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TEACHING CONCEPTS USING THE 5E INSTRUCTIONAL MODEL TO SECONDARY SCHOOL STUDENTS WITH MILD INTELLECTUAL DISABILITY: PARTICULATE STRUCTURE OF MATTER[1]

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ABSTRACT

In this study, the effect of teaching based on the 5E instructional model on students' conceptual learning was investigated. The participants consisted of three inclusion students with mild mental disabilities who were studying in the sixth grade of a secondary school. A lesson plan based on the 5E teaching model was designed, focusing on the curriculum standard "S/he describes that matter has a particulate and distanced structure." within the "Matter and Heat" unit of the sixth-grade science course. While developing the lesson plan, different teaching methods-techniques were included in the learning activities to address the needs and interests of the students based on the related literature and interviews conducted with the class teacher, students, and parents. In the current study, it was concluded that the 5E model-based teaching, which was prepared by taking into account the student needs and different teaching methods-techniques, was effective in supporting students' conceptual learning.
Keywords: science education, special education, 5E teaching model, concept teaching.

HAFİF DÜZEY ZİHİNSEL YETERSİZLİĞİ OLAN ORTAOKUL ÖĞRENCİLERİNE 5E ÖĞRETİM MODELİYLE KAVRAM ÖĞRETİMİ: MADDENİN TANECİKLİ VE BOŞLUKLU YAPISI

ÖZ

Bu çalışmada, fen öğretiminde yaygın olarak kullanılan 5E öğretim modeli temelli öğretimin hafif düzey zihinsel yetersizliği olan öğrencilere kavram öğretimi üzerine etkisi araştırılmıştır. Çalışma grubunu, ortaokul altıncı sınıfta öğrenim gören hafif düzey zihinsel yetersizlik tanılı üç kaynaştırma öğrencisi oluşturmaktadır. Bu çalışmada fen bilimleri dersi altıncı sınıf "Madde ve Isı" ünitesinde bulunan "Maddenin tanecikli ve boşluklu yapıda olduğunu ifade eder." kazanımına odaklanan ve 5E öğretim modelini temel alan ders planı hazırlanmıştır. Ders planı hazırlanırken alanyazına bağlı ihtiyaçlar ile öğretmen, öğrenci ve veli görüşmeleri sonucunda ortaya çıkan ihtiyaçların yanı sıra farklı öğretim yöntem-tekniklerine de yer verilmiştir. Araştırmada öğrenci ihtiyaçları ve farklı öğretim yöntem-teknikleri dikkate alınarak hazırlanan 5E öğretim modeli temelli öğretimin öğrencilere kavram öğretiminde etkili olduğu sonucuna ulaşılmıştır.
Anahtar kelimeler: fen eğitimi, özel eğitim, 5E öğretim modeli, kavram öğretimi.

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INTRODUCTION

Today, it's widely accepted that certain parts of science and technology, albeit small, are used in every profession (Topsakal, 2005). Therefore, it's vital for everyone to be literate in the field of science, regardless of their individual differences (Ministry of National Education, 2004). If individuals with intellectual disabilities learn science, they will show a better understanding of the events taking place in the environment and be more sensitive to the environment, which in turn would help them to independently engage in social life (Scruggs & Mastropieri, 2015).

The constructivist approach is based on the fact that the knowledge is interpreted and reconstructed by the student according to his/her prior experiences. Piaget, who supported the constructivist approach, emphasized that the brain constructs knowledge through phases such as assimilation, accommodation, equilibrium, and schema, while Vygotsky explained constructivism with the concepts of making sense of knowledge, cognitive development, and the zone of proximal development (Piaget, 1936; Sage, 2022). Both scientists emphasize that the mind structures information by passing it through certain filters. In other words, according to this approach, it means more than just knowledge because the knowledge is interpreted and reconstructed by the student (Liang & Gabel, 2005).In educational environments where the constructivist approach is applied, different methods and techniques such as the 5E instructional model, the 7E instructional model, the brainstorming technique, problem-based learning method, which allow students to be more active during learning and constructing knowledge, are generally used (Tiryaki, 2009).

