduction

Today, the rapid increase in the accumulation of knowledge requires the training of individuals who are developed not only in a certain field but also in many fields with the abilities to adapt to the rapidly changing needs of societies (Varış, 1996). In this context, an educational approach that focuses on developing knowledge, skills, behaviors, and values that will help students to contribute effectively to a rapidly changing society has become an important necessity (Jadallah, 2000).

In Turkey, the Ministry of National Education (MoNE) has been adopting a student-centered constructivist learning approach in education programs since 2004. This approach focuses on creating learning environments in which students actively participate, research, question ideas, and discuss and share ideas instead of passively listening to lectures. This approach has brought a new vision to the education system (Titiz, 2005).

The 2005 Science and Technology curriculum emphasizes that individuals should reconstruct knowledge by integrating it with their subjective experiences and existing knowledge structures instead of passively accepting it (Özden, 2020). This approach aims to educate students as individuals who not only accept the information presented to them but also actively participate in the process of creating meaning by interpreting this information (Yıldırım & Şimşek, 2021).

According to various studies in the field, which predominantly focus on key elements such as active participation, student-centered learning, motivation, and self-regulation, central to the constructivist learning approach, several challenges in implementation have been identified. Yürüdür and Cımbız (2017) found that teachers encountered difficulties in adopting student-centered methods due to unfamiliarity with this approach. Eskici (2017), in research involving school principals, highlighted infrastructure inadequacies as a primary barrier to implementing constructivist methods effectively, citing readiness issues among teachers and students.

Bada and Kırpık's (2021) study with social studies teachers revealed that deficiencies in the constructivist approach were often attributed to theoretical gaps in their initial teacher training, compounded by inadequate internship experiences. They noted that experienced teachers tended to distance themselves from constructivist methods compared to newer colleagues who struggled to find time amidst heavy workloads. The study underscored shortcomings in in-service training, deemed inappropriate and insufficient for their needs.

Similarly, Tanık's (2020) thesis with classroom teachers indicated a generally low level of preparedness for the demands of the new educational paradigm. Gender differences emerged, with women showing less favorable attitudes toward constructivist learning than men. However, professional experience positively correlated with a more receptive stance toward the constructivist approach.

Guven and Genç's (2024) study emphasized the pivotal role of teachers in implementing constructivist practices effectively, underscoring the critical link between their self-efficacy beliefs and successful execution. Their findings suggested a generally high level of self-efficacy among teachers, with senior educators exhibiting notably stronger beliefs than their less experienced counterparts. Importantly, variations in subject area or educational level did not significantly influence self-efficacy beliefs among teachers.

The constructivist learning approach focuses on learning beyond teaching and requires students to take a more active role (Naylor & Keogh, 1999; Kumar, 2006). However, this does not weaken the role of the teacher because it is the teacher who prepares this learning environment. When

the salient features of the constructivist learning environment are evaluated, it becomes clear that the teacher who creates this environment is of critical importance. In this context, the duties and responsibilities of the teacher can be summarised as sharing the responsibility for learning with students, encouraging them to think about alternative concepts, helping them to make sense of the world and experiences, revealing their prior knowledge, stimulating students' natural curiosity, guiding them in accessing information sources, providing physical facilities, materials, and technologies, creating a planned but flexible process, guiding them to express their thoughts and questioning, providing a variety of methods in the classroom, organizing and encouraging activities to reveal the social dimension of learning (Nakiboğlu, 1999; Gilakjani et al., 2013; Kalpana, 2014; Özden, 2020). The constructivist learning approach is a pedagogical method that places the student at the center of the learning process, requiring students to take a more active role beyond mere instruction (Naylor & Keogh, 1999; Kumar, 2006). This approach encourages students to construct and interpret knowledge actively. However, this does not diminish the teacher's role; instead, the teacher plays a critical role in creating and maintaining this learning environment. Teachers who establish constructivist learning environments share the responsibility of learning with their students, encourage them to consider alternative concepts, elicit their prior knowledge, and stimulate their natural curiosity (Gilakjani et al., 2013; Kalpana, 2014; Nakiboğlu, 1999; Özden, 2020).

In 2005, the constructivist approach was integrated into the curriculum in Turkey. From that point onwards, teachers were expected to implement this approach in their classrooms effectively. However, various studies and field observations on implementing the constructivist approach have shown that teachers faced significant challenges in fully adopting and applying this method as intended. Teachers encountered multiple barriers in creating and sustaining constructivist learning environments, raising questions about how effectively constructivist methods were utilized in their classrooms.

With the introduction of the inquiry-based teaching approach into the curriculum in 2018, teachers were also expected to adopt and integrate this new approach into their teaching practices. However, this curriculum change did not immediately lead teachers to abandon their familiar constructivist methods. Instead, a gradual transition process was observed, where the new approach was slowly reflected in classroom practices. Teachers often relied on the previous curriculum's methods and the constructivist approach. This indicates that changes in educational policies do not immediately impact classroom practices and that established teaching habits persist among educators.

