# The Effect of Special Ed teachers' Training Program and Its Impact on Students with Intellectual Disabilities

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**Abstract**

In the current study, the researcher highlights the effectiveness of a training program for enhancing the competencies of special education female teachers in utilizing the innovations of the 4th Industrial Revolution, post- COVID-19. The researcher analyzed its impact on creating digital educational content for students with intellectual disabilities. The study sample consisted of middle school special education female teachers and female students with intellectual disabilities. The researcher used standardized study tools and calculated validity and reliability coefficients. The sample included 40 intellectual education female teachers divided into 20 teachers in a control group and 20 teachers in an experimental group. The research tools used were as follows: The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th Industrial Revolution (prepared by the researcher), and the training program used for study purposes (prepared by the researcher).

**INTRODUCTION**

Since the end of 2019 and the beginnings of 2020, the emerging COVID-19 pandemic has begun to dominate the news, becoming the talk of people at the local and global levels. The education sector has been the most prominent on the global stage, which has faced a difficult challenge in providing learning effectively in the most troubled times. The results of the research revealed that the training program was effective in enhancing the competencies of special education female teachers in Utilizing the Innovations of the 4th Industrial Revolution post-COVID-19 and that the program was effective in creating digital educational content for students with intellectual disabilities. The findings confirmed the effectiveness of the program through post-measures and follow-up measurements in the study sample. Therefore, the global educational community suggested in March 2020, that schools close their doors and switch education from school to home, even though the medical point of view was in favor of the idea that children are the least vulnerable groups to the COVID-19. However, they could be a powerful tool in transmitting infection among themselves, or even to their family at home. Therefore, the Chinese Ministry of Education launched the initiative of "Suspending Classes without Stopping Learning" by providing flexible education via the internet for more than 260 million students who learned from their homes independently (Huang, Liu, Tlili, Yang, Wang, 2020). Teachers have a very important role in shaping the personality of learners in light of the technological and informational revolution (Ahmad et al., 2017), which qualifies them to adapt to the requirements of the third millennium with the skills they possess that enable them to interact effectively with these modern innovations. It is necessary to foster professional technological competencies that help teachers solve the most complex tasks associated with the rapid technological changes in the environment and utilize the innovations of the fourth industrial revolution, including (critical thinking, creativity, and creative thinking, the ability

to communicate and work within a team, and constructive interaction with students and learners) (Liu, 2018). Because education in the Kingdom of Saudi Arabia is very important and vital in the time of the rapidly changing fourth industrial revolution, we find that the issue of nurturing the next generation of human resources is very important in facing the effects of the fourth industrial reform, such as rapid technological changes, and how digital learning will be able to empathize and think creatively, which is an essential part of the teacher's role in the classroom, in other words, how completely replacing teachers with technology would be useful educationally to learners and the educational process (Douse, Uys, 2020; Liu, 2018)

The fourth industrial revolution, being a revolution to reform the future education system, is an intelligent information society. Digital smart education has enabled educators to make notable educational endeavors, which enabled them to use different teaching methods that go beyond current teaching methods (Capitanescu, Benetti, 2020). This study is to highlight the most important implications of the emerging COVID-19 pandemic and its impact on digital transformation in education as one of the pillars of the fourth industrial revolution. It is also to highlight how adequate teachers of special education are in creating educational digital content suitable for students with disabilities. In addition to that, within the limits of the researcher's knowledge, the subject of digital learning and artificial intelligence for students with intellectual disabilities has not been addressed yet. Especially that the concept of modernizing education provides for the principle that learners should have equal access to full quality education, according to their abilities, preferences, and individual differences, regardless of their families' wealth, their residence, and what type of disability they have. One direction for implementing this requirement is to integrate new models into educational content and to organize it. This includes developing distance education. The experience of organizing distance education for children with disabilities has shown the success of this idea.

### *The Research Problem*

Educating children with intellectual disabilities and their social adaptation is one of the issues of priority, especially in the field of education, as many obstacles reduce their chances of success in the future life,

including (health problems that prevent them from being in classrooms constantly and continuously, lack of participation in various recreational and cognitive activities, as well as communication with peers). As the change in the social and economic model in the fourth

industrial revolution is a change in the relationship between man and machine, and the foundations of coexistence and mutual integration between the real and virtual world, and the human element, we should develop and enhance the competence of teachers to face these changes and have smooth access to the digital world. The sense of the research problem stemmed from the researcher's field experience. Through the researcher's long experience in teaching and her frequent participation in teacher training programs during her service, she noticed a change in teacher preparation. Despite the rapid progress in life, especially the technical progress, the traditional method of teaching is still the prevailing method in schools, and the reason for this may be the poor academic preparation of teachers, and that the training courses they receive are considered ineffective stereotypical courses, and do not achieve the desired goals. Therefore, the researcher tried in this research to focus on the importance of enhancing the competencies of special education female teachers in Utilizing the Innovations of the 4th Industrial Revolution, and the impact of the training program on creating digital educational content suitable for female students with intellectual disabilities.

