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Investigation of Science Teachers' Course Processes and Recommendations for Conceptual Understanding of Students with Learning Disabilities[#]

Tufan İnaltekin[1,a,*], Arzu Kirman Bilgin[1,b], Şenay Özen Altınkaynak[1,c], Devrim Erginsoy Osmanoğlu[1,d], Selma Erdağı[1,e]

[1]*Dede Korkut Faculty of Education, Kafkas University, Kars, Türkiye*

**Corresponding author*

Research Article

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ABSTRACT

This research focuses on two main questions: (1) What are the lesson processes implemented by science teachers in classes with students with learning disabilities (SLD) regarding concept teaching within the scope of reproduction, growth, and development in plants and animals? and (2) What are the activity suggestions of science teachers regarding concept teaching within the scope of the subject of reproduction, growth, and development in plants and animals in classes with SLDs? Accordingly, the study aims to explore multiple cases. Therefore, a case study design was adopted. The participants consisted of 15 science teachers who teach seventh-grade SLDs. Data were collected through classroom observations and individual interviews for the first research question, and through focus group interviews for the second. Observations were carried out over 12 lesson hours within the scope of the relevant subject by two science teachers who also participated in the individual interviews. Individual and focus group interviews were conducted face-to-face. The context of the observations and interviews was framed by local examples in Kars and its surroundings: geese, bees, and cows under the animal category, and kavılca wheat and greenhouse products under the plant category. The data were analyzed using descriptive and content analysis methods. The findings revealed that science teachers did not utilize the support education room for SLDs. Instead, they predominantly relied on lecture-based and project-based teaching methods, but generally did not evaluate the project assignments they provided. The teachers recommended activities such as field trips, observation, learning by doing and experiencing, drawing, and frequent repetition to enhance the conceptual understanding of SLDs within the relevant subject matter.

Keywords: Science, science teacher, students with learning disabilities, conceptual understanding, course processes.

Fen Bilimleri Öğretmenlerinin Öğrenme Güçlüğü Olan Öğrencilerin Kavramsal Anlamalarına Yönelik Yürüttükleri Ders Süreçlerinin ve Önerilerinin İncelenmesi[#]

Bilgi
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ÖZ

Bu araştırma, "Öğrenme Güçlüğü Olan Öğrencilerin (ÖGOÖ) bulunduğu sınıflarda fen bilimleri öğretmenlerinin bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konusu kapsamında kavram öğretimine yönelik yürüttükleri ders süreçleri nasıldır?" ve "Fen bilimleri öğretmenlerinin ÖGOÖ' nün yer aldığı sınıflarda bitkiler ve hayvanlarda üreme, büyüme ve gelişme konusu kapsamında kavram öğretimine yönelik etkinlik önerileri nelerdir?" şeklindeki iki araştırma sorusuna odaklanmaktadır. Bu kapsamda araştırmada çoklu durumların ortaya çıkarılması hedeflenmektedir. Bu nedenle araştırma sürecinde durum çalışması temel alınmıştır. Çalışmaya, yedinci sınıf ÖGOÖ'nün fen bilimleri dersini yürüten on beş fen bilimleri öğretmeni katılmıştır. İlk araştırma sorusu kapsamında sınıf içi gözlemler ve bireysel görüşmelerden, ikinci araştırma sorusu kapsamında ise odak grup görüşmeleri yoluyla veriler elde edilmiştir. Gözlemler, bireysel görüşmelere katılan iki fen bilimleri öğretmeninin katılımıyla ilgili konu kapsamında 12 ders saati boyunca yürütülmüştür. Bireysel ve odak grup görüşmeleri fen bilimleri öğretmenleriyle yüz yüze gerçekleştirilmiştir. Gözlem ve görüşmeler, Kars ve çevresi bağlamında; hayvanlar başlığı altında "kaz, arı ve inek", bitkiler başlığı altında ise "kavılca buğdayı ve sera ürünleri" konularını kapsayacak şekilde gerçekleştirilmiştir. Elde edilen veriler, betimsel ve içerik analizine tabi tutulmuştur. Araştırma sonucunda, fen bilimleri öğretmenlerinin ÖGOÖ için destek eğitim odasını kullanmadıkları; bunun yerine genellikle ders anlatımı ve proje tabanlı öğretim yöntemlerini tercih ettikleri, ayrıca verdikleri proje ödevlerini değerlendirmedikleri belirlenmiştir. Fen bilimleri öğretmenleri, ÖGOÖ'nün ilgili konulardaki kavramsal anlamalarını geliştirmek amacıyla; gezi-gözlem, yaparak-yaşayarak öğrenme, çizim yapma ve sık tekrar yapmayı içeren etkinlikleri önermektedir.

Anahtar Kelimeler: Fen bilimleri, fen bilimleri öğretmeni, öğrenme güçlüğü olan öğenciler, kavramsal anlama, ders süreçleri.

[a] *inaltekintufan@gmail.com* *https://orcid.org/0000-0002-3843-7393*
[b] *arzukirmanbilgin@gmail.com* *https://orcid.org/0000-0002-5588-7353*
[c] *ozensenay@gmail.com* *https://orcid.org/0000-0002-6614-4168*
[d] *erginsoy@hotmail.com* *https://orcid.org/0000-0003-4698-7499*
[e] *selma_erdagi@hotmail.com* *https://orcid.org/0000-0003-0235-2678*

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Introduction

Science education inherently involves the teaching of abstract and theoretical concepts. While this is a challenging process even for typically developing students, it becomes more complex for SLDs (Brigham et al., 2011). This is because students with learning disabilities experience difficulties not only in reading comprehension but also in reasoning processes (American Psychiatric Association, 2013). Understanding science concepts helps SLDs cope with the problems they encounter in their daily lives (McGrath & Hughes, 2018). Learning science concepts during middle school also helps SLDs understand more difficult and complex science topics they will encounter in higher grades. Ensuring conceptual understanding in science supports the development of their scientific thinking skills (Çoruhlu & Pehlevan, 2021). Science is one of the subjects taught by relating it to students' daily lives. In this way, it is important for conceptual understanding to make students realize that the knowledge they learn can be useful not only at school but also in every area of their lives (Ke et al., 2021). SLDs begin to understand their environment, the world, and their daily lives better through science topics. This knowledge helps students make more conscious and responsible decisions (Er Nas et al., 2022). Ensuring conceptual understanding in science lessons also develops students' skills such as creative thinking (Yang & Zhao, 2021), critical thinking (Zulyusri et al., 2023), making social and cultural connections (Brush et al., 2022), and gaining awareness of societal and environmental issues (Cwik & Singh, 2022). For SLDs, acquiring these skills is crucial in facilitating their lives (Kramer et al., 2021). SLDs often have lower self-confidence compared to their peers (Alkhasawneh et al., 2022). Learning science concepts facilitates the problem-solving process for these students, allowing them to experience a sense of achievement (Er Nas et al., 2022). It is emphasized that science topics are an important tool for acquiring the aforementioned needs and requirements for SLDs (Brigham et al., 2011). Reproduction, Growth, and Development in Plants and Animals (RGDPA) can be seen as one of these science topics. This topic is one of the areas where students face difficulties in conceptual understanding (Wennersten et al., 2023). Students are unable to relate the reproductive processes of plants and animals to concrete examples (Barrutia & Diez, 2021; Hartik et al., 2021).Due to the complexity inherent in analyzing the large number of reproductive types (Fernandez Gonzalez & Franco Mariscal, 2021), the difficulty of teaching in class due to the long duration of growth and development processes (Pany et al., 2024), the inclusion of microscopic concepts (Gabdulinova & Kovrova, 2021), and the lack of opportunities for observation in nature (Schilhab, 2021), it becomes challenging for students to grasp this subject. This difficulty in understanding the topic also hinders the development of life skills such as entrepreneurship, creative thinking, communication, and teamwork (Özen Altınkaynak et al., 2025). Providing examples from events and phenomena observed in the students' local area for the subject of science makes the science lesson more effective, engaging, and understandable (Saljö, 2023). Such an approach helps to make the conceptual knowledge related to science more lasting for these students (Treagust & Duit, 2008; Şanal et al., 2025).

