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DESIGNING AN EDUCATIONAL GAME:

SCIENCE EDUCATION IN THE RESOURCE ROOMS WITH STUDENTS WITH SPECIFIC LEARNING DISABILITIES

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Abstract

The study aims to design a game to be used in the resource rooms for students with specific learning disabilities (SLD) while considering the challenges of students with SLD to improve their life skills and strengthen their conceptual understanding and to demonstrate how resource rooms may be enhanced with educational games for students with SLD. The challenges of students were primarily taken into consideration while developing the carpet game, as well as the advantages that educational games provide regarding these challenges. Semi-structured interviews were carried out with 10 science teachers, 10 primary education teachers, 10 science education academicians and 10 special education academicians. The necessary arrangements were made as a result of the pilot study of the game. In the fifth grade, two students participated in the game. Three science education researchers made the observations and the notes of observation form were taken into consideration while making changes to the game. Finally, the game was played once again, and the science teacher's feedback was gathered. As a result, it is highly possible that the game can be readily modified with only minor adjustments for any other educational level, nation, or set of characteristics. Future studies should create comparable sample games and share them with stakeholders (such as science teachers, physics teachers, special education teachers, and science/physics academicians). We recommend that experimental studies are conducted on this game to develop students' life skills or conceptual understanding and that new adjustments are done to the game, if necessary, based on the results of studies.

Keywords: *Educational games; Life skills; Resource rooms; Science education; Specific learning disabilities*

1. Introduction

Individual differences make each person special. Individual characteristics play an important role in shaping the education system. Students who differ considerably from their peers in terms of individual and developmental characteristics, as well as educational competencies are defined as students who need special education (American Psychiatric Association [APA], 2013). Under the Individuals with Disabilities Education Act (IDEA), students with specific learning disabilities (SLD) are the most common category receiving special education services (Fletcher & Miciak, 2019). In the literature, certain differences may be referred to under various names, such as "specific learning disabilities (SLD)" or specific learning difficulties or differences. Specific learning disability is a neurological disorder of the brain that weakens the brain's capacity for information processing, storage, and response (Talbot et al., 2010). Additionally, it may make it difficult for individuals to learn new things, read, write, or grasp math (National Joint Committee on Learning Disabilities [NJCLD], 2000). A student with SLD may have low expectations for themselves, low self-esteem, and low confidence since they consistently demonstrate poor academic achievement (Flogie et al., 2020; Spektor-Levy & Yifrach, 2019). Furthermore, according to Connolly et al. (2012), the situation can make the student uncomfortable in class and expose them to peer pressure or social rejection (isolation). According to Hogan et al. (2000), all of these may lead to students making fewer friends than their peers, feeling lonely, or displaying poor social relationships (i.e., less cooperative conduct, and difficulty in interpersonal communication) (Cortiella & Horowitz, 2014; Flogie et al., 2020).

It is necessary to structure the education process as much as possible according to the unique characteristics and differences of each student to benefit from the education process at the highest level. The Individualized Education Program (IEP), which is created based on the student's needs and performance, serves as a guide for teachers to implement these arrangements (IDEA, 2024; Martin et al., 2006; Smith & Brownell, 1995). Individualized educational plans are used to help students enhance their social skills (IDEA, 2024). Students with SLD may find it challenging to interact with others in daily life (Hogan et al., 2000). Assisting spontaneous communication and social behavior instruction with others are all possible components of the individualized educational plan (Turkey Ministry of National Education [MoNE], 2024; IDEA 2024). Thus, social skills, behavioral development, cognitive development (intellectual ability and academic success related to advancement of speaking, listening, writing, reading, math, memory, and thinking skills), and communicative development are among the educational needs of students (Kargın, 2017).

Resource rooms (RR) are typically defined as learning environments designed to provide special instructional support for students or small groups of students with learning disabilities (Dev & Haynes, 2015). Also, RR are environments designed with specific equipment and materials to help students with special needs get the most out of the best educational opportunities presented to them. Within the concept of inclusive education, students with SLD get an education in both the classroom as their peers and in RR (MoNE, 2018).

Students with SLD learn their science education within the framework of inclusive education by learning in both the same learning environment as their peers and the RR. A student who has difficulties with basic academic skills like reading, writing, or mathematical computations may struggle to master science courses. Comprehending detailed images, employing an array of measurement instruments, and performing statistical and mathematical computations are all necessary for science. This may be challenging for most students with typical development to understand when learning science topics and is particularly challenging for students with SLD. Therefore, students with SLD require an enhanced RR that brings these skills into relevant teaching resources (such as student worksheets, student guides etc.). Although science teachers have positive intentions and views towards teaching students with learning disabilities (Spektor-Levy & Yifrach, 2019), they feel unguided and unsupported when it comes to offering the right pedagogy to meet the needs of these students (Spektor-Levy & Yifrach, 2019). It is readily apparent there is a need for tools in this discipline because science teachers do not use different practices for their students with SLD (Er Nas & Dilber, 2020).

Integrating games into educational environments helps students overcome these challenges and have better learning experiences (Kalogiannakis et al., 2021). There has been much research done on the use of games as educational tools for knowledge acquisition. Games are an effective way to learn, engage, and perform challenging tasks (Hoffman & Nadelson, 2010). In fact, educational games enhance information retention, generate an in-depth understanding of topics, increase student engagement, and encourage intrinsic motivation (Park, 2012; Vos et al., 2011). It has also been shown to improve academic achievement (Lämsä et al., 2018; Lei et al., 2022; Sung & Hwang 2013). Furthermore, using games as teaching tools improves student performance and has encouraging affordances that improve behavioral results and get gameful experiences (Alsawaier, 2018).