## *The Research Objectives*

To investigate the effectiveness of a training program for enhancing the competencies of special education female teachers in utilizing the innovations of the fourth industrial revolution. To highlight some of the technological techniques required to be utilized after the COVID-19 crisis. To know the impact of the training program on the level of creating digital educational content suitable for students with intellectual disabilities from the viewpoint of their teachers The current research has two main areas of significance:

### The Theoretical Significance

This research highlights the role of the emerging COVID-19 in digital transformation, and its impact on it, and the extent to which the educational process has benefited from the

technological innovations of the fourth industrial revolution. Also, the theoretical significance of the research is a win in the importance of training and enhancing the educational technological competencies of female teachers of students with intellectual disabilities in creating digital educational content appropriate for this category.

Verawardina et l. (2020) reviewed the effectiveness of training programs during Covid-19 and found that the innovations of the fourth industrial revolution provide more tools for physical classroom instructions, online learning, and blended learning. These tools can prove highly beneficial for female teachers because Covid-19 will also require their competencies as virtual leaders. The digital education content can accelerate the pace of learning to provide that the teachers have the potential of using the digital tools and gadgets effectively Verawardina et al. (2020). Hanif and Iftikhar (2020) also confirmed that the post- Covid-19 world will have a huge reliance on the tools of Industry 4.0. The study of Hanif and Iftikhar (2020) presented the concepts of chiobot, turbot, and cobot. Automation is the key concept of Industry 4.0 and the instruction delivery of female teachers can improve significantly through the use of intelligent tutoring systems (VanLehn, 2011).

**The Practical Significance**

This research sheds light on what the technological competencies of special education teachers should be like, to design the curricula and courses provided to children with intellectual disabilities in light of the fourth industrial revolution and the time post-COVID-19 crisis, which contributes to their advancement and helps the developers of their educational programs creating digital educational contents suitable for this category of children. In addition, this also contributes to designing a scale for measuring the effectiveness of a training program to enhance the competencies of special education female teachers in utilizing the innovations of the fourth industrial revolution, post-COVID-19, to be

applied to female teachers as being an active factor in the process of digital transformation in the education of their students with disabilities, as well as to know the impact of the training program on creating digital educational content suitable for students with intellectual disabilities.

**LITERATURE REVIEW**

The current research discusses several basic concepts related to each other by relationships, none of which could be dealt with in isolation from the other relationships, and all of which are tributaries flowing into a large river, which is: putting special education teachers in the focus of attention and care and enhancing his technological competencies in light of the innovations of the fourth technological revolution, and knowing the impact of this on creating good educational digital content suitable for students with intellectual disabilities. The technological development in the twenty-first century has brought about a great positive qualitative leap in the environment of the educational process of various types and has helped in delivering scientific, educational, and even behavioral information and data to learners, which in turn has led to the achievement of the desired goals through relying on the outcomes of the fourth industrial revolution, or the second digital revolution. This concept has been discussed on a global level, especially in the field of education. This term, which is "The Fourth Industrial Revolution", is the term that was coined by the World Economic Forum in Davos, Switzerland, in 2016. The digital or electronic education method is one of the results of this technological development, which is spreading in most sectors of society. Future trends indicate that electronic education will impose itself on educational systems so that school will become a source of learning and not a place for it, which indicates an occurrence of fundamental changes in the educational process (Newby, Stepich, Lehman & Russell, 2006). The Fourth Industrial Revolution, as defined by Schwab (2016), can be defined as the fourth major industrial era since the first industrial revolution in the eighteenth

century. It is characterized by the integration of technologies that remove the boundaries between the physical, digital, and biological fields, which are collectively referred to as cyber-physical systems. The recent years have also witnessed an obvious development in the field of education and habilitation of individuals with special needs. One of the most important developments during those recent years was the use of assistive technology with its various forms in the educational programs of those individuals, as many educational programs and educational applications have been developed using modern technologies in the field of intellectual disability (Al- Qahtani, Al-Juda, 2018). The researcher defines the competencies in the current research procedurally as the ability of special education teachers to utilize the innovations of the Fourth Industrial Revolution for creating appropriate digital educational content for students with intellectual disabilities, such as (the ability to use Microsoft Office programs (writing and editing texts, presentations, Excel), being able to use search engines and browse digital websites easily, the ability to accept new advances in assistive technology of the disabled, the ability to learn about artificial intelligence tools and its application areas in teaching students with disabilities, the ability to start and use multimedia software suitable for the disabled, the ability to use open-source software, and other competencies. E-learning in the light of the Fourth Industrial Revolution is related to four broad areas, which are, Competencies in designing instruction, Competencies of using technology, and Competencies of encouraging students' interaction. Competencies of promoting students' self-learning. Al-Hamidi (2017) and Al-Qahtani (2018) suggest a set of competencies that special education teachers should master to be able to apply e-learning, which is divided into the following, the general competencies, which include the competencies related to computer and information literacy. To learn about the various computer components and software. To learn about the advantages of using a computer. To utilize computers and the Internet in the educational process in general, and in special

education particularly, such as the competencies of basic skills of starting the windows system, managing electronic files, and using word processing and Excel programs to prepare two-dimensional and three-dimensional diagrams. The ability to use the Internet effectively to obtain information that helps in developing learners' skills. The ability to use the Internet to browse, search, send and receive electronic messages. Upload and download programs and books related to the curriculum. Despite the emergence of many studies on educational technology competencies, including those related to e-learning, it has covered it as a sub-subject within a list that addressing the various aspects of educational technology, such as the list of competencies proposed by Salem (2004), which includes, Individualized instruction competencies. Competencies of using educational devices. Performance competencies related to the World Wide Web.

