Using Gamification to Motivate Students with Simple-Moderate Intellectual Disabilities

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Abstract: By the spread of COVID-19, the entire world shifted suddenly to e-learning including schools. This study aims to find ways to enjoy teaching. Gamification in education refers to the introduction of game elements in non-game environment. A case study was adopted for this study as a qualitative approach to investigate the possibility of improving motivation. The study was conducted in the first and second semester of the 2020/2021. The sample consists of (6) participants of pre-services teachers studying in special education course for 15 weeks. Data were collected through semi-structured interviews. The result of the interview showed that there is a clear desire among the students to succeed during learning using game elements. Their desire is very clear and higher. Most of them became active during their learning. They enjoyed learning in gamified learning environment. The researchers recommended that the Ministry of Education should train teachers to employ game elements to motivate their students.

Keywords: *COVID-19, gamification, moderate intellectual disability, motivation.*

Introduction

Research on consequences of COVID-19 has a long tradition. The spread of COVID-19 has affected all sectors of life. The classrooms are not home to nearly 60.2 million school teachers and university professors. A recent study was carried out by (Mulenga & Marbán, 2020). pointed out that many schools and universities shifted to e-learning classes. The problem of how to motivate students effectively to enjoy learning in an environment that is filled with distractions from a variety of technology-driven devices is what teachers struggle with on daily basis (Dichev, & Dicheva, 2017). However, gamification is pretty controversial among instructors because they think it is just a synonym for a type in the e-learning community. On the other hand, some scholars argue that it has a negative influence on learners while a third group believes it is the cure-all for education as we know it. Briefly, the truth lies somewhere in between the aforementioned opinions (Erenli, 2013). This to say that gamification in education refers to the introduction of game elements and gamified experiences in the design of learning processes.

Gamification like many learning strategies has been adopted to support learning in a variety of contexts and subject areas, but also to address related attitudes, activities, and behaviors such as participatory approaches, collaboration, self-guided study, completion of assignments, making assessments easier and more effective, integration of exploratory approaches to learning, and strengthening student creativity and retention. In fact, there are five main principles of Gamification which are Goal orientation; Achievement, Reinforcement, Competition, and Fun orientation (Nah et al., 2013). When the concept of Gamification is applied to education, the opportunities for experiential, self-paced, and lifelong learning expand exponentially. Learners are hooked by fun and then rewarded with knowledge and skills. Applying Gamification techniques in a curriculum can help to provide a more inclusive activity through its effect on students' sense of competition, interaction, and motivation (Aşıksoy, 2017; Davis et al., 2018). Finally, the application of Gamification in the educational context can help to increase students' motivation in learning.

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Motivation is a very important aspect of success in learning. The success in learning depends on whether or not the learners are motivated. Highly motivated learners make any class fun to learn. Learners need to motivate them by increasing both their intrinsic and extrinsic motivation. Accordingly, this can be achieved by using games in learning. Games create engagement that is necessary for learners' experience. Gamification is the process of adapting an experience with game-like elements. The integration of game elements in the non-game situation has a great effect on raising learners' motivation. Advancement in Gamification expands opportunities for game- play, allowing participants to engage in any part and any place. Any learner who owns a smart phone or learns via a smart board will become a gamer. When the concept of Gamification is employed in education, the opportunities for lifelong learning, fun, and rewarded (Arnold, 2014).

While Gamification is the practice of using game-design elements, game mechanisms, and game-thinking in non-game activities. Game-based learning is being used to encourage students to participate in learning while playing and make the learning process more interesting by adding fun to the learning process. Studies showed that it has a positive effect on cognitive development. It could make people excited and be used to encourage intrinsic social motivation (Al-Azawi et al., 2016).

Gamification is a game-based approach to teaching that is based on a sequential technology of games. Since the 1980s, there has been an investigation that argues that Gamification's applications and consequences have piqued the interest of scholars because it offers a new way to engage and motivate students effectively during class in the learning procedure (de Sousa Borges et al., 2014). Moreover, Gamification is defined as the integration of game elements into non-game environments. So, Gamification in terms of using game thinking, approaches and elements in a context different from the games, using game mechanics improves motivation and learning in formal and informal conditions.