It can be said that ensuring the conceptual understanding of the subject for SLDs will ease their future social and economic lives. This is because the topic of plant and animal reproduction includes fundamental knowledge for agriculture and livestock-based industries in the geographical areas where students live. Therefore, teaching the subject of plant and animal reproduction in middle school requires a high-quality instructional process. These types of lesson processes will provide a foundation for students with learning disabilities to develop entrepreneurship skills and shape their economic lives in adulthood (Williams & Dixon, 2013). The role of science teachers is crucial in providing instructional adaptations that are suitable for the characteristics of students with special educational needs (Gokool Baurhoo & Asghar, 2019; Kaya et al., 2022; Mason & Hedin, 2011). To facilitate the learning processes of concepts addressed together with typically developing students in the classrooms of SLDs, teachers should use instructional adaptations such as concretization and visualization (Ogunleye, 2019), using simple and understandable language (Therrien et al., 2011a), frequent repetition (Ergül, 2023), analogy (Al-dhaimat et al., 2022), conducting hands-on activities (Lovitt & Horton, 1994), activities that engage multiple senses (Steele, 2004), nature observations (Maroney et al., 2003), and providing real-life examples (İnaltekin & Erginsoy Osmanoğlu, 2023). This is important because these students struggle with conceptual understanding, despite having the same intellectual abilities as their peers (Pierangelo & Giuliani, 2006). The optimal use of SLDs' capacities through instructional adaptations is important for conceptual understanding (Harwell & Jackson, 2008). In this context, determining the lesson processes of science teachers in classrooms with SLDs is believed to help understand the causes of the difficulties these students face in conceptual understanding. Identifying the lesson processes of science teachers is also thought to assist educational policymakers in determining the best approach to improve the quality of teaching processes. Although research on the conceptual understandings of SLDs in science is limited, there are studies available in the relevant literature. Instruction based on inquiry-based teaching has been found to have a positive effect on academic success in topics such as magnetism and electricity (Aydeniz et al., 2012; Scruggs et al., 1993), rocks and minerals (Scruggs et al., 1993), and ecology (McGrath & Hughes, 2018). Additionally, Griffin et al. (2006) showed that graphic organizers improve academic success regarding fossil fuels while Er Nas et al. (2019) found that

educational games enhance understanding of heat and temperature. Similarly Thornton et al. (2015) demonstrated that collaborative learning improves understanding of plant and animal cells, Marino et al. (2014) revealed that video games help in the learning of living organisms and life, and Marino et al. (2010) found that STEM activities improve academic success in the domains of Earth and the universe for SLDs. Er Nas and Dilber (2020) found that science teachers in classrooms with SLDs generally use experiments found in textbooks and on the internet, with very few teachers conducting lessons in support education classrooms. The topic of RGDPA is also important for implementing garden-based learning processes. This is because garden-based learning is preferred not only for enhancing the academic achievement of students who experience difficulties in learning processes, but also for addressing behavioral disorders (Ruiz-Gallardo et al., 2013). While there have been studies aimed at increasing academic success for typically developing students on the topic of plant and animal reproduction (Serdaroğlu & Güneş, 2019), no research has been identified involving SLDs. Additionally, the lack of data regarding how science teachers use lesson processes and real-life examples in the teaching processes of these students stands out as a significant issue. In this context, the research aims to determine the lesson processes and recommendations of science teachers regarding concept teaching on the topic of plant and animal reproduction in classrooms with SLDs. To this end, the following research questions have been addressed:

1. What are the lesson processes conducted by science teachers regarding concept teaching on the topic of plant and animal reproduction in classrooms with SLDs?

2. What are the activity suggestions of science teachers for concept teaching on the topic of plant and animal reproduction in classrooms with SLDs?

Method

Research Design

This research aims to identify the types of activities in which SLDs in seventh grade participate in the classroom and what types of activities they need for concept teaching within the topic of RGDPA. The reason for addressing the topic of RGDPA is that it is a subject that will enable students to generate business ideas within the scope of agriculture and livestock, and because they will need conceptual knowledge to solve the problems they encounter in the entrepreneurial process. Therefore, the research process follows a qualitative approach aimed at identifying the current situation. This research, conducted using a case study method, is based on a multiple case design. Because this research design allows for an in-depth examination of more than one situation (Johnson & Christensen, 2014). Figure 1 presents the multiple cases addressed by the study's first research question.

Figure 2 presents the multiple cases addressed by the study's second research question.

