Improving the Reading and Writing Skills of Students with Mild Intellectual Disability: The Effectiveness of Infographics

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Abstract. Infographics are considered an effective educational tool to simplify complex information and make it more understandable and absorbable. However, applying this technology to teaching students with an intellectual disability (ID) may be challenging. The current research aimed to verify the effectiveness of the three types of infographics (static, motion and interactive) in improving the reading and writing skills of a sample of 48 students aged 7-10 with mild ID (MID) in an intellectual education programme attached to general education schools in Al-Ahsa in the Kingdom of Saudi Arabia. A quasi-experimental design was taken, in which the research sample was divided into four groups of equal numbers, namely, three experimental groups and a control group. The researchers prepared a reading and writing skills scale (RWSC), verified its validity and reliability, and applied it to the three research groups before and after implementing the three training programmes. The results of the research showed the effectiveness of the three types of infographics (interactive, motion, and static) in developing the reading and writing skills of the research sample. The study suggests using three types of infographics to teach reading and writing to students with MID.

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It suggests further exploration of interactive infographics in future research to improve their skills. The use of these educational infographics in academic subjects saves teachers time and effort, while using them in textbooks helps students retain and understand information more easily. Further research is needed to explore the use of interactive infographics as a teaching tool.

1. Background of the Study

Countries, institutions and individuals have joined forces at all levels to achieve the best learning outcomes as possible. Given the available capabilities and circumstances, among education sectors, guidance, entertainment, and other programmes targeting persons with disabilities and their families, enhancing learning outcomes is feasible. Implementing such initiatives is an indication of national civilisation and represents the realisation of noble human and civilisational principles that preserve the rights of persons. Empowering individuals with disabilities in society to fulfil their roles and contribute to their countries' development is a fundamental principle.

The Education Strategy 2016–2020 in Saudi Arabia aimed to provide equitable quality education in the least restrictive environments, enhancing lifelong opportunities for all individuals, including students with disabilities, across all regions (Saudi Ministry of Education, 2023). To ensure effective education, societies must access advanced methods, techniques and modern technology. Education improves students' knowledge and skills, allowing them to apply them in various life situations. Technology, in turn, brings about significant changes in students' levels and provides greater opportunities for information acquisition (Ahmed, 2019; Tony, 2017).

Among the modern technological means used to simplify the educational process are infographics, an artistic method of transforming complex information, data, and concepts into images and drawings that students can understand and assimilate in an easy-to-understand and attractive way (Hassouna, 2014; Smiciklas, 2012). Infographics generally have a combination of linguistic and non-linguistic aspects and bring together texts, images, symbols, charts and graphs to present data visually. This combination contributes greatly to drawing students' attention to the educational content, leading them to view and think about each of its elements, and to communicating a large amount of information in simple, attractive and interesting forms. For these reasons, this technology has become widespread in educational environments (Lankow et al., 2012; Locoro, 2017; Yildirim, 2016).

Infographics must adhere to specific standards, including defining the goal, providing a clear title, achieving it throughout the design, ensuring sequential and consistent information, developing a visual layout and ensuring it is appropriate for the design size. Teachers and parents have a crucial responsibility

to understand and address educational disabilities that affect students' education (Al-Faramawi & Al-Nassaj, 2010; Yildirim, 2016).

One such disability is ID, which has received great attention from scholars and researchers in the field of special education because of the vast differences that exist among persons with ID and the heterogeneity of their aptitudes and shortcomings (Hawsawi & Al-Maliki, 2022). It is difficult to determine the characteristics of students with ID because the severity of the disability varies from one student to another and across age groups as well as according to the quality of care provided to them by special education programmes or their families (Al-Maliki & Al-Harthy, 2020).

Students with mild ID (MID) represent 8% of all those suffering from ID. MID students face difficulties in learning reading and writing skills, need care in the first years of school, and tend to encounter further difficulties in the final years of school. They can follow regular curricula, but they can learn to some degree if they are provided with special educational services consistent with readiness within the appropriate educational environment. Moreover, they often cannot begin to acquire reading, writing, and spelling skills before the age of 8 or even 11 (Al-Quraiti, 2012; Hamouda, 2013).