Both games and Gamification are beneficial to the educational system and the overall learning experience. The primary distinctions between game-based learning and Gamification are that, unlike game-based learning, Gamification does not need content adaptation to fit the game story and rules. Gamification, on the other hand, is utilized to turn a learning experience into a game. In brief, Gamification is the idea of adding elements of games for a non-game situation, while educational games are designed to help people to learn about a certain subject. Both of them help students to learn better and be motivated and engaged (Hamari et al., 2016).

The term "Gamification" was initially used back in 2003 to characterize the work of computer game creator Pelling, which Terrill first reported in a blog post. In addition, the idea of employing games in serious situations is a novel one, this isn't a new concept. Researchers recently discovered that the motivations of people who use the concept are more motivated than those who do not (Müller et al., 2015).

Gamification has sparked considerable attention among academics and research networks in recent years. This sparked attention was pushing them to investigate the complete range of gamified features utilized in the instructional design process to give engaging experiences and improve programs. (Kyewski & Kramer, 2018; Tsay et al., 2018). Supporting and maintaining engagement in Gamification pedagogies remains difficult despite technological advancements and major impact on learning and instruction (Ding et al., 2018).

Gamification in the classroom attracts the attention of learners due to the characteristics of its design. Examples on these characteristics are "reward-based Gamification" strategies points, levels, badges, achievements, and leaderboards are the main points of the game and their important function in the educational sector in increasing the learning process and altering students' activities appropriately. It is believed that because the students' involvement in games is centered on an instructional environment, their participation in games is limited. There appears to be an increase in knowledge as well.

Gamification is gradually being regarded as an effective learning method for creating highly engaging learning experiences according to mounting research. Researchers tried to investigate the impact of Gamification on boosting motivation, engagement, and social influence (Groening & Binnewies, 2019; Lopez & Tucker, 2019). In addition, the use of gaming mechanics boosts the ability to learn new skills by 40%, according to Gabe Zichermann, who referenced it. Users are more committed and motivated when they use game-based tactics (Giang, 2013). Moreover, Gamification has an impact on student behavior, dedication, and drive which can lead to knowledge and skill growth (Hsin-Yuan Huang & Soman, 2013).

According to Landers (2015), Gamification in education has numerous benefits including more fun, relaxed environment, visible learning progress, and a higher sense of ownership over learning. According to gamified learning theory, there are two key psychological effects; the former is a more direct mediating process whereas the latter is a less direct mediating process. The aforementioned are two ways that games might influence learning. Mediating the procedure (Landers, 2015).

Motivation in Education

In education, motivation is considered a key factor of learning (Daher, 2021). It explains the attention and effort students dedicate to particular learning activities (Gressick & Langston, 2017). A significant problem that many schools and educators are facing today, is that lacking the motivation and interest to learn. So that part of the role of the teacher is managing learner motivation (Rojo et al., 2019). Other studies state that Gamification is a tool to increase motivation by using the elements of games in student education (Annansingh, 2018). The application of Gamification in the educational context can help increase student motivation in learning. The literature has further demonstrated that the use of Gamification in education increases motivation and participation in a particular course (Hakulinen et al., 2015). Often, the first idea of Gamification leads to technology. However, Gamification is a way of engaging people in activities as directed (Dichev & Dicheva, 2017). The stimulus technique is a tool to facilitate the game environment (Faiella & Ricciardi, 2015). In other words, Gamification is a social construct, which motivates participants to participate in a certain way (Dichev & Dicheva, 2017).

The principles of several theories of motivation are the foundation for how Gamification motivates students in the classroom. Self-determination theory, flow theory, and self-efficacy all have complementary components which support Gamification as means to motivate learners (Gooch et al., 2016). Thus, the use of Gamification will be appropriate for students with simple- moderate Intellectual Disability to learn, because it ensures the achievement of the social dimension, develops personal and social skills, develops language abilities, communication skills, cooperation, and increases students' motivation and interest in school more.

Besides, Intellectual Disability is characterized by significant limits in mental functioning and also in adaptive behavior. While the limitation is characterized by decreased skills starting from the developmental stage resulting in lower intelligence compared to the general category. The weakness is also manifested in the skills required for adaptation: cognitive, motor, impaired expression, and social impairment. Students with intellectual disabilities can also suffer from mental disorders of any kind. (American Psychiatric Association, 2013).