The 5E instructional model can be said to be based on students' exploration and using their experiences (Ayaz, 2015). It allows students to generate new knowledge by using their existing knowledge in the process, compare new knowledge with the previously acquired knowledge, and form and integrate new knowledge, i.e., access information actively by using cognitive processes (Marek 2008; Mayer, 2010). It's a model that can be applied to every student receiving formal education, however, students differ from each other in various aspects. Therefore, the design of teaching models should take into account the differences between students (Demir & Toraman, 2021). One of the antecedents to be considered in the design process is the individual needs of the students. For example, there are studies in the literature showing that students with intellectual disabilities can learn some science subjects when teaching methods and techniques suitable for their individual characteristics are used (Çapraz, 2016; Yazıcıoğlu & Kızılaslan, 2021). In the study titled "Effectiveness of presenting the organs of the digestive system to students with intellectual disabilities with the layered teaching method", individual teaching materials were developed and applied to three students, and effective results were achieved (Demir, 2008). The study titled “The effect of fixed time delay teaching on teaching the concepts of living and non-living to students with mild mental retardation”, designed with probe-phase multiple probes, one of the single-subject research methods concluded that the students could learn the concepts of living and non-living in a short time (Kaya 2016). In the study titled "The effect of the use of direct teaching method in teaching element names", success was achieved in teaching the names of 22 elements to four students in the lessons held in the support education room by using the direct teaching method supported by three-dimensional materials (Yozgat et al., 2018). The study titled “Teaching the 'hard-soft' properties of some substances to students with intellectual disabilities”, consisting of initiation, teaching, and follow-up sessions, was conducted with three students. As a result of the study, it was concluded that two students learned the concept of hard-soft but one student couldn't (Mete & Yıldırım, 2020).

The study group of the current research consisted of three sixth graders with mild mental disability studying in a state secondary school in the center of Çanakkale province. The aim of the activity in this study was to teach students with mild intellectual disabilities the concepts pursuant to the science course, “Matter and Heat” unit, the curriculum standard “S/he describes that matter has a particulate and distanced structure” within the

scope of activities based on the 5E instructional model. The activity in this study is important because it can be carried out with the active participation of the students, and the students will be able to use the knowledge acquired accordingly by transferring it to different situations in daily life.

LESSON PLANNING

Needs Analysis for the Lesson Plan

In order to determine the educational needs of the students, semi-structured interviews were conducted with teachers, students, and parents using a semi-structured teacher interview form, a semi-structured student interview form, and a semi-structured parent interview form, respectively. In addition, a literature review was conducted on students' needs in teaching science to students with special educational needs, and activities were developed in line with the identified needs. Findings obtained from the teacher, student, and parent interviews showed that learning with experiments based on peer collaboration, social reinforcements, and game-based activities in which a student is actively involved is important. In addition, the modeling and giving hints methods, which were determined as a result of the literature review, were included in these activities.

Integrating Students' Needs into the Lesson Plan

The 5E instructional model raises students' curiosity about learning and enables them to actively participate in activities for exploration (Martin, 2006). Therefore, the 5E teaching model, which will make the students active and increase their participation in the lesson, was used to develop the activities in the lesson plan.

Again, in line with the students' needs, social reinforcements, including "well done" for the first student (S1), "bravo" for the second student (S2), and "very good" for the third student (S3), were included in the lesson plan in order to encourage students to give correct answers during the teaching process. In addition to these, students' efforts and work were appreciated, and process-oriented social reinforcements were used. Morevoer, special teaching methods and techniques were also included in the lesson plan, and in the activities in the plan, the teacher used the method of "being a model" and provided hints in accordance with the lesson flow when the students couldn't fulfill a behavior expected from them during the teaching process.

Obtaining Expert Opinion on the Lesson Plan

In order to ensure the validity and reliability of the lesson plan, the opinions of three experts, including two experts in the field of science and one expert in the field of special education, were consulted. The activity in the lesson plan was updated as a result of the corrections suggested in line with the expert opinions.

Pilot Implementation of the Lesson Plan

Lesson plan activities were piloted by the researcher, who is a teacher, with a sixth grader with mild intellectual disabilities. As a result, the weaknesses encountered in practice depending on the lesson plan were addressed. In addition, the lesson plan and its activities were examined for their efficiency. In this phase, it was observed that a statement in the worksheet was ambiguous so the student had difficulty understanding it. Once this statement was revised appropriately, it was decided to implement the lesson plan.