The educational literature related to the topic of the current research provides scientific evidence of the effectiveness of the infographic technique in improving the reading and writing skills of students with ID, which can be useful to teachers, families and policymakers. This research encourages further research and exploration and underlines the important role played by infographics in the field of special education. It shows that various types of infographics improve educational outcomes for students with MID, helping them improve their chances of academic success and personal development by realising their potential. The research also examines the impact of this technology on the reading and writing skills of students with MID and thus provides insight into how to improve these skills through the use of innovative educational tools. The research also contributes to the development of a new and effective educational strategy targeting students with MID and can provide evidence on the best ways to teach these students and improve their skills.

The current research is to verify the effectiveness of using the three types of infographics—static, motion and interactive—to improve the reading and writing skills of students with MID. Literacy skills are essential for academic success and effective communication in the community. However, students with MID face difficulties in developing these skills. The current researchers believe that using infographics in their various forms may have a positive impact on improving the reading and writing skills of these students. The literature in the field of special education lacks detailed studies evaluating the effectiveness of using infographics in this context. Although using infographics can be beneficial for moderate, severe and very severe ID, the majority of research on evidence-based therapies for children with ID has concentrated on those with moderate to severe ID rather than

those with MID (Bouck & Bone, 2018). Hence, the current research seeks to answer the following questions:

Q.1. Is there a statistically significant difference between the mean ranks of the first experimental group (which was subjected to the static infographic intervention) and the mean ranks of the control group (which followed the regular programme) in the post-test on the reading and writing skills scale (RWSC)?

Q.2. Is there a statistically significant difference between the mean ranks of the second experimental group (which was subjected to the motion infographic intervention) and the mean ranks of the control group in the post-test on the RWSC?

Q.3. Is there a statistically significant difference between the mean ranks of the third experimental group (which was subjected to the interactive infographic intervention) and the mean ranks of the control group in the post-test on the RWSC?

Q.4. Is there a statistically significant difference between the mean ranks of the scores of the three experimental groups for the infographic programmes (static, motion and interactive) in the post-test on the RWSC?

2. Literature Review

Infographics are considered an effective tool in education and communication, as they help students improve their understanding and remembering (Borkin et al., 2013). Research has shown that students can remember up to 80% of what they see and do, compared to only 20% of what they read (Medina, 2008). However, infographics should be used with caution. Charts and images can be misleading if not designed properly (Cairo, 2013). Therefore, designers must ensure that the data they provide is accurate and reliable and that graphs and images correctly reflect the information they are trying to convey (Kirk, 2016).

In terms of presentation, there are three types of infographics. Static infographics are static designs whose content is chosen by the teacher and present information about a specific topic in the form of pictures or drawings that are easy to understand. This type of infographic can be printed and published on Internet pages. Motion infographics are directed scripts that take into account the presentation of explanatory information that appears in the final version of a motion video to show certain facts and concepts. Motion infographics are divided into two subtypes: (a) regular videos that contain infographics and (b) motion design (motion graphics). Interactive infographics are those where the student uses certain control tools, such as buttons, and a specific programme (code), which is the subject. Hence, some parts of this type of infographic must be designed and programmed in such a way that students can control them easily and they are easy to repurpose (Khalil, 2016; Shaltout, 2018).

ID is a mental impairment affecting general abilities like thinking, problem-solving, planning and academic learning. It can lead to impaired adaptive behaviour and failure to meet personal independence and social responsibility standards in daily life, including communication and academic performance (VandenBos, 2015). ID also arises during the developmental period, which is

identified as before the age of 22, and is one of several conditions collectively known as "developmental disabilities". The prevalence of ID is approximately 10 per 1,000 individuals. However, international prevalence of intellectual and developmental disabilities varies by country, level of development and age, with middle-income countries having 16 per 1,000 and high-income countries having 9 per 1,000 (American Association on Intellectual and Developmental Disabilities. [AAIDD], 2023; American Psychiatric Association [APA], 2022). One way to measure intellectual functional performance is an intelligence test, and an intelligence quotient (IQ) test score of about 70 or 75 indicates the presence of significant limitations in intellectual functioning. Students with ID are classified into four levels according to their IQ (Al-Mawla, 2015). The first level is mild, represented by an IQ in the range 55–70; the second is moderate, represented by an IQ in the range 40–54; the third is severe, represented by an IQ in the range 25–39; and the last is very severe (dependence), represented by an IQ of less than 25 (Liao et al., 2019).