Intellectual Disabilities are neither a disease nor a mental disorder. Mental retardation expresses the current state of human work, arising in the period of development, which is characterized by limitations in mental skills and social skills required for adaptation in his society. These limitations are expressed in the mismatch between his abilities and his functions in the face of the expectations of the society in which he lives and therefore he needs help and support. Intellectual Disabilities are divided into four levels: simple, moderate, severe, and profound (Harris, 2014).

Moderate intellectual disability students attract the attention of researchers as the possibility of helping them increased their learning chances is not low. This category is characterized by IQ: 40–54. It is defined as independent only in some areas of daily life, and it needs limited support in other areas, i.e., permanent support, but for short periods, to guide, teach, and train the individual to perform more important skills independently (Papazoglou et al., 2014). Therefore, this category needs appropriate teaching tools and strategies for special education, especially since these students continued to learn in schools rather than at home during the COVID-19 because there are therapeutic and educational resources that cannot be available in their homes.

Teaching and Learning in Emergency Education

Teaching and learning in emergency education due to COVID 19 pandemic is attracting the attention of educational researchers (Abukhalil et al., 2021; Capinding, 2022; Daher et al., 2022; Lee et al., 2022; Moliner et al., 2022). In addition, after the spread of COVID-19, ministries of education all over the world have the policy to close schools and replace teaching and learning with e-learning (ex., Daher & Salameh, 2022). According to United Nations Educational, Scientific and Cultural Organization (UNESCO), the COVID-19 pandemic has arisen, 1.37 billion students from 138 countries around the world which affected schools and universities. The spread of the disease affected all aspects of life. The classrooms are not home to nearly 60.2 million schoolteachers and university professors. Blahušiaková et al. (2021) pointed out that there are many schools and universities turned into e-learning classes. It forces schoolteachers and university professors to adopt e-learning strategies hastily.

Researchers point to various advantages of e-learning (Abuzant et al., 2021; Daher et al., 2021). It is flexible in teaching and learning. Also, it is a place where teaching and learning occur flexibly (Daher et al., 2022). Ministries of education tried to find an effective form of online education; some students do not have the same opportunity of learning. Most educators started to think of a plan to continue e-learning. They even do not have the right assessment tools; students carried out their assessment tools with a lot of trial and error.

It is obvious that the lockdown of schools and colleges has not only affected the learning processes but also the assessment and examination processes (Dhawan, 2020; Hamdan et al., 2021). This leads many educators to adopt Gamification in e-learning to create a suitable learning environment for students. In general, many studies such as (Nieto-Escamez & Roldán-Tapia, 2021) pointed out that using Gamification during COVID-19 engage students and deliver the curriculum material. During isolation, students were able to connect to their classmate. Gamification also activates students with weaknesses.

In brief, it achieved most of the learning outcomes by comparing with traditional learning. This qualitative study investigates the influence of Gamification on the motivation of students with simple-moderate intellectual disabilities to learn. Participation and motivation are important in the learning process. Studies, such as Chans and Castro (2021), suggest that Gamification increase the motivation and the participation of learners. Here we address the role of Gamification in raising the motivation of students with simple moderate intellectual disabilities. This research came to reveal the effect of using Gamification on the motivation of the simple moderate learners' intellectual disabilities. In addition, this study may help teachers to check if using Gamification benefits teaching in increasing the motivation of the learners.

Research Question

How does Gamification contribute to learning among students with simple- moderate Intellectual disabilities during the Corona pandemic?

Methodology

Research Design

A case study approach was adopted for this study as a qualitative approach. This was specifically designed for exploring how the use of Gamification affects the motivation of students with mild and moderate intellectual disabilities to learn, in COVID-19 educational emergency, from the perspective of pre-service teachers, through detailed, in-depth data collection involving multiple sources of information (Creswell, 2012). The intellectual disability students continued to come to schools during COVID-19 educational emergency, while other students learning by online means. This facilitated the data collection process that was performed through interviews with the preservice teachers.

The main focus of the case study approach was to investigate the motivation to learn among students with simple and moderate intellectual disabilities by Gamification from the perspective of pre-service teachers at a teachers' college.

Sample and Data Collection

The study was conducted in the first and second semesters of the 2020-2021 academic years. The sample consisted of (6) participants of pre-service teachers participating in a field course of special education for 15 weeks. Meaningful sampling was used in this study because it enables researchers to select participants who provide data that are most relevant to the studied case. According to Creswell (2012), the case study-based research should include between 3 and 10 subjects. Therefore, we, according to Creswell's recommendation, chose (6) pre-service teachers who have been selected to participate in this case study. The participants were chosen to participate in the present study depending on their willingness to do so and after they signed a formal consent.