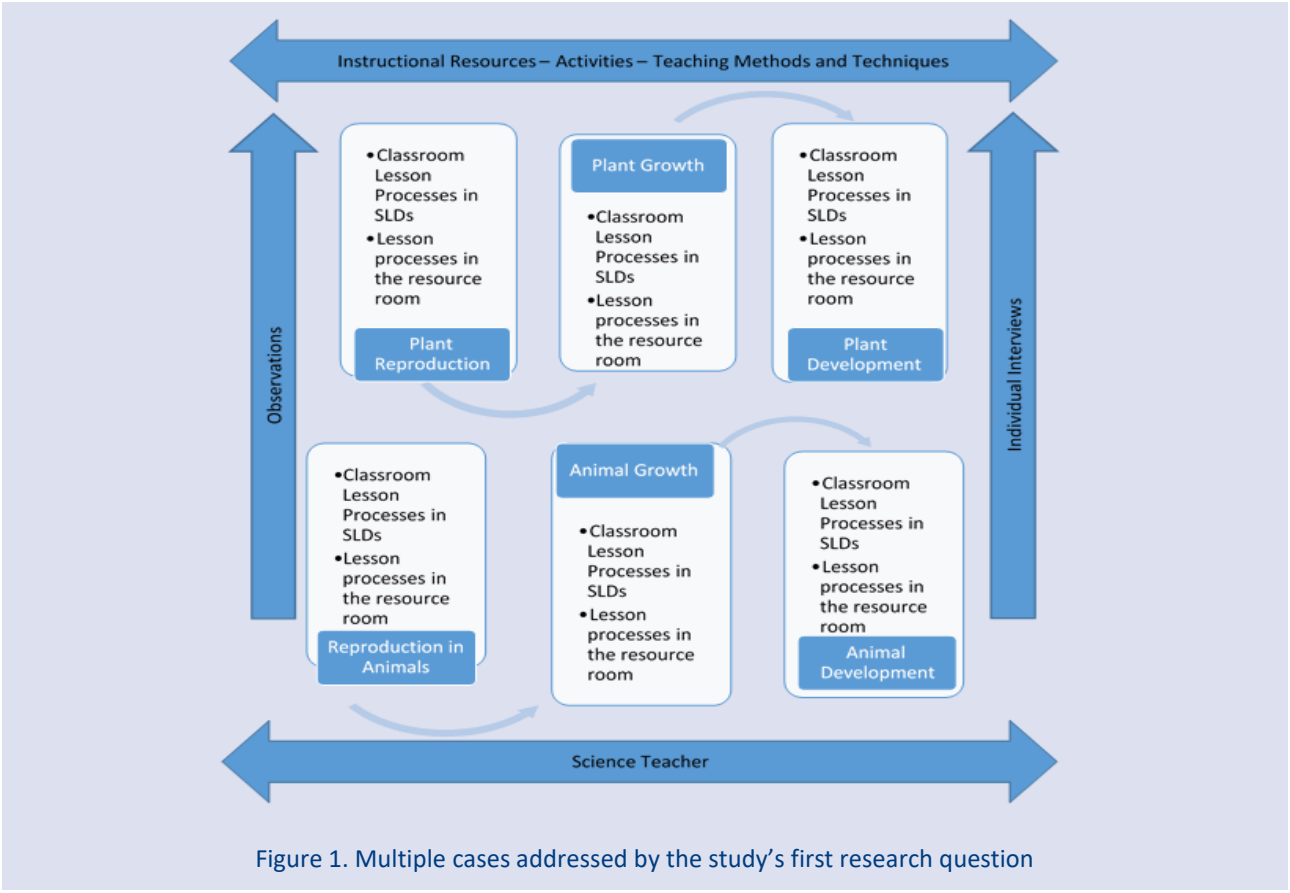

Figure 1. Multiple cases addressed by the study's first research question

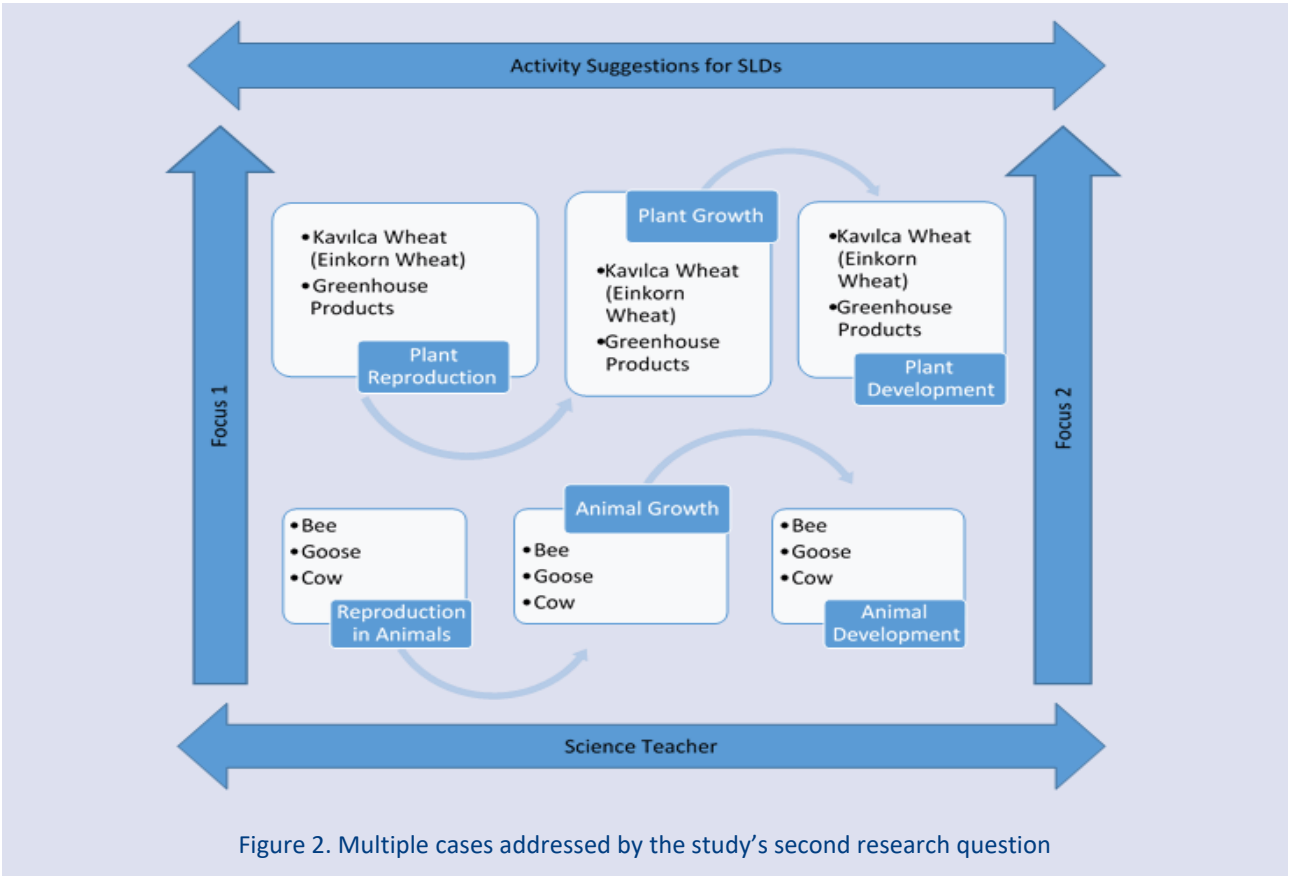

Figure 2. Multiple cases addressed by the study's second research question

Participants

The topic of RGDPA is included in the seventh-grade science curriculum. In selecting the participants, the schools attended by 7th-grade students with Specific Learning Disabilities (SLDs) during the 2022-2023 academic year and the science teachers of these students were first identified through the Guidance and Research Center in the province where the study was conducted. Out of 20 teachers working at these schools, 15 voluntarily participated in the study. The only criterion for participation was that the teacher was responsible for teaching science to 7th-grade students with SLDs. The demographic information of the participants, coded as ST1, ST2, … ST15, is presented in Table 1. In relation to the first research question, individual face-to-face interviews were conducted with 15 teachers, and the instructional processes of F7 and F12 were observed. For the second research question, the participants were randomly assigned to two focus groups (7 and 8 participants, respectively). Three researchers took part in conducting the focus group interviews.

The thesis topics of teachers with postgraduate degrees are different from the related research topic. The participants ST7 (there are 2 students with special educational needs in the class, the class size is 17) and ST12 (there is 1 student with special educational needs in the class, the class size is 22) are currently continuing their master's studies. The two schools where the observations were made are located in the city center. In the province where the research was conducted, crops suitable for the continental climate, such as potatoes, onions, white cabbage, carrots, sugar beets, cereals (wheat, barley, green lentils, chickpeas), beans, corn, and sunflowers, are mostly grown. Cattle and poultry farming are also significant sources of livelihood for the public in the province.

Data Collection Tools

For the first research question, observations and interviews were used. The ten semi-structured questions used in the interviews with science teachers are as follows:

1. How do you teach the topic of reproduction, growth, and development in plants?
2. What examples of plants do you give?
3. Do you have students take care of a plant in your lessons? What practices do you use to have them report on the development process?
4. How do they report? What do you tell them to pay attention to?
5. What do students do with these organisms after the lesson?

(The remaining five questions are adaptations of these questions for animals.)