IMPLEMENTATION OF THE LESSON PLAN

The 5E instructional model, when used together with the course materials helping inquiry and investigation in science courses, is known to be beneficial in engaging students in the lesson, increasing their academic success, providing motivation, and increasing their scientific reasoning (Bybee et al., 2006). According to Bybee (1997), the 5E instructional model comprises the stages of engagement, exploration, explanation, elaboration, and evaluation. The average time to implement this lesson plan and its activities were 45 minutes. The lesson plan based on the 5E instructional model was implemented as described below:

1) Engagement Stage

At this stage, the teacher can start the lesson by telling stories or case studies in order to engage students and activate their knowledge. The aim here is not to evaluate the knowledge of the students, but to activate the students' knowledge by brainstorming (Çepni, 2015). Based on this, the engagement phase was implemented as follows:

The teacher communicated with the children by asking how their day was. He put an empty ice pack on the desk and told the students that they could examine it without squeezing it (Photograph 1). The teacher asked the students, “Look children, I have an ice pack in my hand, has anyone seen or heard of this before?” One of the students, S1 replied, “Yes, for example, if someone's head is swollen, they can hold it on their head”. S2 also participated by nodding in agreement. The teacher handed the Activity Sheet (Appendix 1) to the students.

He asked, “If we try to compress a sand-filled pack, a water-filled pack, and an air-filled pack, which one would be compressed the most? Make a guess.". The teacher asked them to write their answers in the “Let us Guess” section in Appendix 1. The students began to read Appendix 1 in a slightly audible tone. In view of the answers in Appendix 1, S1 replied “Air”, S2 replied “The liquid the most”, and S3 replied, “The gas can be compressed the most because when we hold air, the air gets compressed”. The teacher then said, "Let's test our guesses." and moved on to the activity.

Photograph 1. Students Examining the Packs in the Engagement Phase

2) Exploration Phase

In this step, students begin to explore the reason for the situations that have raised curiosity in their minds in the engagement step. The teacher acts as a guide at this stage and gives feedback and responses to support the knowledge gained by students (Sert Çığık & Civangönül, 2022). Based on this, the exploration phase was implemented as follows: The teacher guided the students by saying, “You can start doing the activity by reading the section on how to do the activity in Appendix 1. The students started to read the related part of the activity in Appendix 1 handed by the teacher and performed the activity according to the instructions. In accordance with Appendix 1, the students first took the first packs containing sand and tried to compress the pack by pressing onto it with their hands. In the meantime, S1 reacted by saying “This can't be compressed”.

Then, in accordance with the instructions in Appendix 1, the students took the second pack containing water and tried to compress the pack by applying pressure from the top with their hands. All three of the students responded by saying "I can't compress it". Finally, the students took the third pack containing air and tried to compress it. Students S1 and S2 responded by saying "I compressed it", while S3 first tried to compress the pack from the corner, told the teacher that she couldn't compress it and once the teacher told her to compress it in the middle, she responded by saying "I compressed it".

Then the students were asked to mark their answers in the “Observations” section in Appendix 1 in line with whether they could compress the packs or not. All three students marked "The pack with sand cannot be compressed +, the pack with water cannot be compressed +, and the pack with air can be compressed +". Then, the students were asked to write in the section that says “Let's explain” in Appendix 1, if their guesses were correct, and if not, the reason for any incorrect guess. In this section, the students' answers were as follows: S1: "My guess was correct", S2: "My guess was not correct, the correct answer was that air is compressed", S3: "My guess was correct". Then the teacher gave reinforcement by saying, “Children, I congratulate you all for your hard work during this lesson”.

3) Explanation Phase

In this step, concepts, processes, and skills are determined. The explanations made by the students and the teacher enrich the explanations made by each student. The teacher makes short and clear explanations after the students' explanations (Bybee et al., 2006). Based on this, the explanation phase was implemented as follows:

The teacher asked, “Well, children, which substances are compressed, and which are not compressed according to our observations?” The students' answers were as follows: S1: "Air is compressed, water and sand are not compressed", S2: "Only air is compressed" and S3: "Water and sand are not compressed, only air is compressed". Since all three students found the correct answer, the teacher reinforced S1 by saying "well done", S2 by saying "bravo" and S3 by saying "very good", and the teacher gave a reinforcer by saying, "Children, congratulations to all of you for your effort during this lesson.”