Educational games that support cognitive development and acquisition and retention of learnt content can be used to teach concepts. In addition to ensuring the student's physical, spiritual, and psychological development, educational games help students establish desired behaviors (Bağ, 2020; Varışoğlu et al., 2013). These kinds of games have become common tools in the classroom meant to keep students motivated and involved in class discussion tasks. Playing educational games gives users the chance to practice various strategies, explore concepts, think critically about real-world examples, and evaluate the results of their actions in an enjoyable environment (Qian & Clark, 2016). Thus, the purpose of the study is to design a game to be used in the RR for students with SLD. The designing of this game is an attempt to meet the needs of the students as well as to provide the materials needed by science teachers at RR and in the field of special education. To identify the game's potential for teaching, the educational framework and functional elements were examined. Designing the RR materials towards educational games and life skills can enhance its quality and close the gap between students' academic achievement and their potential (see Figure 1).

EDUCATIONAL GAMES
- Enhance information retention
- Generate an in-depth understanding of topics
- Increase student engagement
- Encourage intrinsic motivation
- Improve academic achievement
- Provide enjoyable learning environment
- Encourage social interaction and informal communication
- Provide colloborative learning
- Promote inclusivity

LIFE SKILLS
- Strengthening social skills
- Spontaneous communication and behavioral development
- Personal readiness for the social demands of a changing world

RESOURCE ROOMS
- Learning environments
- Designed with special equipment and materials
- Special instructional support
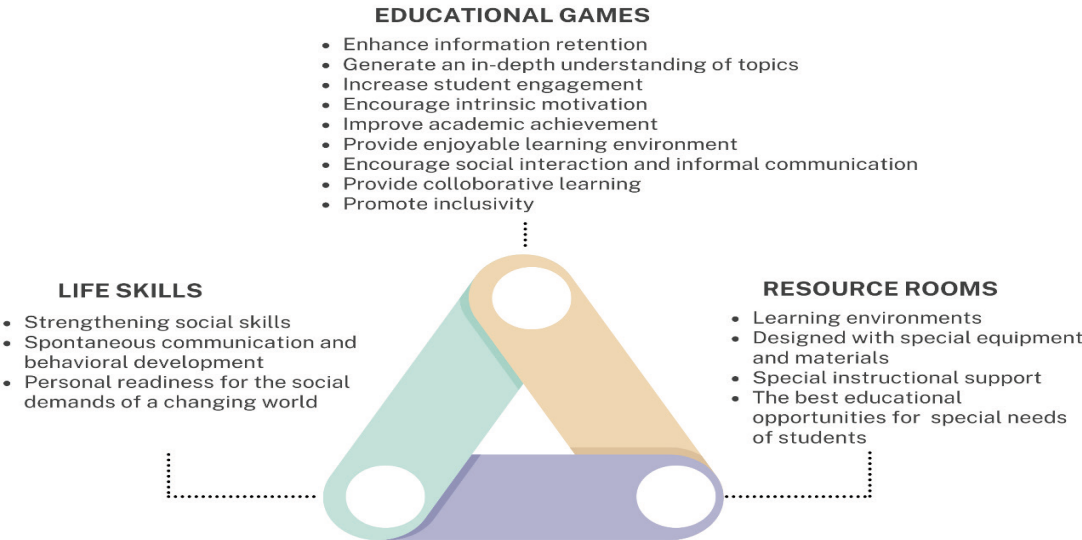- The best educational opportunities for special needs of students

Figure 1

The connection of educational games, resource rooms and life skills. Source: Author's elaboration

As seen in Figure 1, it appears that integrating educational games into the RR teaching process will help students with SLD enhance life skills. In other words, the advantages of educational games will help students enhance their life skills while developing unique resources for RR. Given all of this, it will be helpful to provide resources that assist science teachers in the practices they use with their students in the RR. Thus, it is crucial to develop relevant materials that teachers can use to help students in the RR. This study incorporates educational games approaches, enabling students to conceptual knowledge, actively engaging them in scientific learning and enhancing their life skills (communication, teamwork, decision making, creative thinking etc.) (UNICEF, 2018).

Therefore, the study aims to design a game that students with SLD can play in the RR while considering the difficulties they face to improve their life skills and strengthen their conceptual understanding. This game's design aims to answer the children's needs while also giving the science teachers the resources they require.

2. Method

The educational game was developed for the topic of "expansion and contraction" under the Matter and Heat unit in the 5th- grade science education curriculum. Firstly, interviews were conducted with teachers and academicians. Based on

interview analyses and literature review, the qualities that the game should have for students with SLD were determined (see sections 2.2 and 2.3). Then, the game was developed and its pilot study was carried out. The pilot study was conducted with two students with SLD with three researchers making observations. According to the opinions of the researchers and the students, adjustments were made to the game (see section 2.3.11). Lastly, the game was implemented with two students with SLD who were receiving training in the RR. The teacher's feedback about the game was obtained (see section 2.3.12). The students with SLD were educated in the 5th grade and received support education from the science course. The students continued their education both in the classroom with their peers and by receiving support education services.

To conduct the study, permission was received from the ethical committee. Both the teacher and the school administration had positive reactions. The procedure was explained to the students beforehand. After getting informed about the study, the teacher, the students and their parents signed a "consent form."

Before designing the material (The "carpet" game) for students, the authors carried out semi-structured interviews with 10 science teachers (six women, four men) and 10 primary education teachers (five women, five men), 10 science education academicians (seven women, three men) and 10 special education academicians (six women, four men) to identify effective approaches, activities etc. In the participants of the study, B1 stands for the first science teacher and F1 stands for the first science education academician whereas

S1 refers to the first primary education teacher and O1 refers to the first special education academician. The codes generated from the participants' answers, participants´ code and frequency are shown in Table 1. In the interview, teachers answered two questions about how to teach science concepts and the most effective methods in the resource room. As seen in Table 1, 23 teachers mentioned "learning by doing and experiencing", 15 teachers "providing variety in materials", 11 teachers mentioned "educational games", 9 teachers mentioned "working as a team", 8 teachers mentioned "repeating frequently" and "association with daily life", 6 teachers mentioned "giving responsibility" and 3 teachers mentioned "using reinforcer" in their answers.

The first question was "In your opinion, how can science concepts be taught to students with SLD more effectively?". The responses of academicians and teachers are shown below.