Multiple Arab and foreign researchers have considered infographics in the field of special education, especially for students with ID and autism spectrum disorder (ASD). Among studies in this area, a paper by Darwish and Al-Dakhni (2015) presented static and motion infographics via the web and investigated their effects on developing visual thinking skills among a sample of students with ASD in Egypt and their attitudes toward the use of such infographics. The results showed the effectiveness of both static and motion infographic styles in developing visual thinking and attitudes among this population. Khalil (2016) also studied the impact of static, dynamic, and interactive educational infographics on the achievement and efficiency of learning mathematics among primary school students with MID in Egypt. The results indicated the effectiveness of teaching using infographics on academic achievement, and what the size of the effectiveness and of the effect were, respectively (interactive infographics, motion infographics, and static infographics) in the educational process.

Tsai et al. (2020) found that a motion infographic system, which combines continuous pictures and information simplification, can improve learning outcomes in a resource class. The study found that the experimental group improved academic success and comprehension of visual forms more than the control group, indicating the motion infographic system may increase learning outcomes in a resource class.

Al-Shalawi and Gaber (2021) validated the usefulness of an infographic-based training programme to develop self-protection skills (risks of poisoning, suffocation, and falling) among a sample of ASD children at home. The results indicated the effectiveness of the training programme in developing self-protection skills among these students. Haksiz et al. (2021) indicated the effectiveness of infographics in teaching traffic rules to students with ID through tablet devices, as direct teaching with this technology gave students the necessary skills to use traffic signals and pedestrian crossings and observe traffic rules. Al-Samadi (2022) aimed to determine the extent of the knowledge of infographic

skills and difficulties encountered by pre-service teachers (specialising in ID) in teaching students with ID in the Kingdom of Saudi Arabia. The author concluded that the degree of the concept of infographics as perceived by teachers was between high and medium, and they had a high level of infographic skills.

Reading and writing are fundamental abilities that open up educational, vocational and social opportunities. However, little is known about how best to serve the literacy needs of students with ID when the reading skills gap between this group and those with average development develops (McIntyre et al., 2022). Students with ID struggle with reading and writing, necessitating research-based therapies. Randomised controlled trials and quasi-experimental designs have explored the impact of reading and writing therapies, but more research is needed (Bakken et al., 2021). Moreover, the majority of students with ID struggle to apply concepts learned in controlled circumstances to different settings or conditions. For example, a student may display proficiency when reading isolated words on index cards yet fail to recognise the same words when they occur in linked text. Similarly, a student may automatically read single-syllable words yet be unable to decipher a compound word made up of two recognised syllables (Whitbread et al., 2021). Effective learning and classroom engagement are dependent on students' reading abilities. Reading is, in essence, the foundation of academic achievement. As a result, functional literacy improves learners' capacities regardless of their intellectual aptitude. Students with ID will be better able to grasp and apply what they have learned in real-life settings. Consequently, it is necessary to devise and implement training for professionals who assist students with ID on the benefits of using suitable instructional techniques to build reading skills in this population (Jacob & Pillay, 2022).

Despite mounting evidence that students with ID may benefit from phonics-based reading training, most research and education in this field has concentrated on single-skill sight-word reading (Roberts-Tyler et al., 2020). Multicomponent reading interventions have been linked to improved reading skills across multiple reading components for general education students, and students with ID exposed to multicomponent reading programmes have similarly made significant improvements in reading skills compared to both their own previous reading performance and in comparison to their peers with ID who received traditional sight-word instruction (Afacan et al., 2018). Students with ID are increasingly being included in mainstream contexts. To enhance success in these situations, instructors must help students with reading comprehension (Shelton et al., 2019).

Among studies that focused on studying the reading and writing skills of students with MID, Hafez (2016) sought to verify the effectiveness of a proposed strategy in developing certain reading and writing skills among primary school students in special education institutes and programmes in the Kingdom of Saudi Arabia. The results showed the effectiveness of the proposed strategy in developing the skills required by the research sample. Al-Majzoub and Bakhit (2019) aimed to design a training programme to improve the reading and writing skills of students with MID and to verify its effectiveness in improving their reading and

writing skills. The study concluded that the training programme was effective in improving the reading and writing skills of these students.