Table 1. Demographic information of participants

Katılımcı	Gender		Seniority				Graduation			Focus number	
	Female	Male	1-5 Year	6-10 Year	11-15 Year	16 Year and above	Bachelor's degree	Master's degree	Doctorate	1	2
ST1	√				√			√		√	
ST2	√		√					√		√	
ST3		√				√	√			√	
ST4		√		√			√			√	
ST5	√					√		√		√	
ST6	√				√		√			√	
ST7*		√				√	√			√	
ST8	√					√		√			√
ST9		√			√			√			√
ST10		√	√				√				√
ST11		√	√				√				√
ST12*	√		√				√				√
ST13	√				√			√			√
ST14		√				√	√				√
ST15		√				√			√		√

*Science teacher whose class was observed

Table 2. Lesson process observation form

Lesson Observation Guidelines	
Learning objectives of the RGDPA topic.	Take notes of sample teacher and student sentences. Take notes of the activities carried out by the teacher. Take notes of the course resources used by the teacher. Take notes of the teaching methods and techniques used by the teacher. Take notes of the processes carried out individually for students with learning disabilities.
Learning objective 1	
Learning objective 2	
Learning objective 3	
Learning objective 4	

The questions were developed within the framework of the learning objectives of the plant and animal reproduction topic in the seventh-grade science curriculum. These objectives are as follows (Ministry of National Education, 2018a, p.45):

- Compares the types of reproduction in plants and animals. (a. Sexual reproduction types are not covered, but a mention is made with examples of asexual reproduction types. b. Metagenesis (alternation of generations) is not addressed. c. Internal and external fertilization and internal and external development in animals are not covered. A brief mention is made of metamorphosis, viviparity, and egg-laying reproduction.)
- Explains the growth and development processes in plants and animals with examples. (a. An experiment involving dependent, independent, and controlled variables related to the factors affecting seed germination is conducted. b. A flowering plant example is focused on.)
- Explains the key factors that affect growth and development in plants and animals
- Takes care of a plant or animal and reports on its development process.

The individual interviews lasted approximately 40-60 minutes. Only two of the science teachers agreed to have observations during the teaching process of the topic of plant and animal reproduction. The lesson processes of the teachers were observed by two researchers for a total of 12 class hours. The lessons were recorded in audio. The observation form, consisting of semi-structured observation items, is shown in Table 2.

Under the second research question, two focus groups (8+7 participants) were randomly formed from the teachers participating in the study. The interviews lasted 95 minutes for Focus Group 1 and 107 minutes for Focus Group 2. After the questions were posed, each teacher in the focus groups expressed their opinions in turn. While one teacher was expressing their opinion, the other teachers also shared their views. The first question of the interview form for teacher suggestions on conceptual understanding activities is as follows:

1. What types of activities would you suggest to teach the reproduction, growth, and development of wheat (civca) to students with learning difficulties? Can you explain with an example?

(This same question was also asked in the context of bees, cows, greenhouse products, and geese.)

A total of five questions were asked during the focus group discussions. After the research team prepared the draft of the observation form and interview questions, they were submitted for expert evaluation. In this context, revisions were made to the draft form based on the feedback of two academics working in the field of special education (Prof. Dr.), and two academics working in science education (Prof. Dr. and Assoc. Prof. Dr.). Prior to the research, a pilot application of the data collection tools was conducted by interviewing a science teacher and observing their lessons (for four hours).

Data Analysis

The qualitative data obtained through individual and focus group interviews under the research questions were subjected to descriptive and content analysis by three researchers after transcription. After this process, the researchers came together to compare the analysis results. In cases where agreement could not be reached on the codes, the opinion of another researcher was sought. The codes agreed upon were presented to the reader in tables. In multiple case studies, each case is initially described independently. Subsequently, comparisons are conducted across cases to enable generalizations and draw conclusions related to the research focus (Creswell, 2013; Yin, 2014). In this study, the data obtained for each teacher were analyzed separately, and comparisons were made to identify similarities or differences that might emerge between the cases. Additionally, while creating the codes, examples from the teacher's reference to the textbook (Yönter, 2021) during the interviews were also reflected in the findings. Along with the interviews, data were also obtained through observations for the first research question. In Turkey, science lessons are conducted four hours a week. In the schools where observations were made, there are two science lessons within a day. A single observation form was used for both lessons. Therefore, six observation forms were obtained from both teachers. The obtained data were analyzed through content and descriptive analysis.

According to Yıldırım and Şimşek (2008), the characteristics of credibility, transferability, dependability, and confirmability are among the indicators of the validity and reliability of a qualitative study. In this study, credibility was sought to be ensured through the use of data collection methods focused on depth and expert review, in line with the purpose of the research. The use of both individual interviews and classroom observations by the research team for the first research question demonstrates the aim of obtaining in-depth data. To enhance credibility, the observations were conducted by two researchers and the entire research team was involved in the data analysis process.

To ensure transferability, both detailed descriptions and purposive sampling methods were used. The raw data obtained within the scope of the research questions were coded without interpretation and presented to the reader in the findings section, along with example responses. In this way, detailed descriptions contributed to the transferability of the study. Furthermore, the participants of the study were selected through purposive sampling, thus enabling access to a wide range of participants to achieve a general sample. In addition, purposive sampling allowed the emergence of specific cases unique to students with learning difficulties. This process is considered to have increased the transferability of the study.

The data collection tools were developed through collaboration of the entire research team and expert reviews. The involvement of the entire team in data collection and analysis stages, and the reporting of results in accordance with scientific research principlesensured that the findings were interpreted meaningfully and that the research report was completed consistently.

To ensure confirmability, the confirmability audit method needs to be employed (Yıldırım & Şimşek, 2008). In this study, to enable the use of confirmability audits, sample responses obtained from participants through data collection tools were provided to the reader, with indications of the codes and arguments on which they were based, as discussed in the findings section. Additionally, the preservation of raw data by the researcher and its availability for expert review upon request support the confirmability of the study. Moreover, the fact that the research report was derived from a national project is another factor that enhances the confirmability and credibility of the study.

Ethics Committee Approval

Ethics Statement

The study adhered to all ethical standards. Participants were fully informed about the purpose and procedures of the research, their participation was voluntary, and informed consent was obtained. Furthermore, ethical approval was granted by the Kafkas University Social Sciences Ethics Committee (Decision No. 28, dated January 10, 2022) and the Provincial Directorate of National Education (Decision No. E-91782061-605.01-42597186, dated February 3, 2022).

Findings

The findings of the research are presented considering the order of the learning objectives of the RGDPA topic.

Findings from the First Research Question

Within the scope of the first research question, data were collected through individual interviews and in-class observations. First, the findings obtained from the

individual interviews are presented, followed by the findings from the classroom observations. The analysis findings regarding how science teachers teach the topic of RGDPA in the first and sixth questions of the individual interviews are presented in Table 3.

In the context of the first and sixth questions of the individual interviews, it was observed that all science teachers followed the textbook (f=15), utilized the Education Information Network (EIN) for topic explanations (f=4) and problem-solving (f=13) if class time allowed, as indicated by the responses in the respective codes. The findings obtained from the second and seventh questions of the interview are presented in Tables 4 and 5.

It was found that participants, when teaching the topic of reproduction, growth, and development in plants, often used flowers blooming in the streets or gardens, mainly because the topic explanation coincided with the spring months, rather than relying solely on the textbook (ST1-15). Teachers ST2, ST4, ST5, ST9, ST11, and ST13 frequently used these flowers as examples.

It was found that only four participants (ST2, ST3, ST10, ST14) explained the topics of reproduction, growth, and development in animals using real living organisms in the classroom. None of the participants used the outside of the classroom as a learning environment for the topic. The findings obtained from the third and eighth questions of the interview are presented to the reader in Table 6 as shown.