This study explores how science teachers used the constructivist approach in their classrooms in 2012 and 2022. We look at how they understood and applied this approach when it first became part of the curriculum in 2005, and why they continued to use it in 2022. By examining these two-time points, we aim to understand how the use of constructivist methods and has constructivist methods have changed over time and what factors have influenced these changes. This helps us gain insights into how teachers adapt their practices with changing educational policies and how these changes impact teaching. This study is special because it examines the use of the constructivist approach over a decade, during which significant changes occurred in the curriculum, including the addition of the inquiry-based approach in 2018. This period allows us to see how teachers balance and integrate old and new teaching methods. Our findings can inform the development of future educational policies and teacher training programs, providing valuable insights into how teaching practices evolve in response to policy changes.

Method

Study Design

The study aims to explore science teachers' perspectives on the classroom implementation of the constructivist approach by conducting a comparative analysis across two distinct periods: 2012 and 2022. This research adopts a developmental, longitudinal case study methodology. Longitudinal research focuses on understanding how conditions or phenomena evolve, providing insights into their developmental trajectories (Holland et al., 2006). In this study, the longitudinal aspect allows us to examine how the implementation of the constructivist approach by science teachers has evolved over a decade, from 2012 to 2022. A case study design is employed to deeply investigate the specific context of science teachers' practices within their classrooms over these two periods. Unlike general statistical analyses, case studies provide an in-depth and contextualized understanding of complex educational phenomena (Paker, 2015).

Study Group

In determining the study group, purposive sampling methods were used, and convenience and maximum diversity sampling techniques were preferred. The convenience sampling technique was chosen to include teachers who were deemed voluntary and appropriate for the study (Creswell, 2005).

In scientific research, the maximum diversity sampling method, one of the purposeful sampling methods, was preferred to work with participants with various characteristics to obtain detailed information about the subject being studied and to examine the event from a broad perspective. The maximum diversity sampling method aims to determine different situations and identify common features among this diversity before generalizing on a subject. At the same time, it aims to reveal different dimensions of the problem (Yıldırım & Şimşek, 2021). In this context, face-to-face interviews were conducted with 30 science teachers from schools in different settlements (province, district, village) and with different lengths of service in Diyarbakır province in 2012. However, due to the pandemic in 2022, it was a more challenging process to reach these teachers, and only 22 of them could be reached via e-mail. In the second data collection phase, the questions asked to the teachers in the first data collection phase were repeated. Within the framework of research ethics, the names of the teachers participating in the study were not used. For the teachers who participated in the first study, codes from "2012_Teacher1" to "2012_Teacher30" were given, and for the teachers who participated in the second study, codes from "2022_Teacher1" to "2022_Teacher22" were used.

Data Collection Tool and Collection process

The study tried to determine how science teachers apply the constructivist approach in their classes. For this purpose, teachers were asked open-ended questions. In the 2012 study, face-to-face interviews were conducted with teachers, while in 2022, due to the pandemic, teachers were asked questions over the internet. To prepare more qualified interview questions, a literature review was conducted and five open-ended questions were enriched with probes. In addition, the open-ended questions were subjected to a detailed examination by faculty members working in the Faculties of Education of different universities and specialized in qualitative research methods. The interview questions were reshaped in line with the feedback from the relevant experts. Afterward, the questions were re-examined with a Turkish teacher, the expression disorders in the questions were eliminated and the questions that might be difficult to understand were re-evaluated. After all these arrangements, the interview questions were finalized. The research questions were categorized under two headings: personal information and questions about the purpose of the research. In the personal information section, the gender of the teachers, the type of undergraduate department they graduated from, their length of service, and the place where they work were asked.

The questions directed in line with the aims of the research are as follows:

1. What are the obstacles to the constructivist learning approach?

2. Which methods and techniques do you mostly use while teaching science lessons, and why?
3. Do you use tools and materials while teaching your lessons? Do you have difficulty accessing these tools and materials?
4. What kind of activities do you do in the lesson? How do you determine the activities to be done? What are the problems you encounter while doing these activities?
5. How do you assess your class? Which assessment tools do you use? Do you use alternative assessment techniques? If not, why not?

Analysing the Data

In the study, the descriptive analysis technique was used to interpret teachers' responses to open-ended questions. The main purpose of descriptive analysis is to interpret the results obtained in a regular structure and present them to the reader (Yıldırım & Şimşek, 2021). This study created a framework derived from the main dimensions that emerged in the interviews. Then, using this framework, the data were read, organized, defined, supported with quotations, and interpreted comprehensively.

The researchers first analyzed the teachers' responses to the open-ended questions independently and observed that the teachers answered all the questions regularly.

Validity and Reliability in the Study

This study adopted a qualitative research approach, and it would have been more appropriate to use the concepts of credibility, transferability, consistency, and confirmability instead of validity and reliability (Mills, 2003).

Credibility: Yıldırım and Şimşek (2021) emphasized that for research to be considered scientific, the process must be clear, consistent, and confirmable by other researchers. In this direction, the researchers took care to be objective throughout the process, and no intervention was made in the responses received from the teachers.

Consistency: To ensure the consistency of the study, the data obtained from the teachers were coded separately by the researchers. The reliability level obtained by using the reliability formula suggested by Miles and Huberman (1994) was calculated as 81%. A reliability calculation was made using the agreement / (Agreement + disagreement) formula. The reliability coefficient of 81% obtained as a result of this evaluation shows that the study is reliable since it is above 70% as stated by Miles and Huberman (Miles & Huberman, 1994).