Pezzino et al. (2019) reviewed literature on reading acquisition in students with ID and identified factors contributing to reading difficulties, including cognitive efficiency, perceptual capacities, oral language development, phonological processing and memory.

Abdel-Muttalib et al. (2020) aimed to identify the effectiveness of a programme based on the theory of information organisation and processing in developing reading and writing skills for students with integrated ID in Egypt. The results of their research confirmed that strengthening the teacher and the teacher's continuous encouragement of the participation of integrated students with ID led to assistance in developing their reading and writing skills. Bazkari and Jazouli (2021) revealed the difficulties in reading and writing from which students with MID suffer from the point of view of their teachers. The results from reading indicators demonstrated that the students appeared nervous, fidgety and frowned nervously when they read, at a rate of 70%. As regards writing indicators, the percentage was 65% due to the difficulty of finding a general idea of the text.

Güler Bülbül and Özmen (2021) demonstrated the efficacy of teaching story-writing skills to students with ID and their non-disabled counterparts. All participants' tales increased in length, elements and quality. Students used their newly learned abilities to write personal narratives. The comments from participants revealed that they thought the method was beneficial. Panopoulos et al. (2021) emphasised the significance of educational interventions based on Bronfenbrenner's ecosystem theory. They showed that students with ID improved their reading abilities. According to Bronfenbrenner's ecosystem theory, the results highlight the elements that affect and form educational interventions for reading abilities in students with ID.

Stevens and Burns (2021) investigated the extent to which children with ID improved their word recognition, reading fluency and comprehension by practicing keywords. For a large proportion of the taught words, practising keywords resulted in improved later in-text recognition and generalisation. There was also a strong experimental control for gains in reading fluency. There was no discernible impact on reading comprehension. The research and practical implications were explored. According to Wang et al. (2022), research on the impact of the home literacy environment (HLE) on the literacy development of students with ID was limited, with conflicting results. The findings showed that the HLE had a substantial impact on the literacy development of students with ID, and that reading interest partially mediated this effect. The parent-student connection favourably influenced the regression association between the HLE and reading desire in this mediating mechanism.

3. Methodology
3.1 Research design and participants
The researchers used the quasi-experimental method, which measures the effect of the independent variable on the dependent variable. The main independent variable was the infographic (static, motion and interactive), applied in three training programmes to three experimental groups. The fourth group, namely, the control, followed the regular programme. The dependent variable in this research was improving the reading and writing skills of students with MID. The research population was all students with MID enrolled in intellectual education programmes attached to general education schools in the city of Hofuf in Al-Ahsa Governorate in the Kingdom of Saudi Arabia in the third semester (2022–2023), estimated to comprise 334 students (189 male and 145 female). The researchers investigated primary school students with MID who suffered from difficulties in reading and writing. The research sample consisted of 48 students diagnosed with MID who were diagnosed through the official scale developed by the Ministry of Education, who ranged in age from 7 to 10 years (mean 8.58, standard deviation ±1.62).

The research sample was distributed as follows: (1) The control group consisted of 12 students to whom the regular programme was applied; (2) the first experimental group consisted of 12 students to whom a training programme based on static infographics was applied; (3) the second experimental group consisted of 12 students to whom a training programme based on motion infographics was applied; and (4) the third experimental group consisted of 12 students to whom a training programme based on interactive infographics was applied. Equivalence was applied between the three research groups through the variables chronological age, IQ and RWSC using the Kruskal-Wallis test for unrelated groups to verify the equality of the three groups. The researchers obtained scientific research ethics approval from the Deanship of Scientific Research at King Faisal University before applying the research tools.

3.3 Research Tools and Data Collection
3.3.1 Reading and writing skills scale (RWSC)
The researchers developed the RWSC. The RWSC aims to evaluate the level of basic reading and writing skills among primary school students with MID. In its final form, the RWSC consists of 30 statements and is divided into two dimensions: reading skills (14 statements) and writing skills (12 statements). The teacher answers the scale statements by choosing one of three options, namely, applies (3), sometimes applies (2), or does not apply (1). The students' total scores are calculated by summing the scores they obtain on the scale. The maximum score is 90, the average score is 60, and the minimum score is 30. Scoring above the mean is considered to indicate an increase in the student's level of reading and writing skills, while scoring below the mean indicates a low level in the student's level of reading and writing skills.