1) The competencies of preparing courses electronically:

To identify general and specific objectives of courses and to prepare them electronically.

To identify material and human requirements for preparing courses electronically.

To develop teaching strategies necessary to achieve course objectives.

To manage e-learning, taking into account the different capabilities of learners.

2) Electronic Education:

E-learning is one of the technical competencies that teach students with intellectual disabilities should be interested in. Al-Mberek (2003) refers to many terms used to define e-learning as follows,

- Online Learning. Distance Education.

- Technology-based Training. Web-based Training.

- Computer-based Training.

The role of the innovations of the fourth industrial revolution, post-coivd-19, in creating educational digital platforms, and digital educational content suitable for students with intellectual disabilities. In light of the COVID-19 pandemic and the subsequent impact on education by the school closures, we can observe the indirect effects in education, which are largely due to the extended closure of schools. School closures due to COVID-19 have affected more than one billion students. According to statistics, 150 countries have reported school closures, and these numbers have increased rapidly since late February. Despite the low rates of infection among children, school closures are a fundamental pillar of social distancing tools to reduce the disease spreading and avoid the rapid increase of cases that will lead to pressure on health services. Interrupted education that disconnects students from the learning process has negative effects on learning outcomes, especially for students with educational challenges (academic, socio-economic, students with various special educational needs or persons with disabilities) who may not be able to approach distance learning strategies effectively or have no access to information (World Bank, 2020). Hence, it has been necessary to have alternatives with great power to have a positive impact on the educational process, and learning outcomes of students. The second digital revolution or the fourth industrial revolution has been the best solution to provide an ideal alternative to the educational process that takes place in school, through educational digital platforms for distance learning. Many countries have designed educational digital platforms and windows, including, The Kingdom of Saudi Arabia: The educational platforms included in the free data tariff include, The Unified Education System contains advanced digital solutions that provide advanced digital educational content and tools as well as the ability to complete school assignments and tests through it. In addition, it provides effective communication channels between students, school employees, and parents. National Educational Channel, is

a satellite broadcasting educational channel that provides opportunities for distance education to those who need it. In addition, it provides access to the university's knowledge stock and its activities, and it does work on spreading the notion of knowledge society among all classes of Saudi society, to contribute with distinguished experiences at the global level, in pursuit of competition and leadership. Hence, the Educational Channels Network (Ain) seeks to contribute to training and developing human cadres to reach a level of professionalism. It also seeks to provide advisory services to academic bodies, to help them improve in the way they provide and present their programs and promote its contents and technical levels, to exceed with the good quality and distinction of performance the horizons of local boundaries to the global horizons and competition. The (Educational) Future Gate: The Future Gate, which the Saudi Ministry of Education is working on in cooperation with Tatweer for Educational Technologies Company to transform towards digital learning, is one of the most important initiatives undertaken by the ministry in the national transformation phase, which of course relates to the Kingdom's 2030 Vision that aims at transforming into an educational environment that works to make students benefit from modern technologies. This initiative has adopted student and teacher (which are the core of the educational process) as the main focus in its endeavor to create a new educational environment that depends on technology in delivering knowledge to students and increasing the outcome of knowledge. It also supports the development of teachers' scientific and educational capabilities. The Application of Integrated Learning for Students with Special Needs: the integrated learning platform helps students with special needs in learning via the Internet, and this is what many other learning platforms do not provide. For example, it allows students with visual impairments a smart educational environment that helps in learning and to navigate educational content of regular students without any assistant by providing smart engines that help the students to navigate the educational environment through an audio screen reader. As

- soon as a student enters the platform, the system guides him with the information and instructions it contains to move easily and smoothly within the educational environment by student moving the arrows and following the voice instructions provided by the system, which enables him to pass educational stages easily, pass exams, and reach higher levels of achievement (Abdul Latif, 2015). The Fourth Industrial Revolution has begun at the beginning of this century, and it is based on the digital revolution. However, it is not only related to machines and intelligent and connected systems, but the Fourth Industrial Revolution also combines digital, physical, and biological technologies, and creates paradigm shifts that redefine our existence (Delgado, 2019). Technology can be utilized to reduce or remove environmental barriers for persons with disabilities. Persons with disabilities have the right to control their own choices and direct it the way they want, as well as the right to access information that enables them to make decisions, based on knowledge, that suit their goals and interests. Persons with disabilities have the right to utilize assistive technology tools and the implementation and training strategies necessary to increase their independence and productivity (Viner, Singh, & Shaughnessy, 2020). Individuals with intellectual disabilities (ID) commonly benefits from the same strategies of teaching utilized to teach people with other challenges of E-learning. In terms of potential approaches, it is pivotal to break down the E-learning tasks into smaller fragments and introduce one learning step at a time (Abdul Latif, 2015). Hence, the social model of disability highlights that the concept of disability lies within the social practice instead of the individual body. However, disability is activated on online platforms differently. For individuals with impairment, E-learning, and access to digital technology enhances a sense of self-determination and independence among such people, thus, taking advantage of learning without leaving their personal space (Al-Maliki and Shaaban, 2020).