To increase the study's transferability, each stage was explained in detail, and detailed descriptions were made in the results section. To strengthen the research's confirmability, the researchers kept the raw data and codings obtained during the process so that those who were interested could examine them.

Results

In the study, the results obtained from the open-ended questions asked to Science Teachers in 2012 and 2022 are summarised under four headings.

1- Obstacles to the Application of Constructivist Learning Approach

2012 results

According to the opinions of science teachers in 2012, several factors that prevented the implementation of the constructivist learning approach were identified. The majority of the teachers saw the inadequacy of the physical conditions of the school as the main obstacle to the effective implementation of this approach. This situation made it difficult for teachers to use this method, especially due to the inadequacy of laboratory facilities. For example, the teacher coded "2012_Teacher2" stated that they had difficulty maintaining the classroom activities due to the limited use of the laboratory.

Low readiness levels were determined as another factor that made it difficult for students to adapt to constructivist learning. Students' difficulties in adapting to this learning approach and low readiness levels restricting effective participation negatively affect the learning process. In addition, it was observed that classes with low levels of previous education had difficulty in applying constructivist learning. The teacher coded "2012_Teacher15" emphasized this situation by drawing attention to the student's lack of basic education.

The negative effect of geographical conditions also constitutes an important obstacle according to science teachers. The low academic status of the students causes teachers to have difficulty in applying this learning approach. Teacher coded "2012_Teacher1" stated that geographical factors negatively affect student performance and this situation reduces interest in the lessons.

Parent apathy was identified as another important factor affecting student achievement. Teacher coded "2012_Teacher22" stated that parents' indifference limited the success of students and students who had difficulty in the class had problems in the transition to the next subject.

Finally, teachers' inadequacy in experimentation was another challenging factor that prevented them from carrying out the constructivist learning process effectively. The teacher coded "2012_Teacher6" emphasized that more materials were needed to concretize abstract concepts in science lessons and that teachers considered themselves inadequate in using experimental materials.

2022 results

Teacher views in 2022 reveal in detail the challenges that science teachers face in implementing the constructivist learning approach. These challenges depend on pedagogical preferences as well as the physical infrastructure of schools, curriculum arrangements, and support for distance education processes.

Time management problems are a common concern among teachers. The teacher coded "2022_Teacher1" stated that although they acted by the general objectives of the curriculum, they found it difficult to allocate time for in-depth learning and practice due to the high number of learning outcomes and short duration. In addition, teachers coded "2022_Teacher3" stated that they encountered factors such as lack of time and the difficulty of group work to gather students. The teacher coded "2022_Teacher11" stated that she had to hurry at grade levels where the time for topic distribution was limited.

Curriculum intensity is another obstacle faced by teachers. Teacher coded "2022_Teacher4" emphasized that the intensity of the 6th-grade curriculum led teachers to learn systems without learning the cell subject and that this situation was not logical.

Efforts to maintain teaching practice in the distance education process are also a significant source of difficulty among teachers. The teacher coded "2022_Teacher5" stated that the difficulties encountered in the distance education process constitute an important obstacle for teachers to

implement the constructivist learning approach. In particular, she mentioned the difficulties in interacting with students and applying the constructivist learning approach.

The implementation of experiments in limited time and possibilities limits the chance for students to experience the outcomes and prevents teachers from using this method fully. The teacher coded "2022_Teacher12" revealed the difficulties in providing students with practical experiences by stating that they had to solve questions instead of experiments.

Similarly, inadequacy of materials leads to loss of time due to the lack of textbooks and the search for extra materials. As the teacher coded "2022_Teacher15" stated, the inadequacy of the textbook causes difficulty and waste of time. It can be said that the search for extra assignments and materials reflects the teachers' efforts to overcome the lack of resources. The teacher coded "2022_Teacher6" stated that he thought that there was inadequacy in associating the skills in the acquisitions with daily life and that arrangements should be made in this area.

2. Teaching Methods and Techniques Used by Science Teachers in Their Lessons

2012 results

In the study, the teaching methods used by science teachers in 2012 included various strategies. Methods such as lecture, question-answer, laboratory, concept map, discussion, problem-solving, demonstration, drama, brainstorming, case study, project, and guess-observe-explain are among the strategies frequently preferred by teachers. Most of the teachers stated that they taught most of their lessons with the lecture method, especially for reasons such as overcrowded classes and the lack of information. For example, the teacher coded "2012_Teacher1" emphasized that this method is often a compulsory option with the statement "We can inevitably prefer lecture to teach some concepts".

There are also opinions that subject expression is preferred with visual elements such as projection and presentation. The teacher coded "2012_Teacher3" argued that transferring information to students through visual means can realize a more effective recording process in the brain.

Question-answer method came to the fore as a frequently used strategy to attract student interest and to repeat the subject. Teacher coded "2012_Teacher11" stated that this method was effective in increasing student participation with the statement "Question-answer method attracts children's attention more".

Interactive methods such as discussion and brainstorming were also used. While the teacher coded "2012_Teacher8" adopted the discussion method by asking questions to the class, the teacher coded "2012_Teacher18" applied the brainstorming method to ask questions to the students with the Socratic method and to enable them to find answers.