The participants were pre-service teachers from the Department of Special Education and Arabic Language in their third year of education at a teachers' college. All of the pre-service teachers were female teachers aged 21-22 years old, with good to an excellent achievement. They were trainees at a training school of special education in the same district. They got accustomed to the school and classrooms during the first four weeks of their training.

Data were collected through semi-structured interviews. The interview was conducted by Zoom application and recorded for quality purposes. The interviews lasted between 40 and 50 minutes. The interview started with open questions and advanced into leading ones. The questions aimed to explore the influence of using Gamification on the motivation of students with simple- moderate intellectual disability to learn during COVID-19. Examples of these questions are: How does Gamification contribute to learning among students with *simple- moderate Intellectual disabilities* during the Corona pandemic? How does Gamification contribute to stimulating the motivation to learn among students with *simple- moderate Intellectual disabilities* during the Corona pandemic?

The participants agreed to be recorded during the interviews. A consent form was signed by the participants. The questions were repeated or, if necessary, reworded until the interviewer was convinced that the interviewee had fully expressed the thought she had shared. Consideration was given to the fact that the interviewees might not understand the wording of the questions. The interviewees were, therefore, encouraged to ask questions

Analyzing of Data

This research presents a case study as a type of qualitative research that analyses the implementation influence of using Gamification on the motivation of students with simple- moderate intellectual disability to learn in COVID-19. To ensure validity, we made sure of our interpretations of the data by presenting it to experienced interpreters of the studied phenomenon. Interpreters are well-qualified to interpret the results. One of the interpreters was an instructor who supervised the pre-service students in field training at the department of special education, while another interpreter was a mentoring teacher who mentored the pre-service teachers in the training school.

After interviewing the participants, we transcribed the interviews. We used thematic analysis to code, categorize, and find patterns related to the role of using Gamification on the motivation of students with simple- moderate Intellectual

Disability to learn. In order to guarantee the trustworthiness of the research analysis, the agreement between judges was used (Denzin & Lincoln, 2000). Two persons identified the connections between categories and sub- categories. The agreement between the judges was 0.89, which is acceptable as guaranteeing trustworthiness. This is in line with past research as Daher et al. (2020).

Ethical Considerations

It includes choosing a suitable methodology for the research, a good relationship with participants and keeping the data just for scientific research. Some experts pointed out the fundamental of ethical research involving human participants. Thereupon, we have taken this into account during carrying out this study.

Finding/Results

The study aimed to identify how Gamification contributes to stimulating the motivation to learn among students with simple-moderate mental limitations in light of the Corona pandemic. It shows how Gamification contributes to stimulating the motivation to learn among students of this category through the following dimensions:

Gamification as a Tool for motivation to succeed

The participants in the study agreed to a large extent that there is a clear desire among students with mild-moderate mental limitations to succeed during learning using Gamification through motivation, participation, and competition.

"*Every student's desire to succeed while using Gamification during education was very clear*," Rawan says. Asiel confirms this: "The desire of the average mentally limited student was very high and clear. "*The student can participate in a large proportion compared to the usual ways, such as telling the story", says* Siwar. In addition, Iman believes that: *"When using Gamification, I saw the students competing among themselves as to who finishes first and who succeeds in the game."*

Gamification as a Tool for Motivation to be Alert and Paying Attention

The participants in the study agreed that learning by Gamification increases alertness and attention among students with mild-moderate mental limitations through the use of digital gamification in a way that suits their abilities during the interview we got interesting ideas from the participants. *"The student is very alert to learning by Gamification*," Rawan says. Some participants also indicated that the student's concentration, vigilance, and attention decrease at certain stages. Asil added *"At first the students were excited to participate and interact but at some point, there was a drop in the students' focus, It could be a result of COVID-19 emergency".* Furthermore, some of the participants said that linking the amount of vigilance and attention using different effects of sound and image in the learning process using Gamification. For example, Asil explains *"The use of sounds and images draws the attention of students with intellectual disabilities and increases their alertness".* Whereas Rawan adds *"Through gamification, the student interacts with all his senses with the skill; he hears, sees, and touches. This is the case despite the constraint conditions of COVID-19"*