E. The roles that the technological innovations brought about by the Fourth Industrial

Revolution can play in the smart education and academic empowerment:

Using smart boards in the classroom to display digital curriculum.

Providing students with interactive experiences that make them enjoy learning and discovery activities in the school environment.

Providing learners with support and guidance by teachers through communicating with students and sending and evaluating answers electronically.

Providing new and unconventional educational experiences based on applying modern strategies such as the flipped classroom and other strategies.

Helping teachers to present lessons better and easier through the use of modern presentation technologies. Increasing interaction between the educational process parties of students, teachers, school administration, and parents in an easy and organized way. E-learning is of great importance to the upbringing and education of children with intellectual disabilities, because of the limited capabilities of this group compared to their typical peers of the same age, low attention, difficulties in concentration, poor ability to remember, as well as the clear deficiency in skills of adaptive behavior. All of these characteristics necessitate a special environment in which there are many academic and educational activities, and this is what e-learning provides (Luckasson et al., 2002). Hawsawi (2007) indicates that employing e-learning in the educational process for students with mild intellectual disabilities does not conflict with the educational strategies used for them such as dividing educational tasks, advancing from the easiest to the most difficult and from concrete to abstract, the use of various methods of reinforcement, providing immediate feedback, and other methods and general foundations of teaching students with intellectual disabilities. In addition, e-learning allows materials to be presented in various ways, such as to be in an audible, readable, or practical form, and this takes into account the differences in learning styles among students.

In the context of maintaining uninterrupted education during the period of the COVID-19 crisis, it would be necessary to highlight several basic elements for effective online education in emergencies. Relying on strong internet infrastructure, through which we could deal with millions of users simultaneously. This is critical to support a smooth learning experience via the internet without interruption, and this is achieved when: Providing simultaneous teaching via the internet using visual communication through live video (videoconferencing). And using the tools of (view, download, upload), as well as various interactive learning resources such as (videos, games, etc.) (Huang, Liu, Tlili, Yang, Wang, 2020. Favale, Soro, Trevisan, Drago, & Mellia, 2020). The development of digital technologies and social networks has led to an update in the basis of society's apparent suggestive value and the type of education it receives. We find that a new type of learners has emerged, who can independently shape their educational path with full awareness aimed at self-learning, self-actualization, self-development, and linking study to work and personal development. The present and the future lie in networked educational technologies, which will ensure personalization of the educational process, and eternal availability of education, as well as academic freedom of learners in choosing content, types, methods, place, and time of learning (Romanova, 2018). Students with disabilities need more than one digital tool to do their activities via the internet, as digital learning environments are inseparable from the educational learning environment. As for students with intellectual disabilities, they are characterized by changes in cognitive and affective processes, as they face a set of obstacles related to thinking skills, information, and communication skills. Technology should be used according to each student's needs, capabilities, and abilities. Providing teachers with necessary technological skills and the way of using them in teaching students. The awareness of teachers and students of the importance and effectiveness of educational technology in the educational process. The educational program team should be cooperated to identify the

capabilities and needs of students with intellectual disabilities and develop the appropriate curriculum for each student, in addition to developing solutions to the difficulties likely to be faced, to achieve their program goals. In the same context, Al-hiela (2009) points out a sequence of steps that teachers should follow to ensure the achievement of e-learning goals, namely, Informing students of time available for learning through electronic media. Providing students with the most important experiences that should be focused on and acquired during learning. Making the steps that students should follow to accomplish learning clear. Providing immediate and continuous feedback to improve their performance. Barden (2017) believes that the goals of e-learning for people with special needs are, enabling them to review materials and watch video lectures as many times as they need. Students with disabilities and visual processing disorders can process digital text by changing font style or size, which helps them to process information effectively. Teachers of students with intellectual disabilities being possessing skills of using and employing e-learning, as well as the necessity to change the education pattern of those students, to improve their education, and to meet their needs are of great importance. Also, educational experiences that those students are likely to be deprived of them as a result of their limited capabilities must be provided, thus increasing their educational opportunities through the use of modern technology.