2022 results

According to 2022 teachers' views, science teachers show diversity in evaluating the teaching methods and techniques they apply in their lessons. The teacher-coded "2022_Teacher1" aims for students to understand the subjects more deeply by preferring inquiry-based methods such as argumentation, question-answer, and case study. The teacher coded "2022_Teacher3", on the other hand, aims to attract students' attention and achieve more active participation and applies methods such as argumentation, discussion, question-answer, problem solving and six thinking hats in his lessons.

Teachers coded “2022_Teacher4”, “2022_Teacher6” and “2022_Teacher15”, try to provide students with concrete experiences by emphasizing experiments and observations, aim for students to comprehend science subjects in more depth. Teachers coded “2022_Teacher5”, “2022_Teacher7” and “2022_Teacher8”, who adopt project-based learning approaches, aim to develop students' problem-solving skills. Teachers coded “2022_Teacher5” and “2022_Teacher16” emphasized the difficulties in this process by stating that the lecture method is compulsory in the distance education process.

3. Laboratory Use and Access Difficulties of Science Teachers in Their Lessons

2012 results

A 2012 study revealed important results about science teachers' laboratory use and access difficulties in their lessons. The questions asked to the teachers in the study showed that laboratory use tends to take place in the classroom and most of them perform experiments in the classroom or with the equipment they provide themselves instead of the laboratory. Some teachers do not conduct experiments. The majority of the teachers who conducted experiments stated that they could only conduct experiments in their classrooms. They attributed this situation to reasons such as the fact that the laboratory equipment was old, taking students to the laboratory caused a waste of time and the class size was not suitable for laboratory use. Some teachers also mentioned the lack of a laboratory, the difficulty of student control, and the inadequacy of science teachers in terms of experimentation.

The teachers stated that they carried the experimental materials to the classroom and presented them by demonstration method due to the time loss of going to the laboratory and the lack of a laboratory. However, due to the difficulty of providing materials for each student, they stated that they usually presented the experiments in the form of a demonstration. For example, teacher coded “2012_Teacher5” stated that he did not go to the laboratory but carried the materials to the classroom and performed experiments by demonstration method, while teacher coded “2012_Teacher8” emphasized that it was useless to carry the experimental materials to the classroom and that each student needed a microscope, but that applying this method created time problems. The teachers stated that they provided the experimental materials from the students or by their means. For example, the teacher coded “2012_Teacher5” stated that he requested materials from the students and thus, he provided the experimental materials easily.

2022 results

According to the 2022 teachers' views, the results on science teachers' laboratory use reflect their experiences in accessing laboratory materials. Among the teachers, some can easily obtain materials, as well as those who have difficulty in finding certain materials. This situation causes teachers to face various limitations in their experiments. Teachers resorted to different alternative methods to obtain laboratory materials and tried to make the most effective use of the available resources. For example, a group of teachers, such as “2022_Teacher5”, “2022_Teacher7” and “2022_Teacher9”, procure laboratory materials with their means and even create some materials themselves to enrich their lessons.

The majority of teachers emphasized the importance of using the laboratory regularly in their lessons. However, teachers with limited laboratory facilities face some difficulties in accessing tools and equipment. Teachers in schools with no or inadequately equipped laboratories endeavor to obtain tools and equipment with their efforts. Teachers such as “2022_Teacher1”, “2022_Teacher2”, “2012_Teacher6”, “2012_Teacher7”, “2012_Teacher12” and “2022_Teacher20” stated that they had difficulties in accessing laboratory equipment. Teachers such as “2022_Teacher21”, who can use the laboratory but have certain difficulties in the supply of chemical substances, stated that it is especially difficult to find substances such as acid and base.

4. Measurement Tools Used by Science Teachers in Their Lessons

2012 results

The 2012 opinions of science teachers about the assessment tools they use in their lessons clearly show how various assessment methods are applied in the classrooms. Teachers generally prefer written exams when determining assessment tools. Behind this preference, there are reasons such as the difficulty of assessing students in crowded classes and the practicality of written exams. For example, teacher coded "2012_Teacher4" stated that it is not possible to evaluate student activities one-to-one in crowded classes and therefore they prefer collective assessment. Similarly, teacher coded "2012_Teacher8" stated that keeping a portfolio file is time-consuming and written exams are more practical.

However, other teachers prefer alternative methods instead of classical measurement tools. Teacher coded "2012_Teacher8" emphasized that the concept map was effective in showing students the relationships between concepts and that it was an important tool in eliminating misconceptions. In addition, teacher coded "2012_Teacher10" preferred to use peer assessment to increase student interaction, and teacher coded "2012_Teacher30" stated that it is important for students to make projects and posters to improve their visual understanding.

2022 results

The 2022 teachers' views show the diversity in teachers' approaches to assessment tools and the reasons for using them. For example, teacher-coded "2022_Teacher1" aims to evaluate student performance in detail by using rubrics. Teacher "2022_Teacher3" uses tools such as fishbone, descriptive branched tree, and multiple choice by the grade level. However, it was stated that the teacher coded "2022_Teacher6" emphasized traditional tests and exams and did not use alternative assessment tools. In this case, it is understood that the teacher feels deficient in terms of measurement tools.