The teacher explained that the pack with air can be compressed, but the pack with sand and water cannot be compressed, based on the students' inferences. He then stated that the pack with water can actually be compressed by a very small amount, but this was so little that it could be ignored. And he made an explanation, saying, "If we consider that sand is a solid, water is a liquid, and the air is a gas matter, solids cannot be compressed, liquids are considered incompressible, but gases like air can be compressed." Then, he made another explanation, saying, "The distance between the particles of solids is very small compared to liquids and gases, the distance between liquid particles is more than solids and much lesser than gases, and the distance between gas particles is high."

The teacher then handed each student an A4 paper and said, "Children, let's divide this paper into pieces as small as we can." As can be seen in Photograph 2, the children divided the paper into small pieces. The teacher then made an explanation, saying “No matter how small we cut these pieces of paper into pieces, we still cannot break them into the smallest pieces. The matter basically has a particulate structure. Paper also consists of particulate structures".

Photograph 2. Students in the Explanation Phase

Then the teacher presented the materials showing the representation of solid, liquid and gas particles to the students. These materials are presented in Photograph 3.

Photograph 3. Course Materials Used in the Explanation Step

After asking the students to examine the course materials in Photograph 3, the teacher said, "Which model do you think is an example of solid particles?" Students S1, S2, and S3 were able to show the correct model at the same time using their fingers. The teacher then asked, “Which is an example of liquid substance?”, and all three students pointed at the correct model. When he asked, "Which one could represent particles of gaseous matter?", S1 and S3 pointed their fingers at the correct model and S2 pointed at it with her pencil.

After asking “In which state are the substances such as pencils and erasers?”, The teacher waited for the students to give the answer "solid". S2 replied “solid”. Other students agreed with S2. Because they gave correct answers, the teacher reinforced S1, S2 and S3 by saying social reinforcers "well done", "bravo" and "very good", respectively and congratulated them by saying "Congratulations, you described your thoughts very well during this lesson and participated in the lesson very well".

The teacher hung the plates bearing the words "solid particles", prepared by him, around the students' necks. He asked the students to represent a solid by standing at an appropriate distance. The students' representation of a solid is shown in Photograph 4. Meanwhile, the teacher showed them how to stand up by using the "model prompting method".

Photograph 4. Representation of a Solid

All three students were able to accurately represent the position of solid particles. Then the teacher asked, “In which state are the substances such as water and olive oil?” All three students answered “liquid” at the same time. The teacher reinforced all three students with appropriate social reinforcement. Then, he hung plates bearing the words "liquid particle" around their necks and asked them to position themselves to represent a liquid. Next, all three students took the appropriate position to represent a liquid. Photograph 5 shows students representing a liquid.

Photograph 5. Representation of a Liquid

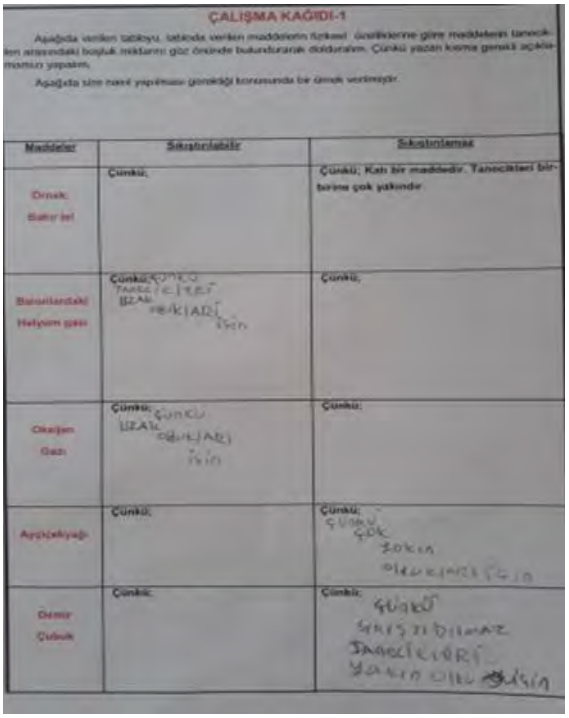
Then, the teacher asked, “In which state are the substances such as air and water vapor?” S1 replied: “Gas”. S2 and S3 also agreed with S1. The teacher said, “Now you represent gas particles.” and hung the signs that say gas particles around the necks of the students. He asked the students to represent a gas. All three students stood in the right positions, apart from each other by a long distance, representing the distance between the particles of a gas. Photograph 6 shows the students' representation of a gas.