Regarding the fourth and ninth questions of the interview, it was revealed that only the teacher coded ST9 wanted them to use the sample development report example in the textbook. Within the scope of the fifth and tenth questions, the majority of the science teachers answered that they do not follow the living things that the students take care of after the lesson (f=14). The participant coded ST4 reported, “I make an exhibition”. The participants stated that they did not teach with SLDs in the support education rooms because they were too busy. Table 7 shows the instructional processes science teachers employed to foster conceptual understanding in students with learning disabilities.

Table 3. Findings on participants' teaching processes of the RGDPA topic

	Living	Code			Example answers
		Following the textbook	EIN		
			Topic explanation	Evaluation	
Theme	Plants Animals	ST1-15	ST5-8	ST1-7, ST9-12, ST14-15	I follow the headings in the textbook for both plants and animals in order (ST2). I open visuals from EBA and explain the topic from there (ST5). After finishing the topic in the textbook, there are very fun activities on EBA, in the form of games, which the kids really enjoy. I usually do the end-of-topic assessments from here (ST6).

Table 4. Findings on examples used in the context of plants

	Activity type	Code	Example	Teacher	f
Theme	Model	Traditional flower model		ST1, ST2, ST11	3
		Real Model	Lilac, dandelion, beans	ST2, ST4, ST5, ST9, ST11, ST13	6
	Visual	Textbook	Duckweed, eucalyptus, red pepper, dandelion, lily, beans, peach, plum, bean, cherry	ST1-15	15
		Digital media	Kiwi, apples, oranges, pears, peaches, beans	ST5, ST6, ST7, ST8	4
	Oral expression	Economic Income	Tomato, cucumber, poppy, sunflower, olive	ST1, ST7	2
	Written expression	Textbook	Beans, chickpeas, lentils, broad beans, Wheat, rose	ST1-15	15

Table 5. Findings on examples used in the context of animals

	Activity type	Code	Example	Teacher	f
Theme	**Visual**	Textbook	Chick, silkworm, kangaroo-grasshopper, frog, lizard, deer, owl, cow, fish, butterfly, sponge, dolphin, planaria, starfish, trout, sparrow	ST1-15	15
		Digital media	Whale, bat, polar bear, snake, fish, cat, giraffe, starfish, spider, grasshopper, frog, ostrich, penguin, dolphin	ST5, ST6, ST7, ST8	4
	Real-life organism	Household animals	Bird, cat, turtle, fish	ST2, ST3, ST10, ST14	4
	Oral expression	Street animals	Cat, dog	ST3, ST5	2
		Income animals	Chicken, goose, cow	ST1, ST6, ST10	3
	Written expression	Textbook	Squirrel, mouse, hedgehog, bat, frog	ST1-15	15

Table 6. Findings obtained from the activities conducted regarding the care and development process.

Activity type	Teachers	f
Assigning the task of watering ornamental plants or the garden	ST2, ST5, ST15	3
Assigning the task of feeding street animals	ST2, ST13, ST14	3
Conducting an activity of building a greenhouse or planting trees	ST5	1
Having students prepare a poster and then present it	ST10	1
Assigning a project task within the scope of plants (germinating beans, lentils, chickpeas)	ST1, ST2, ST3, ST4, ST6, ST7, ST8, ST11, ST12	9
Assigning a project task within the scope of plants and following up with development reports	ST9	1

Table 7. Findings obtained from the participants' course execution processes

Theme	Participant	Code: Method: Narration	Educational Game	Project-based teaching	Question and answer	Conducting the lesson	Activities for SLDs
Traditional instruction	ST7	√	√	√	√	Starting the lesson with a question - explaining conceptual information verbally - asking questions in the lesson - having students read from the textbook - having students do the evaluation activities in the textbook at the end of the subject - conducting an educational game activity from EBA for evaluation purposes - checking project tasks	Allowing both SLDs to speak once during the lesson Giving the right to speak to both SLOs once in the process of conducting the educational game activity from EBA for evaluation purposes in turn
	ST12	√		√	√	Oral presentation of conceptual information – asking questions in class – giving examples from the textbook using only visuals – having students do end-of-topic evaluation activities in the textbook – having them solve questions from supplementary books – checking project tasks	Giving the SLO (who raised his/her finger for a few of the in-class questions) the floor twice. Solving the questions from the auxiliary books for evaluation purposes according to the order of the students, and giving the students the right to speak once in this process.

Both SLDs in the class of participant coded ST7 did not raise their fingers to answer the in-class questions. It was observed that the teacher gave the other students who raised their fingers the right to speak. It was determined that the lesson flows of the two science teachers observed focused on providing conceptual information, were not based on any teaching model, and proceeded in the form of lecturing and then solving questions. It was revealed that both participants used Individualized Education Plans (IEP) ready-made from the internet sites and followed the textbook (ST7, ST12), EIN (ST7, ST12) and supplementary question books (ST12) as course resources. It was determined that both participants used lecture and project-based teaching methods to ensure conceptual understanding. It was revealed that they gave the task of growing beans for plant care individually. In the last lesson hour of the subject, it was revealed that dependent-independent and control variables were taught through the bean plant by preferring the lecture method. Regarding the project tasks, it was observed that both teachers did not ask students to create reports and did not evaluate whether the tasks were fulfilled or not. The following is the conversation between the teacher coded ST7 and one of the two SLDs on the plant care task:

ST7: *Did you grow beans? SLDs: No. (with a frown)*

ST7: *Why? (with a smiling face) SLDs: I don't know ST7: Could it be that you haven't heard the assignment?*

ST7: *Well, why didn't you do it? (student's face tilted downwards) Then you can go over to your friend and examine his beans.*

It was observed that one of the SLDs of the teacher coded ST7 did not fulfill its task, and the other two SLDs germinated beans.

Findings from the Second Research Question

The findings obtained from the focus group interviews conducted for the second research question of the study are presented in Table 8.

Table 8. Participants' activity suggestions for RGDPA for SLDs

Activity Type	Suggestions	Focus 1					Focus 2				
		Animal			Plant		Animal			Plant	
		Goose	Bee	Cow	Kavılca wheat	Greenhouse products	Goose	Bee	Cow	Kavılca wheat	Greenhouse products
Trip - observation	Real environments (farms, gardens, greenhouses, fields) can be observed	√		√		√	√				√
	Observations can be repeated throughout the growth and development processes					√					
	Photographs can be taken during the observation process of real environments	√		√		√					
	Forecast - Observation - Description (FOM) can be made		√		√		√	√	√		
Gaining experience	Planting can be done in the school garden				√	√					√
	Live care can be provided together with families						√			√	√
Drawing	Life cycles for growth - development - reproduction processes can be drawn		√		√						
	A poster on growth - development - reproduction processes can be made							√		√	√
Textbook	Textbooks should mention the characteristics of endemic species in our country and include visuals							√		√	
	Textbooks should include plants and animals of economic value							√		√	
Repeatedly	Question and answer should be done in the lesson to remind frequently.	√	√	√	√	√	√	√	√	√	√
	Reading from popular science magazines	√	√	√							
	Families can be trained and observations can be repeated.		√	√	√						
	Families can watch documentaries at home	√	√	√	√	√					

When Table 8 is examined, it is noteworthy that the participants mostly made suggestions for family involvement and out-of-school learning environments for teaching RGDPA. Some of the suggestions made by the participants in Focus 1 for bees are as follows:

Research: *What kind of activities would you recommend for the reproduction, growth and development of bees?*

ST2: *You can take a trip to the apiary.*

ST3: *It may not be appropriate; there are 25 students in a class, you need to dress them in clothes. It would be expensive; even if not bought, it would be difficult to find clothes for that many students.*