The teacher coded "2022_Teacher7" adopts the in-class situation assessment approach and uses digital and short-term assessments. The teacher-coded "2022_Teacher10" makes students repeat the topics at the end of the lesson. Teacher "2022_Teacher12" encourages self-assessment by using assessment scales with students.

Finally, teacher "2022_Teacher21"'s preference for not using alternative assessment tools was due to reasons such as unfairness and time constraints. This situation points to the teacher's difficulties in selecting assessment tools suitable for his/her classroom dynamics and student profile. This diversity shows that there are differences in teachers' approaches and practices to assessment tools.

Conclusion and Discussion

This study examined the implementation processes of the constructivist learning approach, the difficulties encountered, teaching methods, laboratory use, and attitudes towards measurement tools based on the views of science teachers in 2012 and 2022.

In 2012, inadequate physical conditions, low levels of readiness, geographical factors, lack of parental interest, and teachers' lack of experience were identified as factors preventing the effective implementation of the constructivist learning approach. In 2022, new challenges such as distance education emerged, and problems such as time management concerns, interaction limitations affecting efforts to achieve general goals, and curriculum intensity came to the fore in this process. According to Pınar's (2018) study, problems such as insufficient time allocated for the lesson, crowded classrooms, students' lack of readiness, and irresponsible behaviors became evident. According to Özdemir's (2006) study, students' unpreparedness for the lesson, parents' indifference, teachers' difficulties in

adapting to the new program and inadequate school conditions were stated as the reasons preventing the implementation of the constructivist approach. According to Geçer and Özel's (2012) study, primary school science teachers experienced time problems caused by intensive activities, and according to Doğan's (2010) study, in the implementation of the science curriculum, teachers stated that they had insufficient time to implement different activities in the classroom and to do activities in which students were active in the lesson. These findings point out the common difficulties teachers face in the implementation of the constructivist approach. The findings show that the current study is compatible with similar studies in the literature.

In 2012, teachers stated that they generally taught their lessons with the lecture method due to reasons such as crowded classrooms and low readiness levels of students. However, in 2022, teachers' efforts to diversify teaching methods are noteworthy. The emphasis on inquiry-based methods such as argumentation, discussion, and problem-solving reflects the effort to provide students with a more effective learning experience. According to Özdemir's (2006) study, the majority of science teachers still use traditionalist methods, such as lecture, note-taking, question and answer, and experimentation. According to Yılmaz's (2017) study, it was observed that the "lecture" method is still a common preference among science teachers, but there is a tendency towards new techniques. While this situation shows that teachers tend to adapt to the constructivist approach over time, there is a situation that contradicts the results of Önen et al. (2008). According to Önen et al. (2008), teachers exhibit a more idealistic approach in the first years of their professional experience and they are advantageous in using different, effective teaching methods and teaching materials in this period.

The findings regarding laboratory usage focus on the inadequacy of laboratory facilities and the difficulty of student control in 2012, whereas in 2022, there is observed diversity in access to laboratory materials among teachers. This situation reflects the resource inequality between schools and the various efforts of teachers to find solutions. According to Doğan's (2010) study, science and technology teachers considered factors such as classroom overcrowding and the physical condition of laboratories as problems. Kubat's (2015) study determined that teachers tend to conduct experiments in classrooms, and there is a low number of teachers actively using the laboratory. Additionally, it was found that experiments are mostly conducted as demonstration experiments. In the research by Temur and Geçer (2010), teachers expressed that the allocated time for laboratory practices is insufficient. All these findings align with the results of the current study.

Teacher attitudes toward assessment tools have evolved. In 2012, teachers' preference for written exams was based on reasons such as the difficulty of evaluating students in crowded classrooms and the practicality of written exams. In Pınar's (2018) study, it was determined that science teachers frequently use traditional assessment tools and rarely use alternative measurement instruments. Similarly, in the study by Buluş Kırıkkaya (2009), teachers were reported to infrequently use alternative assessment tools, providing excuses such as the time-consuming nature of alternative assessment activities and teachers' reluctance to break away from old habits. According to Gelbal and Kelecioğlu (2007), the reluctance of teachers to use methods based on student assessment in determining student success stems from concerns that errors may be introduced into measurement results. However, in 2022, diversity is observed in teachers' approaches to assessment tools; various preferences for alternative measurement tools have emerged, such as using rubrics and detailed assessment in addition to traditional tests and exams. This situation indicates that teachers are adopting a more flexible and multidimensional approach in their assessment processes.

Based on the results of this study, the following recommendations can be presented:

- Further studies should explore the evolution of teachers' professional experiences over time, and in-depth analyses should be carried out to understand the factors in the process of adapting to the constructivist approach.

- To address inequalities in access to laboratory facilities, a fair policy in the distribution of resources among schools should be adopted.
- Support should be provided for teachers to access the necessary materials to effectively use the laboratory, and efforts should be made to improve the physical condition of laboratory facilities.
- Guidance should be provided to teachers on developing strategies to increase student readiness levels for the effective implementation of the constructivist learning approach.
- To cope with issues such as curriculum intensity and insufficient time allocated for lessons, teachers should recommend effective planning and pedagogical strategies to achieve learning objectives.