Photograph 6. Representation of a Gas

4) Elaboration Phase

This phase is related to the previous three phases. In this phase, students transfer what they have learned and acquired to new environments and generalizes skills or concepts (Bybee, 1997). Based on this, the elaboration phase was implemented as follows: The teacher handed Appendix 2 to the students and asked them to determine the compressibility of the items given in Appendix 2 and write the reason for their answer in the section starting with "because". As an example, he told the students that a copper wire is incompressible and explained in the part starting with "because" why it's incompressible. Meanwhile, the teacher guided the students, saying "Let's remember if solids, liquids, and gases can be compressed”, and "Let's answer the questions by considering whether the given substances are solid, liquid, or gas".

The answers given by S1, S2, and S3 (Photographs 7, 8, and 9) showed that all three students were able to give correct answers to the different examples asked. The students provided correct explanations by referring to the distance between particles of matter in different forms.



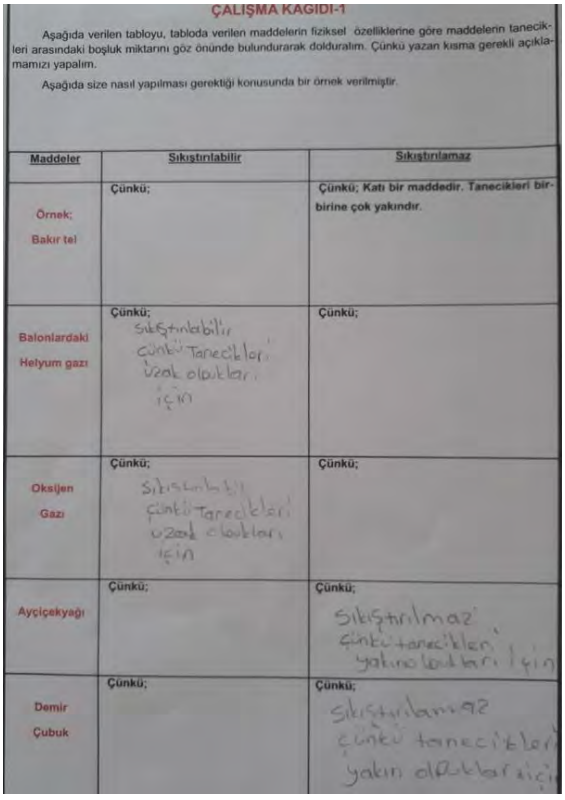
ÇALIŞMA KAĞIDI-1

Aşağıda verilen tabloyu, tabloda verilen maddelerin fiziksel özelliklerine göre maddelerin tanecikleri arasındaki boşluk miktarını göz önünde bulundurarak dolduralım. Çünkü yazan kısma gerekli açıklamamızı yapalım.

Aşağıda size nasıl yapılması gerektiği konusunda bir örnek verilmiştir.

Maddeler	Sıkıştırılabilir	Sıkıştırılamaz
Örnek; Bakır tel	Çünkü;	Çünkü; Katı bir maddedir. Tanecikleri birbirine çok yakındır.
Balonlardaki Helyum gazı	Çünkü; TANECİKLERİ UZAK OLDUKLARI için	Çünkü;
Oksijen Gazı	Çünkü; çünkü UZAK OLDUKLARI için	Çünkü;
Ayçiçekyağı	Çünkü;	Çünkü; çünkü çok yakın oldukları için
Demir Çubuk	Çünkü;	Çünkü; çünkü sıkıştırılamaz tanecikleri yakın olduğu için