**Preparing teachers of students with intellectual disabilities:**

As intellectually disabled students face many problems, being one of the most complicated categories of special education, teacher of the intellectually disabled should be well prepared to possess additional competencies more than any other teacher. Those competencies include having academic and professional preparation in educating the intellectually disabled by obtaining a license that allows him to work in the profession of teaching the intellectually disabled and to have sufficient experience in teaching them, the ability to analyze skills and

tasks required of intellectually disabled children into small sequential steps, as to be easily learned by intellectually disabled children. In addition, the teacher should have stamina and patience because educating those students relies mainly on repetition. Besides, having the ability to stimulate their motivation and attract their attention and interest to the educational materials, because the likelihood of intellectually disabled children being distracted is high, and their ability to focus is poor. Also, the teacher has to evaluate students' performance levels continuously, use records to record their results and provide them with appropriate and immediate feedback in different educational situations, and approve individualized education plans. To learn about the characteristics of the intellectually disabled (the physical, intellectual, emotional, and social) as well as the limitations imposed by the disability, as the intellectually disabled have deficiencies in cognitive, skill, and social processes also to train on using modern-technology-based devices

### Research Methodology Design

The researcher followed a quantitative research design and preferred collecting primary data for the study. The quantitative research design was preferred because the study suggests a training program and three hypotheses were tested for validating the effectiveness of the training program. It was possible only through quantitative analysis to test or reject the hypotheses. Primary data collection was also relevant because the researcher aimed to evaluate the effectiveness of the training program for a very specific segment of female teachers in special education. Other studies would not have provided this specific data to the researcher.

### Population and Sample

The population of the study was female teachers who were teaching the curriculum of special education. The researcher selected a sample of 40 teachers through judgment

sampling. Those female teachers were selected who have experienced professionals and were willing to participate in the training program. All teachers were specialized in teaching students with intellectual disabilities. The sample was divided into the control group and experimental group with 20 teachers in each group. Only teachers in the experimental group attended the proposed training program.

### The research method

In the current research, the researcher has used the quasi-experimental tale design that aims to know the effects of an independent variable (the training program based on enhancing and raising the competencies of special education female teachers in utilizing modern technology innovations, and its impact on creating a digital knowledge content suitable for them) on a dependent variable (academic achievement) of children with intellectual disability from their teachers' point of view.

### Data Analysis

Data were analyzed in SPSS software to test the three hypotheses of the study. The researcher entered the competency scores of all teachers before and after attending the training program and after follow-ups. Differences in the mean competency scores post-measurement were analyzed between the control group (20 teachers) and the experimental group (20 teachers) by using independent samples t-test. Differences in the mean competency scores pre and post-measurement for the experimental group (20 teachers) were analyzed by paired samples t-test. Differences in the competency scores post and follow-up measurements for the experimental group (20 teachers) were analyzed by paired samples t-test.

## RESULTS

All participants belonged to the University f Tabuk. The researcher selected this university because it is a renowned and recognized university in Saudi Arabia and the significance of

the intervention will be replicable to other universities and regions as well. The researcher

has taken into account the consistency of the sample subjects by measuring the variables of

(specialization, academic degree, years of experience, taking the course). The table shows the

demographic information of the sample. The students with an intellectual disability and the

students with a mild intellectual disability, a sample of the study consisted of 40 males and

females (see table 1).

**Table I. Demographic Distribution**

| Distribution of the study sample according to gender | Gender: | N | % |
|---|---|---|---|
| | males | 20 | 50 |
| | females | 20 | 50 |
| | Total | 40 | 100 |
| Distribution of the study sample according to age | Age: | N | % |
| | less than 35 years | 14 | 35 |
| | more than 36 yeas | 26 | 65 |
| | Total | 40 | 100 |
| Distribution of the study sample according to academic qualification | Specialization: | N | % |
| | bachelor's degree in Special Education | 10 | 25 |
| | bachelor of Education with diploma in Special Education | 30 | 75 |
| | Total | 40 | 100 |
| Distribution of the study sample according to years of experience | Years of experience: | N | % |
| | less than 5 years | 12 | 30 |
| | more than 5 years | 28 | 70 |
| | Total | 40 | 100 |
| Distribution of the study sample according to training courses taken in technological competencies | Taken courses: | N | % |
| | yes | 0 | 0 |
| | no | 40 | 100 |
| | Total | 40 | 100 |

Their mental age ranged between (13-16) years, and their chronological age ranged between

(15-18) years. Their intelligence scores ranged from 50 to 70 on The Stanford–Binet

Intelligence Scale, Fifth Edition, with a mean IQ score of (69,62). Those students are

enrolled in integrated education programs in middle school (intermediate school), in which location/ spatial and social integration programs are applied in extracurricular activities, and they receive individual education services. The achievement scores were measured for the experimental sample of (20) male and female students at the post measurements and at the follow-up measurement, and for the control group of (20) male and female students at the post measurements. The consistency of the subjects of the students' sample as a whole was verified in terms of chronological age, level of intelligence, and socioeconomic level of family through students' files at school. The data were statistically processed to ensure the equivalence of the control and the experimental samples. The experimental sample of students was chosen randomly. The pre-measurement of the achievement scores had been applied to the experimental and control groups of students, then the post-measurement of the achievement scores was applied to the experimental and control groups. After 60 days post the application of the program, the follow-up measurement of the achievement scores was applied to the sample subjects of the experimental group of students.