The researchers verified the psychometric efficiency of the scale by presenting it in its initial form, consisting of 36 statements, to a group of arbitrators specialising in the fields of special education, curricula and methods of teaching the Arabic

language. The statements that the arbitrators decided were invalid were excluded, and those that were valid remained. The agreement rate was 90%. Four statements were deleted; hence, before the internal consistency of the scale was checked, there were 32 statements. The researchers then checked the internal consistency of the scale and found that the correlation coefficients for each statement with the dimension to which it belonged ranged between 0.541 and 0.739. Two statements were then excluded. The results for the internal consistency of the scale dimensions and total score were 0.726 for reading skills and 0.713 for writing skills, and both these coefficients were significant at 0.01. Thus, the number of statements in the scale dropped to 30, as the researchers calculated the reliability coefficient for the scale using the Cronbach Alpha method. The Cronbach Alpha coefficient for reading skills was 0.719 and for writing skills 0.701, which indicates that all reliability coefficients are acceptable. Hence, the scale generally has high psychometric efficiency.

3.3.2 Training programmes
The research applied three training programmes based on different types of infographics to improve the reading and writing skills of a sample of students with MID. The first training programme used the static infographic, the second used a motion infographic, and the third used an interactive infographic. The programmes were built based on a number of studies, including those of Darwish and Al-Dakhni (2015), Hafez (2016), Khalil (2016), Al-Shalawi and Gaber (2020), Panopoulos and Drossinou-Korea (2020), and Bakken et al. (2021).

In total, 72 sessions were carried out across the three training programmes, at 24 sessions each. The sessions in each programme lasted between 30 and 45 minutes, depending on which of the three stages of the programme they belonged to. The introductory stage consisted of two sessions (1–2), each lasting 40 minutes; the training phase consisted of 22 sessions (3–22), each lasting 30 minutes; and the evaluation phase consisted of two sessions (23–24), each lasting 45 minutes. These sessions were applied to groups. The experiment were conducted at the same time, over two months, with three sessions per week. The programmes included reading and writing skills that were presented to the three infographic experimental groups (static, motion and interactive). In the three experimental groups, the reading and writing skills were divided as follows:

Reading skills: Students were trained to recognise the shape of all the letters of the Arabic alphabet in their single form; to read the sounds of these letters correctly; to recognise the shape of these letters in words consisting of 2–5 letters; to match words consisting of 2–5 letters; to analyse words consisting of 2–5 letters; to read words consisting of 2–5 letters; to match sentences consisting of 2–5 words; and to understand the meaning of sentences consisting of 2–5 words.

Writing skills: Students were trained to write all the letters of the Arabic alphabet; to complete words with missing letters; to analyse words consisting of 2–5 letters; to copy words consisting of 2–5 letters; and to write sentences consisting of 2–5 words.

3.3.3 Data analysis

Statistical analysis was performed using SPSS version 22. The Mann-Whitney test was used to indicate the difference between the mean ranks between the independent groups in the pre- and post-tests. An analysis of variance was also conducted using the Kruskal-Wallis test to indicate the differences between the means ranks for the three experimental groups in the post-tests.

4. Results

The collected data were analysed using Mann-Whitney test, a test of two independent sample, and the Kruskal-Wallis test, for the test of significant differences. The results of the data analysis are shown in the subsequent sections 4.1 to 4.4.

4.1. Difference between the mean ranks of the first experimental group (to which the static infographic was applied) and the mean ranks of the control group (which followed the regular programme) in the RWSC post-test

Table 1: Results of the Mann-Whitney test for the significance of the difference between the EG_1 and CG in the RWSC post-test

Scale	Group	N	Mean Rank	Sum of Ranks	Z	P
Reading skills	EG_1	12	18.50	222	-4.208	<0.001**
	CG	12	6.50	78		
Writing skills	EG_1	12	18.50	222	-4.227	<0.001**
	CG	12	6.50	78		
Total	EG_1	12	18.50	222	-4.223	<0.001**
	CG	12	6.50	78		

*Note. ** p < 0.01.*

The results of Table 1 show that the Z value for the scale as a whole is -4.224 and the *p*-value is <0.001, which is a value less than 0.01, indicating that there is a statistically significant difference between the mean ranks of the EG_1 and CG in the post-test on the RWSC in favour of the EG_1.