Photograph 7. S1's Answers to Appendix 2



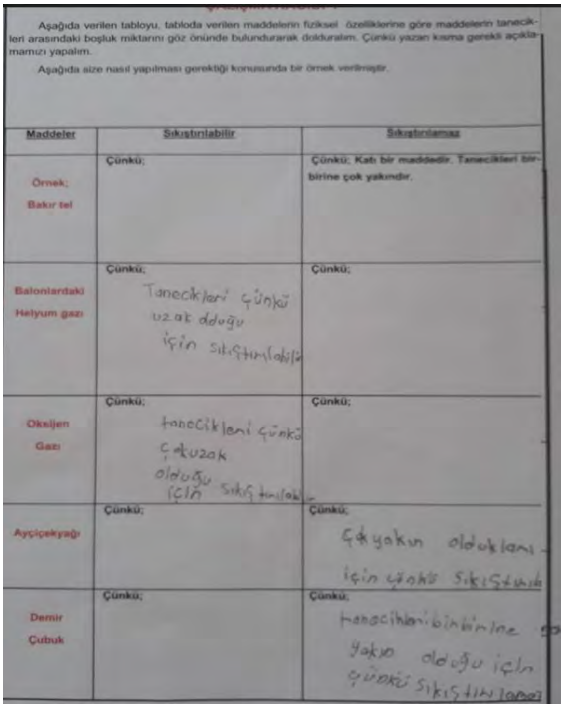
ÇALIŞMA KAĞIDI-1

Aşağıda verilen tabloyu, tabloda verilen maddelerin fiziksel özelliklerine göre maddelerin tanecikleri arasındaki boşluk miktarını göz önünde bulundurarak dolduralım. Çünkü yazan kısma gerekli açıklamamızı yapalım.

Aşağıda size nasıl yapılması gerektiği konusunda bir örnek verilmiştir.

Maddeler	Sıkıştırılabilir	Sıkıştırılamaz
Örnek; Bakır tel	Çünkü;	Çünkü; Katı bir maddedir. Tanecikleri birbirine çok yakındır.
Balonlardaki Helyum gazı	Çünkü; sıkıştırılabilir çünkü Tanecikleri uzak oldukları için	Çünkü;
Oksijen Gazı	Çünkü; sıkıştırılabilir çünkü Tanecikleri uzak oldukları için	Çünkü;
Ayçiçekyağı	Çünkü;	Çünkü; sıkıştırılmaz çünkü tanecikleri yakın oldukları için
Demir Çubuk	Çünkü;	Çünkü; sıkıştırılamaz çünkü tanecikleri yakın oldukları için

Photograph 8. S2's Answers to Appendix 2



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Maddeler	Sıkıştırılabilir	Sıkıştırılamaz
Örnek; Bakır tel	Çünkü;	Çünkü; Katı bir maddedir. Tanecikleri birbirine çok yakındır.
Balonlardaki Helyum gazı	Çünkü; Tanecikleri çünkü uzak olduğu için sıkıştırılabilir	Çünkü;
Oksijen Gazı	Çünkü; tanecikleri çünkü çok uzak olduğu için sıkıştırılabilir	Çünkü;
Ayçiçekyağı	Çünkü;	Çünkü; çok yakın oldukları için çünkü sıkıştırılamaz
Demir Çubuk	Çünkü;	Çünkü; tanecikleri birbirine yakın olduğu için çünkü sıkıştırılamaz

Photograph 9. S3's Answers to Appendix 2

5) Evaluation Phase

In this phase, the point to consider is to focus on the evaluation of what has been learned with open-ended or cognitive and affective products rather than evaluation with multiple-choice tests. Students' levels of understanding are evaluated at this stage (Süzen, 2009). Based on this, the evaluation phase was implemented as follows:

When the teacher came to the classroom, he brought with him three different printed activity mats on which the distance between the particles of solids, liquids, and gases is illustrated. He laid these mats on the floor in different corners of the classroom. After explaining to the students that "Even if the particles of a substance change state, they will not disappear, but because the mats are of the same size, we will show a small number of particles spread over a certain area", he added "We will play a game with you." and explained the rules of the game to the students. He told the students that when he tells them the name of a substance, they should step onto the mat that represents the state of that substance depending on whether that substance is in solid, liquid, or gas state. To clear up any misunderstandings, he said "*wood* " and then moved onto the mat representing the particles

of this substance. He explained this, saying "Wood is in the solid state and the particles of solid substances are very close to each other, so I stepped onto this mat". Then, he added "Although the particles of different substances have different shapes, in the scope of this lesson, we will show the particles in the form of circles or spheres." and started the game.

The teacher gave instructions to the students by saying "iron stick, lemonade, water, water vapor, lighter gas, air, paper, coin, and milk" in the given order. The students tried to step onto the right mat by considering the distance between the particles of these substances. Photograph 10 shows the instance when the students were positioned on the relevant mat when the teacher said, "water vapor".

Photograph 10. Position of Students When the Teacher Said "Water Vapor"

S2 and S3 gave the right response to all 11 instructions and stepped onto the right mat, whereas S1 reacted correctly to 10 instructions and stepped onto the right mat but was undecided only about one instruction. The teacher explained to S1 the correct answer of the instruction that she was unclear about, together with the reason.