ST7: *TUBITAK has books for children on animals, with very descriptive visuals, and there are also books on bees, which are sold at very reasonable prices. They can be recommended to read these books.*

ST5: *Prediction - observation - explanation activity can be done. But observation can be done with the family in real environments or through documentaries.*

ST1: *Families can also watch documentaries at home as a review after classes.*

ST4: *Students can draw the cycle from egg to worker bee/queen bee/ drone.*

Discussion

This study aimed to explore how science teachers teach the concepts related to the topic of RGDPA in classrooms with SLDs and their suggestions. In this context, the interpretations of the findings of the study are presented in this section. The first finding of the study shows that science teachers mostly follow the textbook during the lesson process and do not bring the cultural elements and living examples of the region where the research was conducted into the classroom environment. This situation indicates that teachers are far away from the processes that can ensure the permanence of conceptual knowledge on the topic of RGDPA in their lessons. In Turkey, the Ministry of National Education distributes free science textbooks to all students at the secondary school level. These books facilitate the presentation of the course content in a similar way to all students in equal class periods. However, different climatic conditions and cultures in each region of our country differentiate the daily life problems encountered by students and, accordingly, the solutions. Teachers' familiarity with the socio-cultural and socio-economic structure, cultural elements, and livelihoods of the school region where they work can also differentiate the examples they present to their students in the lesson. This is accepted as an indicator of professional development expected from science teachers (Cobern, 2000, 2012). Using real-life problems from students' immediate natural environment in science lessons enhances the retention of conceptual knowledge (Schilhab, 2021). Especially this finding obtained within the scope of the research makes it even more debatable for SLDs because providing examples from the immediate environment for SLDs is an important factor that positively affects the retention of conceptual knowledge (Brigham et al., 2011; Therrien et al., 2011b). It is noteworthy that almost half of the teachers who participated in the study introduced the flower organ through lilacs and dandelions growing on the streets as an application that will provide conceptual knowledge in terms of SLDs. All teachers used textbook visuals to teach about creatures not found in their local province.

Although the students had the opportunity to get to know these creatures from different sources, it is thought that presenting conceptual information through the creatures they observed first and then giving examples of different species would be more effective for both students with SLDs and typically developing students to comprehend the subject. In particular, when students are made aware of the role of recognizing the living things they observe in their career planning and becoming entrepreneurs in the future, it will increase their interest and motivation towards the lesson (Gilbert et al., 2011). This makes them listen to the lesson more carefully and increases the retention of the concepts they learn (King & Henderson, 2018). The acquisition of entrepreneurial skills is important for this age period (Özen Altinkaynak et al., 2025), and gaining science knowledge is seen as one of the main secrets of being successful in entrepreneurship (Kirman Bilgin, 2019; 2022). In the province where the research was conducted, there are species belonging to this region (Anatolian Red, Caucasian Bee and Goose) within the scope of goose, cow and bee species, and it is possible to see and observe these creatures throughout the province. It is noteworthy that although these creatures are included in the examples given by the teachers, the ones specific to the region are not mentioned.

Nevertheless, it is thought that the inclusion of these creatures in the textbook will have a positive effect on the SLDs in getting to know these creatures and making sense of their reproduction, growth and development processes, and gaining entrepreneurship skills. It is seen that the RGDPA subject has a course content in which out-of-school learning environments can be effective in providing permanent learning in science teaching. However, it is a striking finding that teachers do not make use of these environments. However, when the activity suggestions received from science teachers within the scope of the second research question are examined, it is seen that they stated suggestions that can be evaluated within the scope of out-of-school learning. This finding shows that teachers have professional knowledge about out-of-school learning to increase conceptual retention through repetition, especially for SLDs, but they do not benefit from these environments.

Studies show that out-of-school learning environments are not used in science courses due to reasons such as high cost (Schilhab, 2021), difficulty in transportation (Karademir, 2018), and inadequacy in planning the preparation and teaching process (Anderson et al., 2006). It is thought that the teachers participating in the current study were also affected by similar reasons. It is seen that the participants maintain the characteristics of traditional teaching rather than the characteristics of

contemporary learning approaches in their lesson processes. Constructivism, which was taken as the basis in science courses as a result of the reforms in the curricula as of 2005, is still the learning theory taken as the basis in the curriculum after the update processes in 2024. However, studies show that science teachers do not implement these reforms in the classroom environment due to reasons such as excessive class size (Ural Keleş, 2018) and insufficient class time (Yangın & Karasu, 2016). This finding of the study can also be explained by the participants' inadequacies in applying constructivism in classrooms with SLDs. Therefore, it can be said that the topic of RGDPA is one of the science topics that should be associated with daily life problems and especially entrepreneurship. Watson (2000) emphasizes that, according to constructivism, daily experiences have a conceptually important place for SLDs and that teachers are responsible for the learning of these students. IEP is a special education plan suitable for the needs of students in need of special education so that they can be more productive in education. IEP implementation is a process shaped in line with the individual needs of the student. However, the fact that the teachers participating in the study obtained the IEP from the internet and mostly used the lecture method can be accepted as an indicator of their lack of professional knowledge on instructional adaptations for SLDs or their lack of consideration of individual differences of SLDs. Studies show that pre-service science teachers (Mertoğlu et al., 2020), science teachers (Uçar et al., 2023) and science educators (Macaroğlu Akgül & Mertoğlu, 2020) have insufficient professional knowledge on instructional adaptations, do not make instructional adaptations in their lessons (Uzoğlu & Denizli, 2016), and carry out the course process for typically developing students (Kolonich et al., 2018; Spektor Levy & Yifrach, 2019).

The results of this research are in line with the observation findings of the current study. Collaborating with the family to effectively implement the IEP in science class helps to achieve the appropriate goals of SLDs (Grigorenko et al., 2020; Brigham et al., 2011; Zembylas & Isenbarger, 2002). Senel Coruhlu et al. (2024), Er Nas et al. (2022), and McGinnis (2013) emphasize that evidence-based instruction in science teaching for SLDs increases retention, which is the biggest problem for these students in learning. It can be said that the topic of RGDPA is one of the science topics in which evidence-based learning will be provided within the scope of the subject by cooperating with families and it will be easy for the teacher to carry out this process due to the region where the students live. Additionally, it is a suitable subject for project-based teaching, and there is an activity suggestion for this process in the textbook. However, teacher observations made within the scope of the research show that the steps of the project-based teaching process were not fully implemented. In particular, it was revealed that students did not work on a report in which they would record their data and problem-solving processes. This situation can be seen as a process that will negatively affect the permanence of learning because it is also necessary to teach dependent, independent and control variables within the framework of the achievements of the subject. This teaching process may prevent students from acquiring or developing both scientific process, scientific reasoning, and entrepreneurship skills. Şahin Civelekoğlu and Öztürk (2010) found that science teachers did not want to involve families in project tasks.

When the activity suggestions of science teachers who have SLDs in their classes for teaching the reproduction, growth and development processes of geese, bees, cows, sorghum wheat and greenhouse products regarding the subject of RGDPA are examined, it is seen that they emphasize the importance of learning by observation and doing, drawing and the necessity of repetition. These findings are consistent with the suggestions of the studies conducted on increasing the permanence of learning for SLDs (Asghar et al., 2017; Scruggs & Mastropieri, 2007; Scruggs et al., 1998; Bowey, 2000; Engelmann, 1999). However, the fact that the participants did not apply their suggestions during the lesson processes is a striking finding that merits further research in the future.