4.2. Difference between the mean ranks of the second experimental group (to which the motion infographic was applied) and the mean ranks of the control group (which followed the regular programme) in the RWSC post-test

Table 2: Results of the Mann-Whitney test for the significance of the difference between the EG_2 and CG in the RWSC post-test.

Scale	Group	N	Mean Rank	Sum of Ranks	Z	P
Reading skills	EG_2	12	18.50	222	-4.211	<0.001**
	CG	12	6.50	78		
Writing skills	EG_2	12	18.50	222	-4.208	<0.001**
	CG	12	6.50	78		
Total	EG_2	12	18.50	222	-4.181	<0.001**
	CG	12	6.50	78		

*Note. ** p < 0.01.*

The results of Table 2 show that the Z value for the scale as a whole is -4.182 and the *p*-value is <0.001, which is a value less than 0.01, indicating that there is a statistically significant difference between the mean ranks of the EG_2 and CG in the post-test on the RWSC in favour of the EG_2.

4.3. Difference between the mean ranks of the third experimental group (to which the interactive infographic was applied) and the mean ranks of the control group (which followed the regular programme) in the RWSC post-test

Table 3: Results of the Mann-Whitney test for the significance of the difference between the EG_3 and CG in the RWSC post-test

Scale	Group	N	Mean Rank	Sum of Ranks	Z	P
Reading skills	EG_3	12	18.50	222	-4.194	<0.001**
	CG	12	6.50	78		
Writing skills	EG_3	12	18.50	222	-4.181	<0.001**
	CG	12	6.50	78		
Total	EG_3	12	18.50	222	-4.176	<0.001**
	CG	12	6.50	78		

*Note. ** p < 0.01.*

The results of Table 3 show that the Z value for the scale as a whole is -4.177, and the *p*-value is < 0.001, which is a value less than 0.01, indicating that there is a statistically significant difference between the mean ranks of the EG_3 and CG in the post-test on the RWSC in favour of the EG_3.

4.4. Difference between the mean ranks of the three experimental groups for the infographic programmes (static, motion and interactive) in the RWSC the post-test

Table 4: Results of the analysis of variance using the Kruskal-Wallis test for the significance of the differences between the EG_1, $EG_{2 \text{ and }}$ EG_3 and their significance in the RWSC post-test

Scale	Group	N	Mean Rank	df	X^2	P
Reading skills	EG_1	12	6.50	2	31.459	<0.001**
	EG_2	12	18.50			
	EG_3	12	30.50			
Writing skills	EG_1	12	6.50	2	31.451	<0.001**
	EG_2	12	18.50			
	EG_3	12	30.50			
Total	EG_1	12	6.50	2	31.553	<0.001**
	EG_2	12	18.50			
	EG_3	12	30.50			

*Note. ** p < 0.01.*

The results of Table 4 show that among the mean ranks of the three experimental groups for the infographic programmes (static, motion and interactive) in the post-test on the RWSC, the three groups were ranked highest to lowest in terms of effectiveness in the following order: interactive infographic, motion infographic and static infographic. The highest mean ranks were for the EG_3, while the lowest mean ranks were for the EG_1.

5. Discussion

An abundance of information has led to the emergence of various types of infographics as technological alternatives to traditional teaching methods. This technology plays an effective role in simplifying information and presenting it to students in an attractive and interesting way during the educational process, which has led to its widespread use in various educational environments. The results of the current research indicate the effectiveness of the three types of infographics (static, motion and interactive) in improving the reading and writing skills of students with MID, demonstrating that this technology is effectively capable of converting complex information and concepts into pictures and drawings in an easy, smooth and clear way. It is attractive and exciting for students with MID, making it easier for them to understand and assimilate information and concepts.