*The research tools*

In this part, the researcher presents the tools she used while preparing this research, and they can be summarized as follows:

In this part, the researcher presents the tools that she used while preparing this research, and they can be outlined as follows:

The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th Industrial Revolution (prepared by the researcher). The training program for enhancing the competencies of special education female teachers in utilizing the innovations of the Fourth Industrial Revolution (prepared by the researcher). The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th

Industrial Revolution, prepared by the researcher: The scale in the current study is a 5-point Likert scale  (from Strongly Agree to Strongly Disagree) of 90 items that consist of two parts, which are:: The initial information, which is considered as variables through which we ensure the consistency of the sample, such as (age, gender, and years of experience).: The scale dimensions: The scale consists of three dimensions, which are: (First: the role of COVID-19  in the occurrence of the Fourth Industrial Revolution and digital transformation, which consists of (30) items, such as "Applying artificial intelligence is a  real opportunity to achieve sustainable development goals in line with the requirements of the Fourth Industrial Revolution". Second: the technological competencies of teachers of students with intellectual disabilities, which consists of (30) items, such as "To learn about the effectiveness of using information technology with students with disabilities". Third: the role of the Fourth Industrial Revolution in creating appropriate knowledge content for the disabled, which consists of 30 items, such as "The Internet of Things-based smart classrooms will substitute the traditional classrooms"). The total items of the scale are (90) items. For preparing the scale, the researcher reviewed some sources that are a set of Arabic and English scales, namely: Al-Qahtani (2018); Sheninger (2019); Selwyn (2016); Dowling-Hetherington et al. (2020), and other studies that addressed competencies of special education teachers in utilizing the innovations of the Fourth Industrial Revolution. The psychometric properties of the scale have been verified by calculating the validity and reliability coefficients. The validity has been calculated using the face validity method by using the validity of the arbitrators: The researcher presented the tool in its preliminary form to arbitrators from the specialized faculty members of professors of education technology and special education, as well as the female teachers to benefit from their suggestions and opinions in determining the clarity of the statements and the extent of their relevance to the dimension to which they belong and their suitability to the purpose of the study and to ensure

the properness of the language used. The number of arbitrators was (10). The validity was verified by selecting the items that had (80%) of the arbitrators' approval. The items that had the approval of (50% or less) of the arbitrators were deleted. The scale reliability: The researcher has verified the reliability of the scale items using the method of:

Cronbach's alpha Coefficient: as all items were (0,558) (Table II). This reassures the researcher to use the study tool as a tool to collect information to answer the study questions and to trust the results of its application.

**CRONBACH'S ALPHA**

Guttmann Coefficient: Since the variance is equal here, Split-half Reliability has been used by using the method of correlation between forms, and the reliability coefficient was (0.615).

The training program: the competencies of special education female teachers in utilizing the innovations of the Fourth Industrial Revolution (prepared by the researcher): A training program based on enhancing the competencies of special education female teachers in utilizing the innovations of the Fourth Industrial Revolution has been prepared for female teachers of female students with intellectual disabilities, as for knowing the impact of this program after its application on female teachers on creating digital content suitable for their student' and its impact on the academic achievement scores of the students with intellectual disabilities. The program offered training female teachers on nine pillars of Industry 4.0. These include data analytics and big data management, simulation, horizontal/vertical integration, Internet of Things, robotics, the cloud, cyber security, augmented reality, and additive manufacturing. These concepts were mapped to the competencies in digital content creation. The program first provided an understanding of the theoretical concepts and then its implementation was also demonstrated for digital content creation. Through implementing this program, the researcher sought to consider characteristics of the teachers and students,

in terms of skills, individual characteristics, capabilities, and other issues that should be taken into account, then to know the impact of the teachers training on the students with intellectual disabilities through the improvement of their achievement scores as a result of what the teachers have learned in the program

*Description of the Training Program*

The researcher has identified the main goal of the o a program current research as the effectiveness of a training program for enhancing the competencies of special education female teachers in utilizing the innovations of the 4th industrial revolution, post-COVID-19, and its impact on creating digital educational content for students with intellectual disabilities. There is no doubt that goals are the first step in preparing any program or educational unit. Those goals are derived from values, trends, and the philosophy of society, as well as the need to train those who work with people with intellectual disabilities in a way that guarantees the quality of education and care provided to them. When determining the goals of this program, the researcher relied upon a set of foundations that would help its success, and she summarized them as follows, the goals of the program should be consistent with the main goal of training teachers of students with intellectual disabilities in the competence of teachers in providing necessary educational skills and teaching strategies through building digital knowledge content that contributes to the education of those students. Improving the academic achievement of students with an intellectual disability by training their teachers, and through what their teachers provide to them. The program was designed based on being progressed through (6) phases divided into (24) sessions so that each phase consisted of (4) sessions, and each session lasted two hours (120 minutes). The implementation of the program took eight weeks, with three sessions per week. All sessions were interactive group sessions presented to the teachers through a virtual classroom. The researcher relied in these sessions upon organized meetings, and the presentation of the

sessions was based on a set of techniques such as lecturing, discussion, dialogue, self-talk, emotional release, activities during the presentation, and homework, in addition to role play, modeling, and workshops. The program was arbitrated by a group of professors of education technology, special education, and kindergarten, and it was approved in its final form. Table III shows the training sessions used in the current research. Skills taught to the Participants

The ability to fully prepare the lesson, select rearrangement goals, the ability to use modern technology, the ability to design a digital curriculum, and the ability to utilize time effectively.