Conclusion

In this study, the lesson processes of science teachers in the classes where SLDs were included were examined within the framework of the subject of RGDPA, and it was revealed that the participants carried out the lesson flow in the order of drawing attention, explaining the subject, and making an evaluation. It was determined that the participants, who mostly followed the textbook, benefited from EIN for visual use and evaluation purposes. It was seen that they preferred the supplementary books apart from the resources provided by the Ministry of National Education for evaluation and repetition purposes. It was revealed that they did not conduct lessons in the support education rooms due to the intensity of the lessons for SLDs. However, support education rooms are defined by the Ministry of National Education (2018b) as environments that should be arranged to provide support education services in the areas where these students need assistance. Studies have shown that support education rooms have a positive effect on students' conceptual understanding (Er Nas et al., 2019; Turan & Atila, 2021; Akman Yozgat et al., 2018).

In the province where the research was conducted, it was determined that living things that are both a cultural product and are cared for throughout the country (kavılca wheat, Caucasian bee, goose, cow and greenhouse products) were rarely included among the examples. It was revealed that the teachers mostly showed the living things in the book as examples and used the book for explaining the subject since they mostly followed the textbook. Very few of the participants exemplified real living beings, and it was seen that these living beings were not among the group of species specific to the city where the research was conducted. Another research result determined that teachers who were given the task of

germinating seeds did not follow up or make a work plan for these living beings after the lesson. It was revealed that the teachers who were observed in the in-class activities did not conduct a different activity for SLDs, but included it in the regular in-class activities. It was determined that the participants used methods and techniques such as project-based teaching and educational games that represent the constructivist approach.

Science teachers suggested activities such as trip-observation, learning by doing-living, prediction-observation-explanation, and drawing, which are related to daily life, for concept teaching in the classes where SLDs are included. The participants suggested that constant repetition is a very important process for SLDs and is necessary for them to learn the reproduction, growth, and development processes of all living things. This research also revealed that family participation is needed for SLDs within the scope of the RGDPA subject.

Suggestions

Considering the results of this study, it is recommended that science teachers who have SLDs in their classes give importance to IEPs within the scope of RGDPA and provide support training for SLDs. In addition, teachers can be advised to take into consideration the agricultural and animal husbandry opportunities of the region and the living creatures that students observe when designing instructional adaptations in SLD classes within the scope of RGDPA. Science teachers and school administrators can be advised to ensure that students are directed to activities where they can make trips and observations or use school gardens effectively in order to relate the subject to their daily lives within the scope of RGDPA, where skill teaching is as important as conceptual understanding. School administrators can be advised to make plans for science teachers to provide support training for SLDs. Educational politicians can be advised to include local endemic species, living creatures with sociocultural and economic value in textbooks in addition to global examples. In the next study, the reasons for the problems experienced by science teachers who teach SLDs in the course processes within the scope of RGDPA can be investigated. In addition, research can be conducted on supporting conceptual understandings of SLDs through entrepreneurship-based activities associated with daily life within the scope of the RGDPA topic.

Limitations

In this study, Individualized Education Program (IEP) plans were not used as a data collection tool because the lesson processes of science teachers were examined through observations. These IEP plans were not analyzed or compared with the observation findings. This is considered a limitation of the study.

Genişletilmiş Özet

Giriş

Bitkilerde ve hayvanlarda üreme, büyüme ve gelişme, konusunda Öğrenme Güçlüğü Olan Öğrencilerin (ÖGOÖ) kavramsal anlamalarını sağlamak onların, gelecekteki sosyal ve ekonomik yaşantılarını kolaylaştıracaktır. Çünkü ilgili konu, bu öğrencilerin kendi yaşadıkları coğrafyalardaki tarım ve hayvancılık temelli iş kolları için temel bilgileri içermektedir. Dolayısıyla, öğrenme güçlüğü yaşayan ortaokul öğrencilerine bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konularının kazandırılması, nitelikli öğretim süreçlerini gerektirmektedir. Bu öğrencilerin özelliklerine uygun öğretimsel uygulamaların sağlanmasında mesleki anlamda fen bilimleri öğretmenlerinin rolü büyüktür (Gokool Baurhoo & Asghar, 2019). ÖGOÖ' nün öğrenim gördüğü sınıflarda tipik gelişim gösteren öğrencilerle birlikte ele alınacak kavramların öğrenme süreçlerini kolaylaştırmak için öğretmenlerin, somutlaştırma ve görselleştirme (Ogunleye, 2019), basit ve anlaşılır dil kullanımı (Therrien vd., 2011a), sık tekrara başvurma (Ergül, 2023), analoji kullanımı (Al-dhaimat vd., 2022), uygulamalı etkinlikler yürütme (Lovitt & Horton, 1994), fazla sayıda duyuya hitap edecek etkinlikler (Steele, 2004), doğa gözlemleri (Maroney, Finson, Beaver ve Jensen, 2003) ve gerçek hayattan örnekler verme (İnaltekin ve Erginsoy Osmanoğlu, 2023) gibi öğretimsel uyarlamaları kullanmaları önemlidir. Bu bağlamda araştırma, ÖGOÖ'nün yer aldığı sınıflarda fen bilimleri öğretmenlerinin "bitkilerde ve hayvanlarda üreme, büyüme ve gelişme" konusu kapsamında kavram öğretimine yönelik yürüttükleri ders süreçlerini ve önerilerini belirlemeyi amaçlamaktadır. Bu amaç doğrultusunda aşağıdaki araştırma sorularına yanıt aranmıştır:

1. ÖGOÖ'nün yer aldığı sınıflarda fen bilimleri öğretmenlerinin "bitkilerde ve hayvanlarda üreme, büyüme ve gelişme" konusu kapsamında kavram öğretimine yönelik yürüttükleri ders süreçleri nasıldır?
2. Fen bilimleri öğretmenlerinin ÖGOÖ'nün yer aldığı sınıflarda "bitkilerde ve hayvanlarda üreme, büyüme ve gelişme" konusu kapsamında kavram öğretimine yönelik etkinlik önerileri nelerdir?

Yöntem

Özel durum yöntemiyle yürütülen bu araştırmada iç içe geçmiş çoklu durum deseni temel alınmıştır. Araştırmaya yedinci sınıfta öğrenim gören ÖGOÖ'nün dersini yürüten 15 fen bilimleri öğretmeni katılmıştır. İlk araştırma sorusu kapsamında gözlem ve görüşmelerden yararlanılmıştır. Sorular BHÜBG konusu kazanımları çerçevesinde geliştirilmiştir. Görüşme yapılan öğretmenlerden sadece ikisi BHÜBG konusunun işlenmesi sürecinde gözlem yapılmasını kabul etmiştir. Öğretmenlerin ders süreçleri iki araştırmacı tarafından 12 ders saati süresince gözlemlenmiştir. İkinci araştırma sorusu kapsamında araştırmaya katılan öğretmenler arasından iki odak grup rastgele oluşturulmuştur. Elde edilen nitel veriler betimsel ve içerik analizine tabi tutulmuştur.