Child means play. Everything depends on the game, whether it is a student who needs a support training room or a student who is performing at a typical level. Something becomes more permanent the more games someone plays with it. Things that are more enjoyable than others and may keep individuals engaged longer… (S6 Educational games)

The second question was "How do you proceed with the teaching process with these students in the resource room? What methods do you think students with SLD can learn most efficiently?". The responses of teachers are shown below.

I definitely use reinforcers a lot. I prepare a poster for him, both verbally and in the form of small gifts and rewards. The smiley

won when he could. I do not know, let's say we won flowers, we won stars, I can make him follow himself. (S1 Using Reinforcer)

We did it again, we did it again on the subjects we learned in that process. We did it once, twice, three times and more. (S7 Repeating frequently)

7 primary school teachers, as well as 4 science teachers, stated that educational games would be an effective method while no academician mentioned it. In fact, most teachers did not include educational games in the RR. Besides, repeating frequently, learning by doing and experiencing, working as a team, associating with daily life, giving

Table 1

Teaching process in the resource room and effective ways to teach science to students with SLD. Source: Author's elaboration.

Themes	Codes of Participants	Frequency
Learning by doing and experiencing	**B1**, B4, B6, S1, S2, S3, S4, S5, S9, S10 B7, B8 (in the resource room) F1, F2, F4, F6, F7, F9, O2, O5, O7, O8, O10	23
Providing variety in materials	**B1, B3**, B4, **B5**, B6, **B7**, B10, S2, S4 B8, B9 (in the resource room) F2, F8, O3, O6	15
Educational games	B2, B4, **B8**, S1, S2, S3, S6, S9, **S10** B9, S4, (in the resource room)	11
Working as a team	B5, B6, B8, B9, S1, S5, S10 F2, F3	9
Repeating frequently	S3, **S7**, S8, S9, **S10** F2, F9, O2, O5, O7	10
Association with daily life	**B2**, B5, B6, **B7**, B9 O1, O2, O9	8
Giving responsibility	S2, S5, S10 B7, B8 (in the resource room) F6	6
Using Reinforcer	S1, S2, S4 (in the resource room)	3

Note:

Answers provided in both the science classroom and the resource rooms are indicated in bold.

responsibility, and using reinforcers were highlighted by both academicians and teachers. Their opinions contributed to the development of the carpet game in the following ways: The immediate repetition cabin, the QR code application and the clue box were to address the code of repeating frequently. Teamwork and communication skills were included to focus on working as a team. Daily life examples of expansion and contraction were included to associate the concept with daily life. Including brief and motivational expressions were provided for using reinforcers. These are all highlighted as effective strategies, so these themes were

considered when designing the carpet educational game. After considering the academicians' and teachers' responses to the interview questions, the researchers designed the carpet game.

2.1. Instructional Design

Figure 1 illustrates that the advantages of educational games in terms of the challenges faced by students and the significance of providing them with life skills were taken into consideration during the carpet game's design.
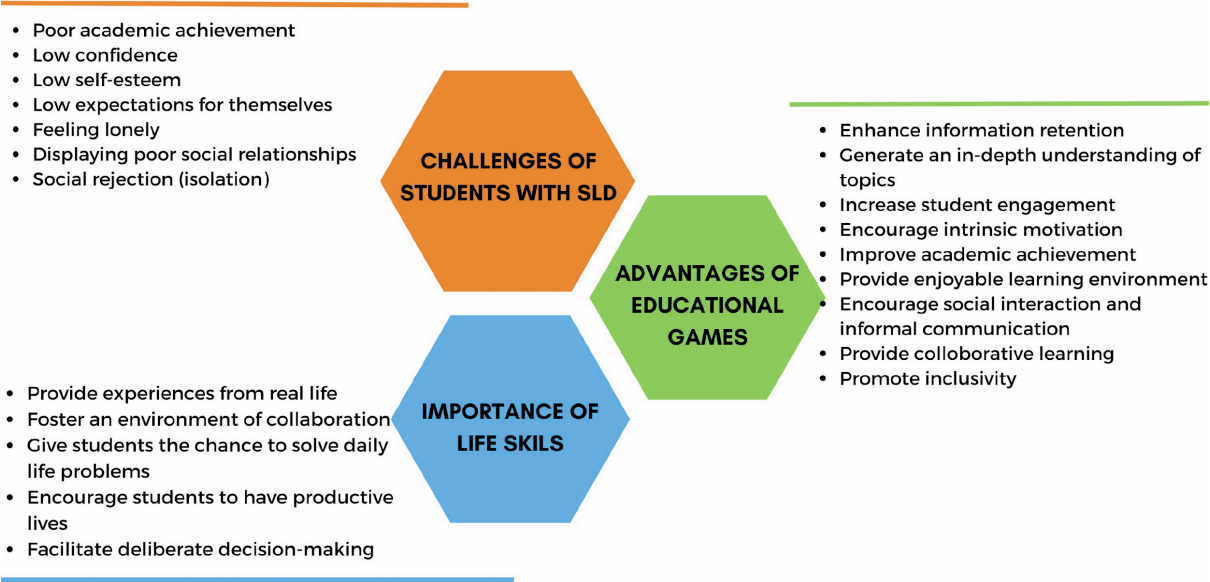

- Poor academic achievement
- Low confidence
- Low self-esteem
- Low expectations for themselves
- Feeling lonely
- Displaying poor social relationships
- Social rejection (isolation)

CHALLENGES OF STUDENTS WITH SLD

ADVANTAGES OF EDUCATIONAL GAMES

- Enhance information retention
- Generate an in-depth understanding of topics
- Increase student engagement
- Encourage intrinsic motivation
- Improve academic achievement
- Provide enjoyable learning environment
- Encourage social interaction and informal communication
- Provide colloborative learning
- Promote inclusivity

- Provide experiences from real life
- Foster an environment of collaboration
- Give students the chance to solve daily life problems
- Encourage students to have productive lives
- Facilitate deliberate decision-making

IMPORTANCE OF LIFE SKILS

Figure 2
Considerations when designing the carpet game. Source: Author's elaboration

With the carpet game, the focus is on the social and affective dimensions of learning along with the development of academic success (cognitive skill development). Given its advantages, educational games are used to support the learning of students with SLD socially, cognitively and emotionally. However, achieving the set goals depends on how educational game will be designed. Therefore, the game designed in this study has been arranged to meet these objectives. The following explains the arrangements made in the carpet game, which was designed considering the difficulties experienced by students with SLD.