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References

Bada, M., & Kırpık, C. (2021). Sosyal bilgiler öğretmenlerinin yapılandırmacı yaklaşıma dair öz yeterlik algıları ve buna etki eden faktörlere ilişkin görüşleri. *IBAD Sosyal Bilimler Dergisi,* (9), 462-480. https://doi.org/10.21733/ibad.846169

Buluş Kırıkkaya, E. (2009). İlköğretim okullarındaki fen öğretmenlerinin fen ve teknoloji programına ilişkin görüşleri. *Türk Fen Eğitimi Dergisi, 6*(1), 133-148. http://tused.org/index.php/tused/article/view/113 adresinden erişilmiştir.

Creswell, J. W. (2005). *Qualitative inquiry and research design: Choosing among five traditions.* Thousand Oaks, CA: Sage Publications.

Doğan, Y. (2010). Fen ve Teknoloji Dersi Programının Uygulanması Sürecinde Karşılaşılan Sorunlar. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi, 7,* 86-106.

Eskici, M. (2017). Okul yöneticilerinin yapılandırmacı yaklaşım temel alınarak geliştirilen öğretim programlarının uygulanmasına yönelik görüşleri. *İnönü Üniversitesi Eğitim Fakültesi Dergisi, 18*(2), 16-32. https://doi.org/10.17679/inuefd.323373

Geçer, A., & Özel, R. (2012). İlköğretim Fen ve Teknoloji Dersi Öğretmenlerinin Öğrenme-Öğretme Sürecinde Yaşadıkları Sorunlar. *Educational Sciences: Theory & Practice, 12* (3), 2237-2261.

Gelbal, S., & Kelecioğlu, H. (2007). Öğretmenlerin ölçme ve değerlendirme yöntemleri hakkındaki yeterlik algıları ve karşılaştıkları sorunlar. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 33,* 135-145.

Gilakjani A. P., Leong L., & Ismail, H. N. (2013). Teachers' use of technology and constructivism. *I. J. Modern Education and Computer Science, 4*, 49-63.

Güven, K., & Genç, E. (2024). Öğretmenlerin Yapılandırmacı Yaklaşımı Uygulamaya Yönelik Öz-yeterlik İnançlarının İncelenmesi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi*, *24*(1), 363-388.

Holland, J., Thomson, R., & Henderson, S. (2006). *Qualitative longitudinal research: A discussion paper*. London: London South Bank University.

Jadallah, E. (2000). Constructivist learning experiences for social studies education. *The Social Studies, 91*(5), 221-225. https://doi.org/10.1080/00377990009602469

Kalpana, T. (2014). A Constructivist perspective on teaching and learning: A conceptual framework. *International Research Journal of Social Sciences*, *3*(1), 27-29.

Kubat, U. (2015). Fen bilimleri öğretmenlerinin laboratuvarı kullanımını ve deneylerin yapılış şeklinin değerlendirilmesi, *Akademik Sosyal Araştırmalar Dergisi*, *3*(17), 314-321.

Kumar, M. (2006). Constructivist epistemology in action. *The Journal of Educational Thought, 40*(3), 247-261.

Miles, M., & Huberman, A. M. (1994). *Qualitative Data Analysis*. Thousand Oaks, CA: Sage Publications.

Mills, G. E. (2003). *Action Research A Guide for the teacher researcher* (2nd. edition). Pearson Education, Boston.

Nakiboğlu, C. (1999). Kimya öğretmeni eğitiminde bütünleştirici (constructivist) öğrenme modelinin öğrenci başarısına etkisi. *DEÜ Buca Eğitim Fakültesi Dergisi Özel Sayı, 11*, 271-280.

Naylor, S., & Keogh, B. (1999). Constructivism in classroom: Theory into practice. *Journal of Science Teacher Education, 10*, 93-106.

Önen, F., Saka, M., Erdem, A., Uzal, G., & Gürdal, A., (2008), Hizmet içi eğitime katılan fen bilgisi öğretmenlerinin öğretim tekniklerine ilişkin bilgilerindeki değişimin tespiti: Tekirdağ örneği, *KEFAD, 1*(9), 45-57.

Özdemir, N. (2006*). İlköğretim II. kademedeki fen bilgisi öğretiminde yaşanan sorunlar ve çözüm önerileri*. (Yayınlanmamış yüksek lisans tezi). Pamukkale Üniversitesi Fen Bilimleri Enstitüsü, Denizli.

Özden, Y. (2020). Öğrenme ve öğretme (13. Baskı). Ankara: Pegem Akademi?

Paker, T. (2015). Durum Çalışması. Seggie F. N. ve Bayyurt Y. (Ed), *Nitel Araştırma Yöntem, Teknik, Analiz ve Yaklaşımları* (119-135). Ankara: Anı Yayıncılık.

Pınar, M. A. (2018). Fen bilimleri öğretmenlerinin seçmeli bilim uygulamaları dersi öğretim sürecine yönelik görüşlerinin değerlendirilmesi. *Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi*, (36), 33-48. https://dergipark.org.tr/en/pub/ataunikkefd/issue/38134/404057 adresinden erişilmiştir.