Bulgular

Bireysel görüşmelerde fen bilimleri öğretmenlerinin tümünün bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konusunu işlerken ders kitabını takip etme (f=15), ders süresi yeterli olursa Eğitim Bilişim Ağı'ndan (EBA) konu anlatımı (f=4) ve soru çözümü (f=13) çerçevesinde yararlanma kodlarında yanıt verdikleri görülmüştür. Katılımcıların bitkilerde üreme, büyüme ve gelişme konusunu işlerken ders kitabının (F1-15) dışında konu anlatımının bahar aylarına denk gelmesinden ötürü genellikle sokaklarda veya bahçelerde açan çiçekleri çoğunlukla (f=6) kullandıkları tespit edilmiştir. Katılımcıların sadece dördünün (f=4) hayvanlarda üreme, büyüme ve gelişme konusunu işlerken sınıfta gerçek canlılar üzerinden açıklama yaptıkları tespit edilmiştir. Katılımcılardan hiçbiri konu kapsamında sınıf dışını, öğrenme ortamı olarak kullanmamıştır. Katılımcılar, ders yoğunluklarının fazla olmasından dolayı destek eğitim odalarında ÖGOÖ ile ders işlemediklerini belirtmişlerdir. Gözlenen iki fen bilimleri öğretmeninin de ders akışlarının kavramsal bilgi verme odaklı olduğu, herhangi bir öğretim modelini temel almadıkları, konu anlatımı ve sonrası soru çözümü şeklinde ilerledikleri tespit edilmiştir. Her iki katılımcının da Bireyselleştirilmiş Eğitim Planını (BEP) internet sitelerinden hazır kullandıkları, ders kaynağı olarak ders kitabı (F7, F12), EBA (F7, F12) ve yardımcı soru kitaplarını (F12) takip ettikleri ortaya çıkmıştır. Kavramsal anlamayı sağlamaya dönük ise her iki katılımcının da anlatım ve proje tabanlı öğretim yöntemini kullandıkları tespit edilmiştir.

Tartışma

Araştırma, fen bilimleri öğretmenlerinin ders sürecinde çoğunlukla ders kitabını takip ettiklerini, araştırmanın yürütüldüğü bölgeye dair kültürel öğeleri ve canlı örneklerini sınıf ortamına taşımadıklarını göstermektedir. Bu durum öğretmenlerin derslerinde BHÜBG konusuna dair kavramsal bilgilerin kalıcılığını sağlayabilecek süreçlerin uzağında kaldıklarına işaret etmektedir. Araştırmaya katılan öğretmenlerin yarısına yakınının sokaklarda yetişen leylak ve karahindiba üzerinden çiçek organını tanıtmaları ÖGOÖ açısından kavramsal bilgiyi sağlayacak bir uygulama olarak dikkat çekmektedir. Öğretmenlerin tümünün ders kitabındaki görsellerde yer alan canlılar üzerinden ders anlatmaları ÖGOÖ'nün yaşadıkları ilde gözlemleyemedikleri canlıları kapsamaktadır. Araştırmanın yapıldığı ilde kaz, inek ve arı türü kapsamında bu yöreye ait olan türler vardır ve bu canlıları il genelinde görmek ve gözlemlemek mümkündür. Öğretmenler tarafından verilen örnekler içerisinde bu canlılar olmasına rağmen yöreye özgü olanlardan bahsedilmediği dikkat çekmektedir. Yine de bu canlıların ders kitabında yer alması ÖGOÖ için bu canlıları tanıma ve üreme, büyüme ve gelişme süreçlerini anlamlandırmada ve girişimcilik becerisi kazanmada olumlu etki yaratacağı düşünülmektedir. Bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konusunun yedinci sınıf kademesindeki kazanım içeriği fen öğretiminde kalıcı öğrenmeyi sağlamada okul dışı öğrenme ortamlarının kullanılması gerektiğini işaret etmektedir. Ancak öğretmenlerin bu ortamlardan yararlanmadığı dikkat çekici bir bulgudur. Bununla birlikte, ikinci araştırma sorusu kapsamında fen bilimleri öğretmenlerinden alınan etkinlik önerileri incelendiğinde, okul dışı öğrenme kapsamında değerlendirilebilecek öneriler sundukları görülmektedir. Bu durum, öğretmenlerin okul dışı öğrenmenin özellikle ÖGOÖ'nün tekrar yoluyla kavramsal kalıcılığı artırabileceğine ilişkin mesleki bilgiye sahip olduklarını, ancak bu ortamlardan yeterince yararlanmadıklarını göstermektedir.

Sonuç

Fen bilimleri öğretmenlerinin ÖGOÖ'nün yer aldığı sınıflarda ders süreçlerinin "bitkilerde ve hayvanlarda üreme, büyüme ve gelişme" konusu çerçevesinde incelendiği bu araştırmada katılımcıların ders akışını sırasıyla dikkat çekme – konu anlatımı – değerlendirme yapma şeklinde yürüttükleri ortaya çıkmıştır. Çoğunlukla ders kitabını takip eden katılımcıların görsel kullanım ve değerlendirme amaçlı EBA'dan yararlandıkları tespit edilmiştir. Milli Eğitim Bakanlığı (MEB)'nın sunduğu kaynaklar dışında kullanılan yardımcı kitapların ise öğretmenler tarafından değerlendirme ve tekrar yapma amaçlı tercih edildiği görülmektedir. ÖGOÖ'ye yönelik ders yoğunluğuna bağlı olarak destek eğitim odalarında ders işlemedikleri ortaya çıkmıştır. Araştırmanın yapıldığı ilde gerek kültürel bir ürün olan gerekse ülke genelinde bakımı yapılan canlıların (kavılca buğdayı, Kafkas arısı, kazı, ineği ve sera ürünleri) örnekler arasında nadiren yer aldıkları tespit edilmiştir. Katılımcıların çok azı gerçek canlı üzerinde örneklendirme yapmış olup bu canlılarda yine araştırmanın yapıldığı şehre özel bir canlı türü olmadığı görülmektedir. Tohum çimlendirme görevi veren öğretmelerin ders sonrası bu canlılarla ilgili takip veya iş planı yapmamaları tespit edilen bir diğer araştırma sonucudur. Ders içi faaliyetlerde gözlem yapılan öğretmenlerin ÖGOÖ'e yönelik farklı bir etkinlik yürütmedikleri, onları olağan sınıf içi etkinliklere dahil ettikleri ortaya çıkmıştır. Fen bilimleri öğretmenlerinin bu öğrencilerin yer aldığı sınıflarda ele alınan konu kapsamında kavram öğretimine yönelik günlük hayatla ilişkilendirilmiş gezi–gözlem, yaparak-yaşayarak öğrenme, tahmin-gözlem-açıklama ve çizim yaptırmaya yönelik etkinlikler önermişlerdir. Katılımcıların, sürekli tekrar yaptırmanın ise ÖGOÖ için çok önemli bir süreç ve ele alınan tüm canlıların üreme, büyüme ve gelişme süreçlerini öğrenmeleri için gerekli olduğunu önerdikleri tespit edilmiştir. Bu araştırma, ayrıca bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konusu kapsamında aile katılımının ÖGOÖ için ihtiyaç olduğunu ortaya çıkarmıştır.

Öneri

Bu araştırmanın sonuçları dikkate alınarak sınıflarında ÖGOÖ'nün yer aldığı fen bilimleri öğretmenlerine, bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konusu kapmasında BEP'e önem vermeleri ve ÖGOÖ'e yönelik destek eğitim sunmaları önerilmektedir. Ek olarak

öğretmelere, bitkilerde ve hayvanlarda üreme, büyüme ve gelişme konusu kapsamında ÖGOÖ'in bulunduğu sınıflarda öğretimsel uyarlamalar tasarlama süreçlerinde, yaşanılan bölgenin tarım ve hayvancılık imkanlarını ve öğrencilerin gözlem yaptıkları canlıları dikkate almaları önerilebilir.

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