2.2. The Game Development

The carpet game was developed in Turkish. The target group is 5th- grade students with SLD. The game was designed as the RR material in science class, this is, to be played after the teaching of the subject. Students can be taken to the RR in groups of two or three. The game was designed for the concepts of "expansion and contraction" under the Matter and Heat unit of 5th-grade science subjects. The daily life examples of the expansion and contraction concepts included in the game were created by scanning resource books and considering expert opinions (see Table 1). Further, the most appropriate visuals for the decided examples were selected

Figure 3
The image of the carpet

Table 2
Daily life examples on the carpet. Source: Author's elaboration

Ball inflation in hot weather	Electric wire tension during the winter	Closing of the gap between train rails in summer	Rising of liquid in a thermometer in a hot environment
Falling of glass from eyeglass frame in summer	Squeezing of jar lid in cold weather	Opening of jar lid when placed in hot water	Inflating of car tires in summer
Car tire deflation in the winter	Bursting of deodorant bottles in hot weather	Overflowing hot milk	Rising of hot air balloons
Increasing volume of heat-receiving substances	Putting the inflated balloon in a container filled with ice	Inflated ball swelling when placed next to stove	Reducing volume of heat-releasing substances
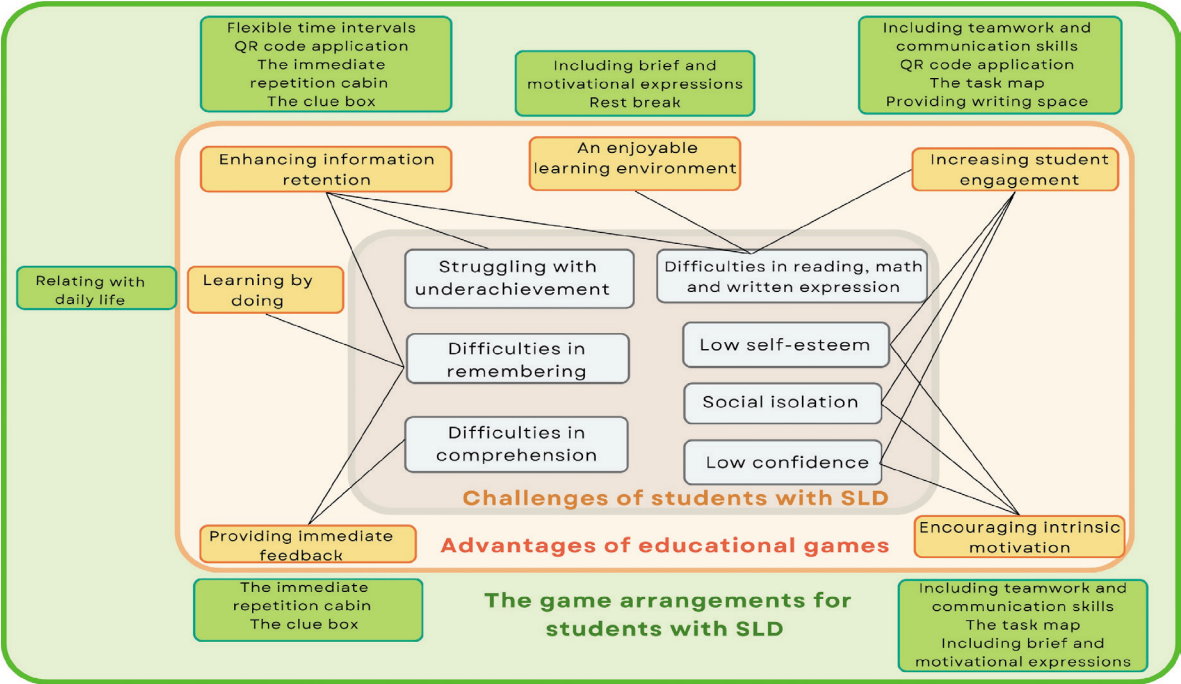
Figure 4
The game arrangements for students with SLD. Source: Author's elaboration.

within the scope of expert opinions. The examples and photographs that were pasted on the carpet were prepared in the size 1x1 meter. Notwithstanding, it was decided to enlarge the carpet at the end of the pilot study and the new carpet size was prepared in 1.4x1.4 meters (see Figure 3). This way, the carpet was in a size where students can move on. The daily life examples are as shown in Table 2.

2.3. The Game Arrangements for Students with SLD

The carpet game was designed considering the challenges that students with SLD face as well as the advantages that educational games provide regarding these challenges.

Figure 4 summarizes this consideration. Each arrangement is explained in detail under subheadings.

The interaction process of the students before, during and after the game is explained in Figure 5. The results of the students' actions throughout the game are also explained.