CONCLUSION and SUGGESTIONS

In this study, teaching was carried out using methods and techniques such as the 5E instructional model, role-playing method, prompting method, and use of reinforcement in order to teach the curriculum standard "S/he describes that the matter has a particulate and distanced structure" within the unit "Matter and Heat" from sixth-grade curriculum to students with mild mental disabilities.

Considering that each student gave the correct answer to the instructions given to the students according to the data in the evaluation step of this lesson plan and only S1 wasn't sure about one instruction, the students can be said to have learned the concepts during the lesson. Accordingly, the activities in the lesson plan designed by using methods and techniques such as the 5E instructional model, role-playing, model prompting, and using reinforcement can be said to be effective in teaching science concepts to students with mild mental disabilities.

There are studies in the literature showing the positive effects of the 5E instructional model-based teaching on students' academic achievement and learning of the subjects. Varinlioğlu et al. (2022) concluded that the course materials prepared according to the 5E teaching cycle helped students in associating the course with life. Tatar and Demir's study (2022) found that the argumentation-supported 5E instructional model had a positive effect on students' learning. Gürbüz's study (2022) determined that the 5E instructional model enriched with reflective science diaries enhanced the academic achievement of students. Similarly, Demir's study (2020) concluded that teaching based on the 5E instructional model enhanced student achievement. As described above, there are many studies in the literature showing that the 5E instructional model has positive effects on the learning process of individuals with normal development.

In this study, unlike other studies in the literature, it was concluded that the 5E instructional model-based teaching was effective in teaching science concepts to individuals with intellectual disabilities and allowed students to learn new concepts by actively participating in the process.

Active participation of students in the lesson is thought to be effective in acquiring new knowledge and learning concepts. Kavak and Köseoğlu's study (2007) concluded that the role-playing method based on the constructivist learning approach facilitated learning. It's feasible to say that the role-playing method used in the current study helped students learn new concepts easily as they actively participated in the lesson during role-playing. This suggests that the 5E

instructional model should be included in individualized teaching plans in teaching science to individuals with intellectual disabilities.

Based on the idea that simulations enable teaching students a phenomenon as if it were real (Demirel, 2005), science educators focusing on teaching the particulate structure of matter may also employ computer simulations as an alternative method. In addition, syringes may be preferred by science teachers as an alternative to the ice packs used in the activity in this study. Besides all these, it's possible to include more alternative reinforcers that encourage the development of students such as "I appreciate your effort in this task", as used in some parts of the current study, rather than using the main reinforcers preferred in this study, which were identified using the reinforcement determination form, in activities for individuals with intellectual disabilities. Future studies might investigate the effects of the 5E instructional model on the concept learning of students with various types of disabilities.

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Appendix 1

Activity Sheet

ACTIVITY SHEET

Activity Name: **Which ice battery can be compressed the most?**

Aim of Activity: **To be able to explore the distance between the particles of matter in different states.**

Supplies Of Activity: **Batteries/packs filled with sand, water, and air.**

1) Predict

Which battery is most compressible? Why do you think so?

……
……

Activity process:

- **Let's get the packs that contain sand, water, and air from the teacher.**
- **Let's compress the pack with sand.**
- **Let's compress the pack with water.**
- **Finally, let's compress the pack with air.**
- **Note the compression states in section 2 (Observe).**
- **Note the accuracy of your guess in section 3.**
- **Considering that sand is solid, water is liquid, and air is gas; What can you say about the compressibility of solid, liquid, and gaseous substances? Let's write in section 4 (Draw Conclusions).**

2) Observe

Tick the appropriate one among the compressible and incompressible options.

	Incompressible	Compressible
The battery with sand		
The battery with water		
The battery with air		

3) Explain

Is your guess correct? If your guess is not correct, what do you think could be the reason?

……
……
……

4) Draw Conclusions

If we consider that sand is solid, water is liquid and air is gas, what can you say about the compression of solid, liquid, and gas materials?

……

……

……

……

Appendix 2

Worksheet

WORKSHEET

Select the compressibility states of the substances given in the table and write the necessary explanation in the selected section.

An example is shown for you on the table.

Substances	Compressible	Incompressible
Example; **Copper fiber**	**Because;**	**Because; It is a solid substance. The particles are very close to each other.**
Helium gas in balloons	**Because;**	**Because;**
Oxygen gas	**Because;**	**Because;**
Sunflower oil	**Because;**	**Because;**
Iron bar	**Because;**	**Because;**