The results showed that there was a difference between the mean ranks of the first experimental group (to which static infographics were applied) in the pre- and post-tests on the RWSC. This result is consistent with the studies of Smiciklas, (2012), Borkin et al. (2013), Cairo (2013), Hassouna, (2014), Kirk (2016), and Haksiz et al. (2021). These results can be explained by the fact that the static infographics feature images, drawings and colours have significance for and an influence on students with MID; thus, these features attract their attention for longer than traditional learning methods. There is a difference between the mean ranks of the second experimental group (to which motion infographics were applied) in the pre- and post-tests on the RWSC. This result is consistent with Darwish and Al-Dakhni (2015), Al-Shalawi and Gaber (2020) and Tsai et al. (2020). The researchers ascribe this result to the fact that motion infographics consist of 3D images, ensuring the participation of students with MID and attracting their attention for longer than static infographics. There is a difference between the mean ranks of the third experimental group (to which interactive infographics were applied) in the pre- and post-tests on the RWSC. This result is consistent with Khalil (2016), and the researchers explain this result as being because users of interactive infographics have greater control over its elements than in the other two types of infographics, which makes it more attractive to students.

As can be seen from the results outlined above, the third experimental group (to which interactive infographics were applied) outperformed the first (static infographics) and second (motion infographics) experimental group, as also found by Hafez (2016), Khalil (2016), Shaltout (2018), Al-Majzoub and Bakhit (2019) and Abdel-Muttalib (2020). The researchers believe that interactive infographics are a means which allows students with MID to participate in the educational content provided to them, ensuring that their attention is maintained.

In addition, their concentration is sustained for longer periods, which is what distinguishes the interactive infographic from the other two types, especially motion infographics. Although static infographics are easier to design and less expensive than motion and interactive infographics and are easy to repurpose and share, they are less effective than the other two types in terms of allowing the participation for students with MID and less effective in terms of achieving appeal and excitement. For these students, motion infographics, whether with 2D or 3D drawings, attracts their attention longer than static infographics. Likewise, static infographics are less interactive compared to motion and interactive infographics.

The researchers in general explain these results in terms of the fundamental and critical role played by infographics in developing the skills of students with MID, which has resulted in significant benefits for these students as this type of technology is distinguished by application possibilities.

The researchers also attribute the improvement of the reading and writing skills of the three experimental groups to the impressive ability of this technology to attract students' attention through interactive activities, in addition to directing use according to their needs and abilities and providing an environment conducive and supportive to achieving the desired goals.

The researchers also explain these results due to the use of techniques that have a direct impact on students with MID, such as modelling, indoctrination, feedback and reinforcement, all of which helped attract students' attention for the longest possible period.

6. Limitations
A specific sample of students with MID was selected to participate in the study, and it may not have been adequate or representative of the wider population. It may also be difficult to provide the necessary resources to design and implement infographics effectively, as doing so may require time, money and technical skills. Reliable and effective measurement tools must be used to evaluate the impact of infographics on reading and writing skills, and comprehensively applying these tools to students with MID may be challenging. External factors, such as the school environment, home support and personal motivation, may affect the effectiveness of infographics in enhancing the reading and writing skills of students with MID, and these factors must be taken into account when analysing the results.

7. Conclusion and Recommendations
The research aimed to verify the effectiveness of three types of infographics (static, motion and interactive) in improving the reading and writing skills of students with MID. The results showed the effectiveness of this technique on the reading and writing skills of the research sample. Through these results, several recommendations can be made. These include applying the three types of infographics in teaching curricula for students with MID, as well as analysing the courses taught to students with MID and identifying the characteristics of those courses to design technology-based curricula using infographics in different

styles. The results of this research can also be beneficial for practitioners, especially if future research supports them. It should also be possible to conduct similar research on different educational content taught to primary school students with MID. The results of future research may differ from those of the current research according to the degree of interest, inclinations and defensiveness of the students toward the topics assigned to them. This research can also be used to provide the educational literature with a new experimental study that may be useful in developing a theoretical framework for infographics as an effective technology and electronic control tool for use with students with MID. A study could also be conducted using the same three types of infographics with various students with MID who can deal with each category. Likewise, these three types can be used to develop the advanced linguistic skills of these students. The attention of special education teachers can also be directed toward the conditions for effective infographic design from concept to production and to the use of the three types of educational infographics in various courses offered to students with MID who have difficulty understanding these courses. Training courses could be held for teachers on the use of modern and effective technologies, including various types of infographics, in teaching reading and writing to persons with MID.

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8. References

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