2.3.1. The Immediate Repetition Cabin

First, a page is provided where students can review the subject according to their preferences. The "immediate repetition cabin" was created to help students in remembering and making frequent repetitions what they had learned before
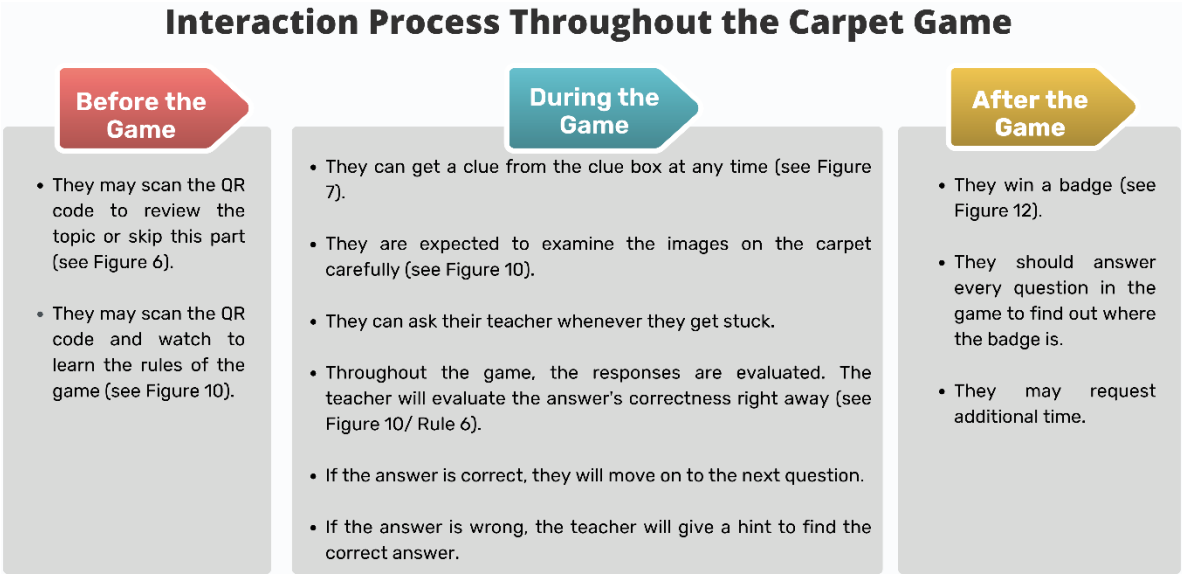
Interaction Process Throughout the Carpet Game

Before the Game

- They may scan the QR code to review the topic or skip this part (see Figure 6).
- They may scan the QR code and watch to learn the rules of the game (see Figure 10).

During the Game

- They can get a clue from the clue box at any time (see Figure 7).
- They are expected to examine the images on the carpet carefully (see Figure 10).
- They can ask their teacher whenever they get stuck.
- Throughout the game, the responses are evaluated. The teacher will evaluate the answer's correctness right away (see Figure 10/ Rule 6).
- If the answer is correct, they will move on to the next question.
- If the answer is wrong, the teacher will give a hint to find the correct answer.

After the Game

- They win a badge (see Figure 12).
- They should answer every question in the game to find out where the badge is.
- They may request additional time.

Figure 5
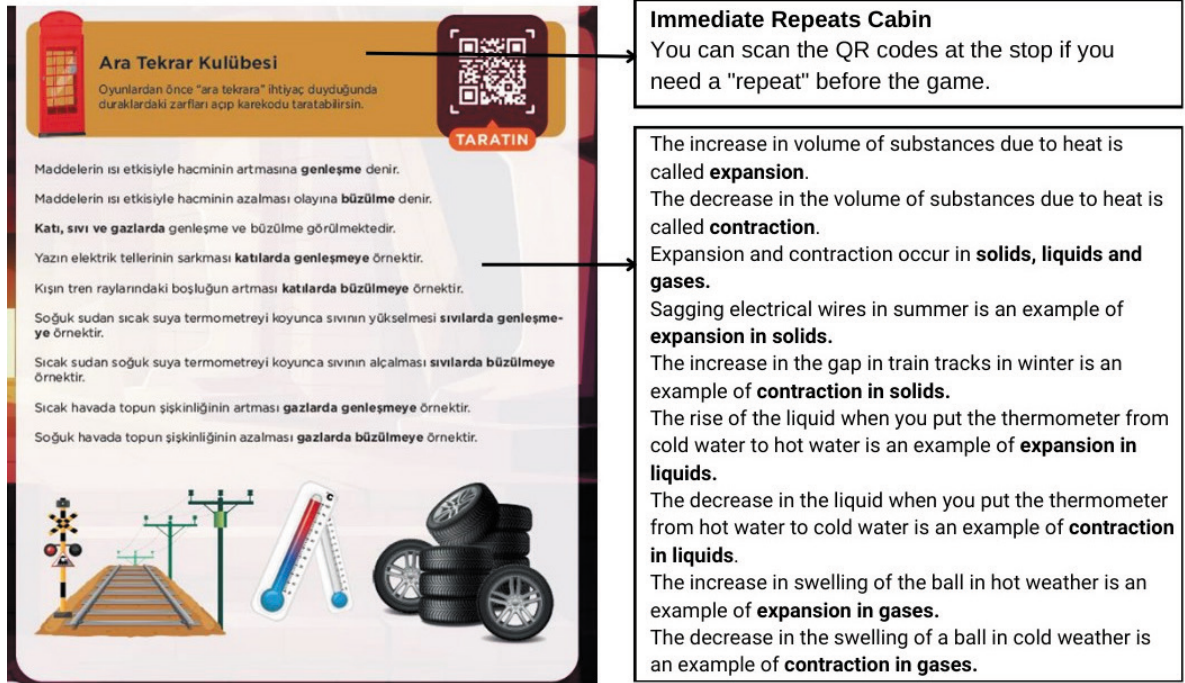The interaction process through the carpet game. Source: Author's elaboration

Figure 6
The immediate repetition cabin. Source: Author's elaboration.

starting the game. To help students with SLD who struggle with remembering or learn at a slower rate than their typically developing peers, the immediate repeat cabin was added to the game. Figure 6 shows the "immediate repetition cabin".

2.3.2. The QR Code Application

In order to enable students with SLD to read and listen to written content, the QR code section was placed in the immediate repetition cabin. The QR code area was created so that students with SLD could read as well as listen to written text (see Figure 6).