A set of techniques has been used in the program which is: lecturing, discussion, modeling, role-playing, brainstorming, reinforcement, direct teaching, scientific dialogue, and homework. These techniques were used either individually or collectively. Table III shows the sessions and techniques of the current program. Applying the pre-measurement: The Scale of the Competencies of Special Education Teachers had been applied to the experimental and control groups before the implementation of the program to identify the level of competencies of the subjects of the two groups. Applying the post-measurement: the program was evaluated through applying the Scale of the Competencies of Special Education Teachers, then comparing the results of the experimental group in the pre-measurement to their results in the post-measurement, then comparing the results of the control group to the results of the experimental group in the post measurement.

### *DISCUSSION*

In this chapter, the researcher addresses the results of the statistical analysis to test the validity of the hypotheses to answer the research questions, to discuss its results in light of the theoretical framework and previous research, and to provide some recommendations.

To verify the hypotheses of the study, the researcher processed the data statistically, through several methods as follows:

*Table II. Sessions and techniques of the training program*

| Duration | Phase | Sessions number | Phase title | Session target | Techniques used in the session |
|---|---|---|---|---|---|
| +120 m<br>+120 m<br>+120 m<br>+120 m | The fifth phase | The 17th, 18th, 19th, and 20th sessions | Open-source software | Identifying aspects of curricula that are appropriate for technology applications and ways in which they could be implemented. Learning about assistive technology, its applications, and how it could be integrated into a learning environment. Finding some smart device applications for teaching different subjects to students with disabilities. | Lecturing, discussion, dialogue, relaxation, production, and presentation. |
| Duration | Phase | Sessions number | Phase title | Session target | Techniques used in the session |
| +120 m<br>+120 m<br>+120 m<br>+120 m | The sixth phase | The 21st, 22nd, 23rd, and 24th sessions | Finding appropriate digital knowledge content | Explaining how to employ multimedia application platforms of social networks such as Facebook, Instagram, and YouTube in interactive teaching. Explaining how to design and produce various interactive educational activities by the mean of some applications (Scratch, E-book). Presenting some useful applications. Also, an educational platform has been created for research purposes. www.spedclasses.com | Discussion, dialogue, relaxation, giving the teachers space for emotional release, imagination, role play, modeling, and interacting. |

*Table III. Sessions and techniques of the training program*

To test this hypothesis, independent samples t-test was used, and the results are shown in Table IV. V.the T-test results of the significance of the difference between the mean scores of the control and the experimental groups in the post-measurement on the scale of the competencies of the study sample of the female teachers. The higher value of the experimental group (411.20) indicates that competencies improved significantly by attending the training program compared to the control group (257.80).

### Testing the Second Hypothesis

$H_2$: There are significant differences between the mean scores of the pre and post-measurements in the experimental group on The Scale of the Competencies. To test this hypothesis, a paired-samples t-test was used, and the results are shown in Table V. the T-test results of the significance of the difference between the mean scores of the pre and post measurements on the scale of the competencies of the experimental sample of the female teachers The significance value shown in Table V is less than 0.001 that confirms significant differences in the group means. The higher value in the post-measurement (411.20) in the experimental group indicates that competencies improved significantly for the experimental group. by attending the training program.

### Testing the Third Hypothesis

$H_3$: There are significant differences between the mean scores of the post and follow-up measurements in the experimental group on The Scale of the Competencies to test this hypothesis, a paired-samples t-test was used, and the results are shown in Table VI. I. The T-test results of the significance of the difference between the mean scores of the post and follow-up measurements on the scale of the competencies of the female teachers in the experimental sample. The significance value shown in Table VI is 0.041 which confirms significant differences in the group means. When the training had just finished, the mean

competency level of the experimental group was 411.70 that increased to 504.10 using follow-ups. The current research has addressed the effectiveness of a training program for enhancing the competencies of special education female teachers in utilizing the innovations of the 4th industrial revolution, post-COVID-19, and its impact on creating digital educational content for students with intellectual disabilities

*Table IV: Results of Hypothesis I*

| Groups | N | M | SD | Degree of freedom | T Value | Significance level |
|---|---|---|---|---|---|---|
| The experimental group (post-measurement) | 20 | 411.20 | 91.63 | 39 | -2.198 | .041 |
| The experimental group (follow-up measurement) | 20 | 504.10 | 182.61 | | | |

| Groups | N | M | SD | Degree of freedom | T Value | Significance level |
|---|---|---|---|---|---|---|
| The control group | 20 | 257.80 | 148.68 | 38 | -4.881 | .000 |
| The experimental group | 20 | 411.20 | 91.63 | | | |