Tanık, M. (2020). *Sınıf öğretmenlerinin yapılandırmacı eğitim modeline ilişkin tutum ve nitelik düzeylerinin incelenmesi*. (Yayınlanmamış yüksek lisans tezi). Kırıkkale Üniversitesi, Sosyal Bilimler Enstitüsü, Kırıkkale.

Temur, A., & Geçer, K. (2010). Fen ve teknoloji öğretmenlerinin laboratuvar uygulamalarında karşılaştıkları bazı güçlüklerin tespiti (Van ili örneği). *Yüzüncü Yıl Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 15*(1), 82-88.

Titiz, O. (2005). *Yeni öğretim sistemi*. İstanbul: Zambak Yayınları.

Varış, F. (1996): *Eğitimde program geliştirme: Teoriler ve teknikler*. Ankara: Alkım Kitapçılık Yayıncılık.

Yıldırım, A., & Şimşek, H. (2021). *Sosyal bilimlerde nitel araştırma yöntemleri* (12. Baskı). Ankara: Seçkin Yayıncılık.

Yılmaz, Ö. (2017). Fen öğretmenlerinin tercih ettikleri öğretim strateji, yöntem ve teknikler: fen öğretmen adaylarının düşünceleri. *Iğdır Üniversitesi Sosyal Bilimler Dergisi*, (12), 493-510.

Yürüdür, E., & Cımbız, T. C. (2017). Sosyal Bilgiler öğretmenlerinin yapılandırmacı yaklaşıma dayalı sınıf içi uygulamalarına yönelik görüşleri. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi, 19*(3), 276-300. https://doi.org/10.17556/erziefd.337992

Genişletilmiş Özet

Giriş

Günümüzde bilgi birikiminin hızlı artışı, toplumların değişen ihtiyaçlarına uyum sağlayabilen bireylerin yetiştirilmesini gerektiriyor (Varış, 1996). Bu nedenle, öğrencilerin topluma etkili bir şekilde katkıda bulunmalarını sağlayacak bilgi, beceri, davranış ve değerleri geliştirmeye odaklanan bir eğitim anlayışı önemli hale gelmiştir (Jadallah, 2000).

Milli Eğitim Bakanlığı (MEB), 2004 yılından itibaren öğrenci-merkezli yapılandırmacı bir öğrenme yaklaşımını benimsemeye başlamıştır. Bu yaklaşım, öğrencilerin derslere aktif katılımını teşvik eder ve araştırma yapmalarını, fikirleri sorgulamalarını ve tartışmalarını sağlar. Bu yaklaşım, eğitim sistemine yeni bir vizyon kazandırmıştır (Titiz, 2005).

2005 Fen ve Teknoloji dersi öğretim programında, öğrencilerin bilgiyi pasif bir şekilde kabul etmek yerine, bu bilgiyi kendi deneyimleriyle bütünleştirerek yeniden yapılandırmaları vurgulanmaktadır (Özden, 2020). Bu yaklaşım, öğrencilerin bilgileri yalnızca kabul etmekle kalmayıp aynı zamanda onları yorumlayarak anlam oluşturmalarını hedefler (Yıldırım ve Şimşek, 2021).

Araştırmalar, yapılandırmacı öğrenme yaklaşımının temel unsurları olan aktif katılım, öğrenci merkezli öğrenme ve fen öğrenme üzerine odaklandığını gösteriyor. Ancak, öğretmenlerin bu yaklaşımı uygulamada zorluklar yaşadığı ve hazır olmadıkları tespit edilmiştir (Yürüdür ve Coşkun Cımbız, 2017; Eskici, 2017). Diğer çalışmalar da öğretmenlerin staj eğitimlerinin yetersiz olduğunu ve hizmet içi eğitimlerin etkili olmadığını ortaya koymuştur (Bada ve Kırpık, 2021; Tanık, 2020).

Yapılandırmacı öğrenme yaklaşımı, öğrencilerin daha etkin bir şekilde öğrenmelerini sağlar. Ancak, öğretmenlerin bu yaklaşımı uygulamalarında kritik bir rol oynamaktadır. Öğretmenlerin görevleri arasında öğrenme sorumluluğunu paylaşmak, farklı düşünme biçimlerini teşvik etmek ve öğrencilere rehberlik etmek bulunmaktadır (Nakiboğlu, 1999; Gilakjani, Leong ve Ismail, 2013; Kalpana, 2014; Özden, 2020). Bu öğretim programının uygulanmasıyla ilgili bir dizi araştırma gerçekleştirilmiş olmasına rağmen, yapılandırmacı yaklaşımın öğretmenler tarafından istenilen düzeyde uygulanamadığına dair bir sonuca varılmıştır. Bu çerçevede, çalışmanın hedefi Fen Bilimleri öğretmenlerinin yapılandırmacı yaklaşımın sınıf içi uygulamalarına yönelik görüşlerini 2014 ve 2022 yıllarındaki iki ayrı dönemde boylamsal olarak inceleyerek karşılaştırmalı bir şekilde ortaya koymaktır.