The QR code was also placed in the game rules (see Figure 7). Students had the option of listening and watching the game rules. The creation of the QR code gives the opportunity to watch and listen to the game rules for them. For a better understanding of the rules and gameplay, a video demonstrating how the game is played was also made.
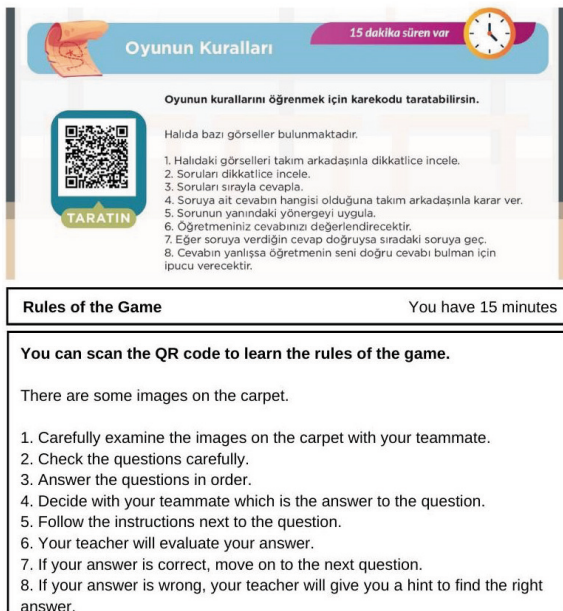
Figure 7
The carpet game rules. Source: Author's elaboration.

2.3.3. The Clue Box

Students were advised prior to the game that they may get clues if they required them while playing. It was also mentioned that Mavis, the bird character, was added to help students on their journey and provide them with details regarding the game. We prepared the clue envelopes and put them in the classroom's clue box. The purpose of the clue box was created especially to give students who have trouble with memory recall, additional opportunities to play the game (see Figure 8).
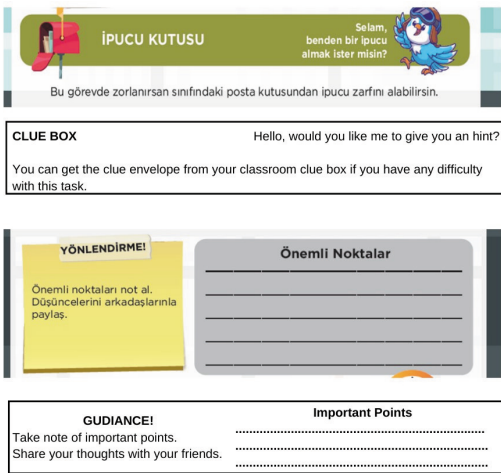
Figure 8
Clue box. Source: Author's elaboration.

2.3.4. Including Teamwork and Communication Skills

The guidance of the game emphasizes the importance for students to work as a team in order to support each other. During the game, students' teamwork received extra attention. The carpet game's guidance is displayed in Figure 9. Throughout the game, students were reminded that they were peers, and there were expressions throughout the game that symbolized their cooperation. As a team, they participated in the game and gave justifications for their predictions and suggestions. It was emphasized that they would need teammates to help them through this process.
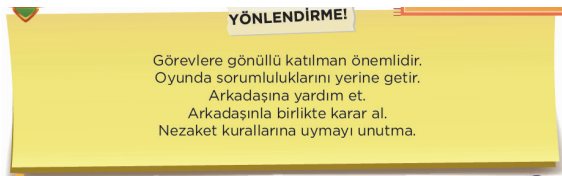
YÖNLENDİRME!

Görevlere gönüllü katılman önemlidir.
Oyunda sorumluluklarını yerine getir.
Arkadaşına yardım et.
Arkadaşınla birlikte karar al.
Nezaket kurallarına uymayı unutma.

GUIDENCE!

It is important to volunteer for the tasks.
Fulfill your responsibilities in the game.
Help your friend.
Make decisions together with your friend.
Remember to follow the rules of politeness.

Figure 9
Guidance. Source: Author's elaboration

2.3.5. Providing Writing Space

The suitable writing section was created by providing guidance before starting play. They have this kind of area at their use to write down anything they want. Additionally, a remark with the phrase "share your thoughts with your friends" was included since students were encouraged to openly discuss their thoughts and opinions with their peers (see Figure 10). This approach is meant to help students with SLD in continuing the process.

YÖNLENDİRME!

Önemli noktaları not al.
Düşüncelerini arkadaşlarınla
paylaş.

Önemli Noktalar

GUIDANCE!
Take note of important points.
Share your thoughts with your friends.

Important Points
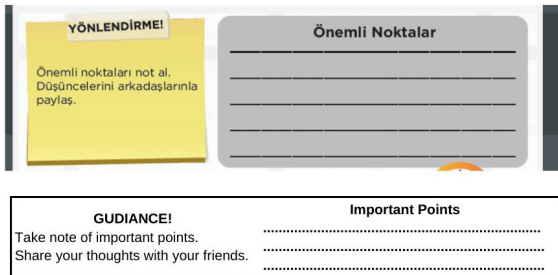
Figure 10
Writing area and guidance. Source: Author's elaboration.

2.3.6. Providing Enough Time and Flexible Time Intervals

The duration was specified. The length of the game was decided by considering the students' difficulties. Furthermore, the game rules were only a few lines long to keep students engaged in the process. The clock image at the top of the page, on the right, displayed the current time (see Figure 7).

The game rules were provided before the game started. The name of the game and its visual (on the left at the top of the page) were all indicated. The game incorporates examples from everyday life that students come across regularly to enhance their learning of the subject matter (for example, the reduction of the winter vehicle wheel's swelling). Both the photographs and the written examples of expansion or contraction are included on the carpet.

2.3.7. Relating to Daily Life

Daily life examples of expansion and contraction were included in the immediate repetition cabin, the clue box and the examples on the carpet to help students remember these concepts (see Table 2).

2.3.8. Including Brief and Motivational Expressions

The game instructions and questions were provided in brief expressions (see Figure 11). To keep students engaged in the process, the game instructions were stated in a few lines. The instructions were presented in the form of items. The teacher encourages students to follow the game and motivates them to continue the game.

At the conclusion of the game, the student received a thank you as well. Students were informed that upon completion of the task, they would receive a badge. They were also told how to get their badge in the proper stop and where to obtain their

F**igure 12**
Direction at the end of the carpet game. Source: Author's elaboration.
badge. When the game is over, the carpet game continues as seen in Figure 12.