Gamification as a Tool for Motivation to Master the Goal

The results showed that there is a discrepancy in the participants' answers in the extent to which students with mild-moderate mental deficiencies master the goal with self-responsibility while learning by Gamification. Where some participants indicated that the student tries to master the goal with self-responsibility elaborately in an attempt to prove themselves, and some participants indicated that mastering the goal differs from one student to another, while some participants linked that mastering the goal by the student is linked to several factors, including simplifying the game from Before the teacher, reinforcement and assistance in the various stages of the game. Rawan has added a significant contribution, she says "*The student takes it upon himself, regardless of his special needs, to be proficient, especially since he is alone and wants to prove himself. "*Not only Rawan but also Bayan affirmed the aforementioned idea, her main concern was that *"Students take on themselves the responsibility to carry out the game's instructions in a perfect manner, and make every effort to reach the victory".* In addition, Siwar notes *"In general, a student with a mental disability can master the game if it is simplified to suit him".* Lastly, Eman believes that *"Without the teacher's help, the student cannot reach the desired goal. This is especially true especially in times of emergency as that of COVID-19. In these times, students are reluctant to learn".*

Gamification as a tool for motivation to Keep challenge, perseverance, and determination to accomplish tasks

The participants in the study unanimously agreed that learning by Gamification helps in developing challenge, perseverance, and determination to complete tasks among students with mild-moderate mental limitations. While one participant saw that the challenge and determination are related to how easy the game is. Rawan says: *"Learning through Gamification grew and developed challenge and perseverance, and increased the resolve and determination of each student. "*Moreover, Eman says *"It surprised me when he answered (for me), meaning that the student insisted on completing the task alone without anyone's help. This indicates the student's challenge and insistence on completing the task without assistance".* Additionally, Asiel explains: "*Through learning by playing games, there was a challenge among the students.*

Through it, each student and student grew and developed in one way or another. Strengths among them were challenge and determination. He developed many concepts, the most important of which is the determination and responsibility to complete the tasks required of him." Bayan confirms *"I used to see and touch the insistence and repeated attempts of students in order to accomplish the required task."* However, Siwar presents another point of view: *"There is often no noticeable insistence if the student finds the game difficult, but if it is facilitated in a way that suits him and the teacher asks him to try to solve it, he tries and insists on implementation."*

Gamification as a Tool for the Pleasure and Satisfaction of Getting Things Done

The results indicated that there is a discrepancy in the students' pleasure and satisfaction with completing their tasks during the learning process by Gamification, as a large percentage of the participants agreed that the students feel great pleasure and happiness while learning by Gamification, while some participants had another opinion, which is that the student feels pleasure and loss. Associated with winning and losing: *"I see that the students enjoy a lot of learning by Gamification and are satisfied that it helps them learn in a new and different way*". Asil says. Siwar adds: *"I saw the student's joy and happiness when we clap for him because he completed the game and did what was required of him. This brings joy to the student and encourages him to participate."* In addition, Bayan says: *"Students in this category enjoy the least achievement they achieve, especially if someone encourages and praises them".* While Rawan sees: *"The student was often satisfied and listened to in learning during the tasks, but soon his feeling of loss disappeared".* Asiel confirms this: *"The student used to show a feeling of pleasure and happiness while performing the task, but if he finished the task with a loss; his feeling was different, turning into anger or sadness".*

Gamification as a Tool of Motivation for Interaction, Collaboration, and Sharing Among Peers to Accomplish Tasks

The results showed that they agreed among themselves in a large percentage between the participants in the satisfaction and acceptance of students with mild- moderate mental limitations for the achievement of their peers, as this satisfaction led to interaction, participation, and encouragement among the students. Eman says: *"The rest of the colleagues were happy with the achievement of their colleague, and they applauded for him and waited for their turn to complete the task like the rest of the colleagues".* Asiel stresses that *"When the task was completed, there was interaction and participation between peers, that is, by encouraging each other upon completion by clapping".* Additionally, Siwar says: "*People with disabilities accept the achievement of their peers and seek to imitate them".* She now differs from the viewpoint of the rest of the participants in the dissatisfaction and acceptance of peers to complete the tasks, saying: *"Students with mild-moderate mental limitations may feel dissatisfaction, especially in times of emergency education".*

Gamification as a Tool of motivation for Organizing and Controlling during Accomplishing Tasks and Achieving the Desired Goal

The results varied with regard to the organization and control processes for students with simple-to-moderate mental limitations in their achievement of tasks and achieving the desired goal during the learning process by Gamification, and some participants believed that learning by Gamification helps in controlling students for a longer period.