Yöntem

Araştırmanın amacı, Fen Bilimleri öğretmenlerinin yapılandırmacı yaklaşımı sınıf içinde nasıl uyguladıklarını 2012 ve 2022 yıllarında karşılaştırmalı bir şekilde incelemektir. Bu amaçla, durum çalışması deseni kullanılmıştır. Çalışma grubu, farklı yerleşim yerlerindeki (il, ilçe, köy) ve farklı hizmet sürelerine sahip 30 fen öğretmeni ile 2012'de yüz yüze görüşmeler yapılmıştır. Ancak, 2022'de pandemi nedeniyle sadece 22 öğretmene e-posta yoluyla ulaşılabilmiştir. İki veri toplama aşamasında da öğretmenlere aynı sorular yöneltildi. Araştırma etiği gereği öğretmenlerin isimleri kullanılmamış, onlara kodlar verilmiştir. Açık uçlu sorularla öğretmenlerin yapılandırmacı yaklaşımı nasıl uyguladıkları tespit edilmeye çalışılmıştır. 2012'de yüz yüze yapılan görüşmeler, 2022'de internet aracılığıyla gerçekleştirilmiştir. Görüşmeler için ilgili literatür taranmış ve açık uçlu sorular belirlenmiştir. Ayrıca, uzmanlar tarafından incelenen sorular düzeltilmiş ve daha anlaşılır hale getirilmiştir. Araştırma soruları kişisel bilgiler ve yapılandırmacı yaklaşıma ilişkin sorulardan oluşmaktadır.

Araştırmada, öğretmenlerin verdiği yanıtlar betimsel analiz tekniği ile değerlendirilmiştir. Görüşmelerden elde edilen verilere dayanarak temel boyutlar tespit edilmiş ve bu boyutlar üzerinden veriler yorumlanmıştır. Araştırmacılar, öğretmenlerin soruları düzenli olarak yanıtladığını gözlemlemiştir.

Araştırmada geçerlik ve güvenirlik kavramları yerine inandırıcılık, aktarılabilirlik, tutarlılık ve teyit edilebilirlik kavramları kullanılmıştır. İnandırıcılık için araştırmacılar objektif olmaya özen göstermiş ve öğretmenlerin yanıtlarına müdahale etmemiştir. Tutarlılık için veriler ayrı ayrı kodlanmış ve güvenirlik düzeyi %81 olarak hesaplanmıştır. Aktarılabilirlik için çalışmanın her aşaması detaylı olarak açıklanmış ve bulgular detaylı bir şekilde betimlenmiştir. Teyit edilebilirlik için elde edilen veriler ve kodlamalar saklanmıştır.

Sonuç

Bu çalışma, 2012 ve 2022 yıllarında fen bilimleri öğretmenlerinin görüşlerine dayanarak yapılandırmacı öğrenme yaklaşımının uygulanma süreçlerini, karşılaşılan zorlukları, öğretim yöntemlerini, laboratuvar kullanımını ve ölçme araçlarına yönelik tutumları analiz etmektedir.

2012 yılında, fiziki koşulların yetersizliği, öğrencilerin düşük hazır bulunuşluk düzeyi, coğrafi faktörler, veli ilgisizliği ve öğretmenlerin deney yetersizliği gibi etkenler, yapılandırmacı öğrenme yaklaşımının etkili bir şekilde uygulanmasını engellemiştir. Buna karşın 2022 yılında, uzaktan eğitim gibi yeni zorluklar ortaya çıkmıştır; bu süreçte zaman yönetimi endişeleri, etkileşim sınırlamaları ve müfredat yoğunluğu gibi sorunlar öne çıkmıştır.

2012 yılında, öğretmenler genellikle kalabalık sınıflar ve öğrencilerin düşük hazır bulunuşluk düzeyleri gibi nedenlerle derslerini çoğunlukla düz anlatım yöntemiyle işlediklerini ifade etmişlerdir. Fakat, 2022'de öğretmenlerin öğretim yöntemlerini çeşitlendirmeye yönelik çabaları dikkat çekmektedir. Argümantasyon, tartışma ve problem çözme gibi sorgulamaya dayalı yöntemlere vurgu yapılması, öğrencilere daha etkili bir öğrenme deneyimi sunma çabasını yansıtmaktadır.

Laboratuvar kullanımı konusunda, 2012'de laboratuvar olanaklarının yetersizliği ve öğrenci kontrolünün zorluğu vurgulanırken, 2022'de öğretmenler arasında laboratuvar malzemelerine erişimde çeşitlilik olduğu görülmüştür. Bu durum, okullar arasındaki kaynak eşitsizliğini ve öğretmenlerin farklı çözüm arayışlarını yansıtmaktadır.

Ölçme araçlarına yönelik öğretmen tutumları zamanla değişiklik göstermiştir. 2012'de öğretmenlerin yazılı sınavları tercih etmelerinin sebepleri arasında kalabalık sınıflar ve yazılı sınavların pratikliği yer alırken, 2022'de öğretmenlerin ölçme araçlarına yaklaşımlarında çeşitlilik gözlemlenmiştir. Rubrik kullanımı, detaylı değerlendirme ve alternatif ölçme araçlarına yönelik çeşitli tercihlerin artması, öğretmenlerin değerlendirme süreçlerinde esnek bir yaklaşım benimsemeye başladığını göstermiştir.