2.3.9. The Task Map

The task map consists of 8 stops. Each game was explained to the students as a task. The task map (see Figure 13) that would guide them through the procedure was illustrated to them. Its goal is to offer a winning-based solution to the low self-esteem issue that affects students with SLD.
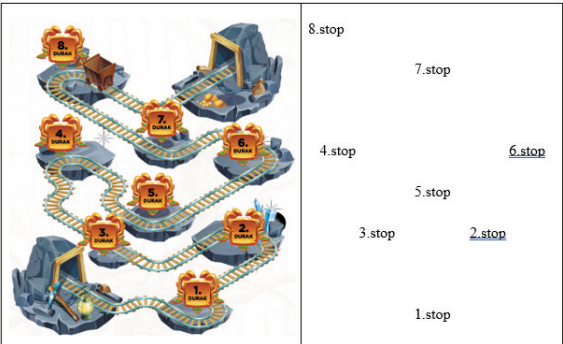
Figure 11
The questions for the carpet game. Source: Author's elaboration.

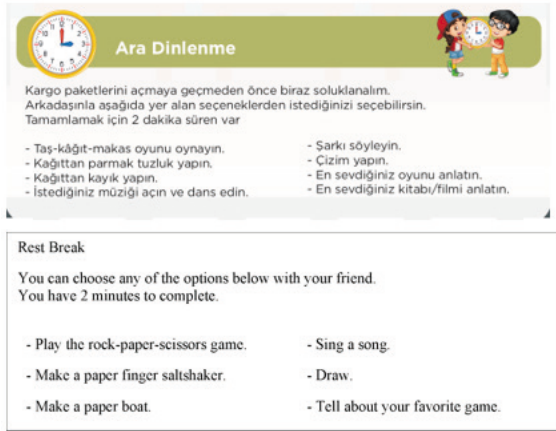Figure 13
The task map. Source: Author's elaboration

Figure 14
The rest break Source: Author's elaboration.

2.3.10. Rest Break

In order to keep students engaged in the process, reduce their shy behavior, and allow them to interact with their peers, breaks are scheduled at the conclusion of each subject (see Figure 14).

2.3.11. Adjustments Taken within the Scope of the Pilot Study

The game's final form was determined by a pilot study. Two students from the 5th-grade participated in the game. Three science education researchers made the observations are crucial for the evaluation stage of the game.

Three researchers evaluated the game according to the evaluation form. They used this form to record their observations as well. Discussions were held regarding the topics on which

the researchers disagreed. Feedback from the researchers on the items in the observation form and their observation notes were considered. They expressed a common opinion in terms of the following: The materials of the game are attractive for the students with SLD (11-12 years old). The content of the game contributes to the conceptual understanding of students and provides an opportunity to give feedback to students. The game gave students the opportunity to be active and examples from their daily life. It also allows students to communicate with their teammates and to speak (express their thoughts freely) during the process. The game allow students to work collaboratively in the process and to make joint decisions with their team. The researchers discussed the item regarding the rules of the game being clear and concise and the suitability of the game material. It was observed that students needed a rule to review questions before answering and that they were unable to move freely due to the carpet's size. As a result, it was determined to make the carpet larger. While playing the carpet game, students also provided feedback on the game. As a result of the evaluations, the following adjustments were made.

- It was decided to enlarge the carpet when the children were playing the game because it was narrow and made it difficult for them to walk around comfortably. While the carpet was 1x1 meters in size, at the end of the pilot study, the new carpet size was prepared in 1.4x1.4 meters (see Figure 15).
- It was observed that students required a framework to review the questions before responding. Consequently, the second item was changed to include the rules "Examine the questions carefully" and "Read the instructions next to the question."

- It was observed that the number of options offered to the students was not sufficient when they wanted to do something different from the options offered during the breaks. Therefore, the number of options during the breaks was increased by considering the communication and teamwork skill indicators.

2.3.12. The science teacher's feedback

A science teacher used the carpet game in the RR. Students with SLD in the fifth grade played the game (see Figure 16). Following the process of implementation, an interview was held with the teacher. The teacher's opinions are stated below:

I may assess the lesson and determine whether students have learned by doing this through the game. It was enjoyable for the students as well as for me. Students can engage in physical activity while playing the carpet game. Because of the design of this game, students feel more successful. Students may believe they can comprehend and perform every task in the game. It would therefore be easy for any teacher to use any content intended for resource rooms. Because it will make teachers and students happy, I think this educational game is a huge success.

Figure 15
The initial (left) and final size (right) of the carpet

Figure 16
Photographs from the gameplay process

3. Discussion

This section focuses on how the carpet game's included features might affect the life skills and cognitive development of students. Our study highlights the carpet game arrangements for students with SLD. Also, it offers recommendations for adapting these arrangements to be appropriate for other units and subjects. The game could potentially act as a starting point for enhancing the ways that many subjects are taught. In this context, the carpet game was developed as a way to improve the teaching of expansion and contraction in science education. Instead of using traditional lectures, this kind of educational game experiences where knowledge may be gained through an action.

As a result of this study, the carpet game might be a potent tool to teach information in a readily and more comprehensible way rather than the traditional teaching of the concept of expansion and contraction in RR because game-based learning significantly improves knowledge and increases active participation in classes (Lei et al., 2022; Pinedo, 2022; Sung & Hwang, 2013). Further, there may be a potential to enable students to interact with the game and teach the subject outside of what is learned in the general classroom environment. Because students can become active participants in games (Pinedo, 2022) as opposed to passive followers, these educational games may need emotion, focus, and attention.

The arrangements of the carpet game can allow students to completely exhibit their conceptual or skill development performances. For instance, including daily life examples in the immediate repetition cabin, the clue box and the examples on

the carpet might enrich their understanding. They can also help to build long-term memories, which are necessary for the construction of knowledge. Some of the daily life examples can not only be instructive but also thought-provoking, generating a lot of conversation among players who frequently review what they learned and are motivated to learn more about certain topics. This allows for more effective teaching practices and evaluations based on the student's level. The carpet game may allow for failure in a special way, as students can continue to play without facing serious consequences. Furthermore, it can effectively engage any student since it may be personalized according to various learning contexts, skill levels, emotional states, and cognitive capacities (Plass et al., 2015). The suggested arrangements differ depending on the needs of the students. As a result, the arrangements of our study could be made based on the student's specific needs.