"*Learning by Gamification can help control students with limited mental retardation for a certain period and longer because students are drawn to learning by Gamification".* Ala Lian says. On the other hand, there was another opinion that the organization and control processes were not achieved by losing order and control somewhat due to the enthusiasm of the students. Rawan explains: *"This was the most difficult part among the students. When they saw the Gamification learning system, we lost some order and control due to the students' enthusiasm".* May asserts: "*When the students saw that we were going to learn through Gamification, the students were excited, so we were losing order".* Some participants consider that regulation and control during learning by Gamification is related to the way in which learning is carried out through Gamification. Eman says: *"The more distinctive the learning through education, that is, there are enough images, colors and sounds that would captivate the student with his attention and focus, the more organized and calm the student will be".*

Discussion

This study explored the motivation of students with simple moderate-intellectual disabilities to learn, in the gamification environment, during COVID-19 from the perspective of pre-service teachers. The findings of the study revealed that Gamification is an effective tool that can be used with students with moderate intellectual disabilities to learn during crises especially during the COVID-19 pandemic. The participating pre-service teachers believe that using Gamification creates competition among students; their interaction became clear between four dimensions (learners, teacher, each other, and the content). In addition, their attention becomes better because it suits their abilities. Gamification leads to more concentration in learning, which was revealed in previous studies, such as (Gressick & Langston, 2017; Lopez & Tucker, 2019) and the result of this study. The results of the interview showed that there is a clear desire among the students to succeed in learning. Their desire is very clear and higher as (Groening & Binnewies, 2019) pointed out. Most of them became active during their learning.

On one side, Gamification increased students' attention. Furthermore, it enhanced their interaction, skills on the other side (Nieto-Escamez & Roldán-Tapia, 2021). They became more aware of the class and its subject. Gamification is an effective tool to master the goals of learning and their manner to reach success. It helps teachers to teach better because students' good behavior encouraged them to teach well and achieve the learning goals. It is also a suitable tool to develop challenges and perseverance among students. In addition, it develops many concepts. Students feel pleased and interested while applying Gamification (Al-Azawi, et al., 2016; Annansingh, 2018). This increased their achievement, images, attention, and focus that would captivate the sound with their attention (Aşıksoy, 2017; Davis et al., 2018; Su & Cheng, 2015).

Conclusions

In conclusion, using Gamification is a very effective and suitable tool to be used in teaching and learning. The results of this study and other studies improved that Gamification has many benefits such as enhancing students' motivation, skills, interaction, and communication. Based on the result of this study, teachers should use Gamification in their teaching because it has many benefits. The connection between the interviews with the participants shows that Gamification is very suitable and beneficial for students with simple moderate mental limitations. Our interviews assured that most of the participants were motivated in learning, participating, engaging, and enjoying. Many previous studies assured this result; Gamification is suitable and beneficial for all students' especially simple moderate mental limitations. Besides the elements of Gamification, it has a good impact on students and it increased their participation and enhanced their attitudes towards learning.

Recommendations

The Ministry of education should train teachers to use new teaching methods such as Gamification. Teachers also should develop themselves and conduct studies about Gamification because it is important in teaching and learning. They should train their teachers to use gamification in the classroom effectively in all subjects and for students of various levels of achievement. Moreover, teachers and students should accept anything new in learning to develop themselves and their students.

Besides, teachers have to vary their methods of teaching and learning to lead to students' motivation during the achievement of the learning goals. Gamification is one method that can be used in order to achieve that.

Limitations

The limitations of this study are the limitations of the population and sample, and the limitations of the dependent variable studied. Thus, further research is expected to study a larger population, and measure other variables related to technology learning with disabilities.

Authors Contribution Statement

Abu Mukh: Conceptualization & design & writing. Tarteer: Conceptualization & design & writing. AL-Qasim: Data acquisition & analysis & writing. Saqer: Data acquisition & analysis & writing. Daher: Editing & supervision.

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