*Table V: Results of Hypothesis II*

### First Hypothesis Analysis

The first hypothesis states that: There would be substantial differences between the mean scores of the control and the experimental groups in the post-measurement on The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th Industrial Revolution in the study sample of the males in favor of the mean scores of the experimental group. The results showed that there is a statistically significant difference

between the mean scores of the control and the experimental groups in the post-measurement on the scale of the competencies of the study sample of the female teachers in favor of the mean scores of the post-measurement (Table IV), meaning that the mean scores of the experimental sample of the female teachers on the scale of competencies in the post-measurement are higher with statistical significance than their counterparts in the pre-measurement, which confirms that the program has a significant effect size in enhancing the competencies of the female teachers in the experimental group. This result is consistent with the study of (Al-Dahshan, 2019), which concluded that the Fourth Industrial Revolution will bring about fundamental changes in the goals and method of teaching and learning of our children, which has imposed on teachers' new roles and responsibilities by including their preparation programs with appropriate courses in the fields of artificial intelligence and its applications, and the philosophy of artificial intelligence and other skills. The results of the research also agreed with the results of the study of (Al-Youssef, 2017) regarding the degree to which Islamic education teachers possess the competencies of using smart technology or hose with higher educational qualifications and more years of experience, without considering the gender of teachers. However, the results of the first hypothesis differed from the study of Ventayen (Ventayen, 2019), which addressed the teachers 'competencies in applying technological tools in teaching

*Second Hypothesis Analysis*

The second hypothesis states that: There would be substantial differences between the mean scores of the pre and post measurements on The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th Industrial Revolution in the experimental sample of the female teachers in favor of the mean scores of the post-measurement. The results in Table V showed that there is a statistically significant difference between the mean scores of the pre and post measurements on the scale of the competencies

of the experimental sample of the female teachers in favor of the mean scores of the post-measurement, meaning that there are substantial differences between the two mean scores of the experimental sample of the female teachers on the scale of the competencies. The results of this hypothesis are consistent with many studies that emphasized the importance of training teachers to enhance their various educational technological competencies, such as the study of (Al-Qahtani, 2018), which emphasized that it is necessary to enhance technological competencies and use education technology tools and employ them through social media amongst female teachers to keep up updated trends in education. The results also agreed with the results of the study of (Bani Hamad, 2019), as those results revealed that the degree to which special education teachers in the southern region of the Kingdom of Saudi Arabia possess technological competencies is great. The general objective of this study was to identify technology integration for pre-service teachers at the beginning of teacher education and preparation programs, as junior teachers had indicated that they don't feel fully prepared to integrate technology effectively in the classroom.

*Third Hypothesis Analysis*

The third hypothesis states that: There would be substantial differences between the mean scores of the post and follow-up measurements on The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th Industrial Revolution in the experimental sample of the female teachers. The results of the analysis of his hypothesis indicate that there is a statistically significant difference between the mean scores of the post and follow-up measurements on the scale of the competencies of the female teachers in the experimental sample in favor of the follow-up measurement, which confirms the effectiveness and continuation of the program's impact on the female teachers even after a period of the end of its application due to its clear impact on the teachers and the continuation of this impact on the educational process. An overlapping explanatory study of

mixed methods was conducted to (a) examine the prevailing educational methods and techniques used by teachers, (b) identify the features of learning and teaching in the twenty-first century, and (c) develop pedagogical frameworks to promote the utilizing of advanced technologies. That study also emphasized the features of teaching in the twenty-first century, the importance of developing a pedagogical framework to promote the utilizing of advanced technologies, and providing educational courses for teachers, to ensure the continued success of utilizing the innovations of the Fourth Industrial Revolution in education.

**CONCLUSION AND RECOMMENDATIONS**

This study aimed to highlight the effectiveness of a training program for enhancing the competencies of special education female teachers in utilizing the innovations of the 4th Industrial Revolution, post-COVID-19. The sample included 40 intellectual disability education female teachers divided into 20 teachers in a control group and 20 teachers in an experimental group. The researcher used the quasi-experimental design that aimed at knowing the effect of an independent variable (the training program) on a dependent variable (academic achievement) of children with intellectual disability from their teachers' point of view. Three hypotheses of the study analyzed the perceptions of the teachers on The Scale of the Competencies of Special Education Female Teachers in Utilizing the Innovations of the 4th Industrial Revolution. The first question was focused on post-measurement between the control and experimental group. The second question was focused on the comparison of pre and post-measurements in the experimental group. The third question was focused on the post and follow-up measurements in the experimental group. In all three cases, significant differences were found.

**Consent for Publication**

Not applicable

**Ethical Statement**

> **Commented [TN1]:** Kindly add an IRB approval and TESE statement.

**TESE purpose statement**.

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