Students in RR can get the chance to engage with their peers and enhance their social skills by playing this game in groups. Moreover, students studying the subject in the RR may find it easier to interact with their peers while attending class. Because a student who is familiar with the subject may engage better in class. This may ensure that students will be included in the classroom. Since educational games encourage social interaction and informal communication—all of which enhance communication skills—they can be a helpful tool for promoting inclusivity (Niedderer et al., 2022). The carpet game promotes face-to-face communication as well as interaction between students. This may enhance teamwork and communication skills (Janakiraman et al., 2021). Therefore, a student who has better communication

skills can build good relationships with classmates or with others in their daily lives. Students increasingly collaborate to choose correct answers during the game. This cooperative attitude would result in collaborative learning, which would undoubtedly help the game succeed in increasing students' conceptual understanding and social interaction, and demonstrate that the game has the potential to be an effective teaching tool. Students might be inspired to learn and perform well by collaborating with others and reaching goals. This feeling of achievement might motivate one to engage with the subject and become proficient in it. Collaborating to achieve a shared goal can encourage a positive learning atmosphere and motivate students to help and learn from one another. The cooperative features of the carpet game might increase peer cooperation and peer learning (Chen & Law, 2016) by creating a rich learning environment that lies between what students already know and what they may learn from others (Vygotsky, 1978). The conversations and exchange of ideas that occur in the game as a result of the examples of concepts not only encourage collaborative learning but also strengthen other essential skills including scientific reasoning, decision-making and teamwork. Therefore, through such activities, students can learn through decision-making and responding to the consequences of their actions.

Compared to conventional lectures, learning can take on greater importance and meaning in an enjoyable setting (Wang et al., 2018). The originality and enjoyment factor of games might encourage student participation and learning. The game is made more interesting by the originality of students playing with their hands and feet. This may make them

want to find the right answer, concentrate on the game, and perform better. Further, students may find the game more entertaining if they use the game physical pieces that were created especially for the carpet game, such as huge images and badges. Thus, this could enhance engagement and confidence during gameplay as they achieve educational goals. Parallel to this, it is stated in the literature that students' self-confidence and participation increase with the game (Plass et al., 2015) helps them accomplishing the game's educational objectives (Wang & Zheng, 2021).

Students could receive timely individualized feedback from the teacher, enabling them to improve their learning approaches and enhance their comprehension. These aspects have the power to hold students' attention and draw them in, which might result in higher levels of engagement and better learning results. Due to the requirement for physical resources, the carpet game can be used with minor educational arrangements. It is hence appropriate for RR.

The carpet game presents additional advantages besides acting as a teaching tool for the concepts of expansion and contraction. First, the game's materials are available, inexpensive to reproduce, and may be produced by hand. Because of this, the carpet game is a cheap, easily replicable educational tool that may be used in a variety of educational contexts and education levels. Second, the game's elements are highly adaptable, enabling the contents to be modified for usage in a variety of contexts without changing the game's structure. This, together with the fact that player interactions shape the game, makes it more unpredictable and engaging.

On the other side, it might be expected that the game provides teachers with materials that they require in RR for students with SLD. Teachers (Kılıçel & Ertaş Kılıç, 2021) or science teacher candidates (Er Nas & Yaman, 2023) appear to understand the significance of educational games. Therefore, explaining in detail the arrangements made in the educational game by considering the students' challenges and creating specific educational games may help to clarify how science teachers might improve a RR for students with SLD.

4. Conclusion

Here, a new educational material for RR's teaching and learning was designed, based on an educational game. This study aimed to design a game that could be played in RR, taking into consideration the challenges of students with SLD to enhance their life skills and support their conceptual understanding. The following was carried out to reach the study's main aim. First, the challenges of students were primarily taken into consideration while developing the carpet game. Then, the game features were determined by considering the advantages of educational games and interviews with teachers and academicians. Each feature of the game was explained in detail under subheadings. Further, the necessary arrangements were made as a result of the pilot study of the game. The notes of the three researchers on the observation form were taken into consideration while making changes to the game. Finally, the game was played once again, and the science teacher's feedback was gathered. Consequently, the arrangements made within the aim of the study are interpreted as the game was designed in RR taking into consideration

the challenges of students with SLD to enhance students' life skills and support their conceptual understanding in RR and demonstrate how resource rooms may be enhanced with educational games for students with specific learning disabilities. Educational games are useful tools for teaching complicated concepts. This game not only could teach and relate the concepts of expansion and contraction to real-world examples, but it also could make learning more engaging and exciting for students. Playing the carpet game may have the potential to improve knowledge of expansion and contraction concepts and increase awareness of real-world examples of these concepts. As an alternative to traditional approaches, this board game can be used to promote interest in studying abstract or complex subjects. Further studies into the game's adaption for different subjects, educational levels, and nations could help validate the potential findings reported here.

For educational equity and social justice pedagogy for all science learners, it is crucial to support students with SLD in their science education. Indeed, these students require an enhanced learning environment that facilitates scientific study. It is suggested that those designing game-based educational environments for science education consider using the carpet game, which allows students to observe, investigate, and control a variety of factors in addition to receiving immediate feedback on their performances. It is highly possible that the game can be readily modified with only minor adjustments for any other educational level, nation, or set of conditions. Future studies should create comparable sample games and share them with stakeholders (such as science teachers, physics teachers, special education teachers, and science/physics academicians).

This game may be arranged for different age groups and also in a different units and the number of players may be increased. If the number of students is high, the game might be played by forming more than one group. Depending on this, the game time may be rearranged. We recommend that experimental studies should be conducted on this game to develop students' life skills or conceptual understanding and that new adjustments might be made to the game if necessary based on the results of studies.

Acknowledgements

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