



Using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19: Teachers' perspectives

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Título: Uso del aula virtual para enseñar a estudiantes con necesidades especiales en aulas inclusivas durante y después de la COVID-19: perspectivas de los docentes.

Resumen: Fomentar y continuar con los entornos de aprendizaje inclusivos es importante para permitir que todos los estudiantes puedan participar, comprometerse y aprender plenamente. El entorno de aprendizaje online obliga a los educadores a pensar de forma creativa sobre cómo lograr este objetivo. El objetivo era investigar el uso del aula virtual para enseñar a estudiantes con necesidades especiales en aulas inclusivas durante y después de la COVID-19 desde la perspectiva de sus docentes. La investigación cuantitativa se lleva a cabo con el objetivo de investigar el uso del aula virtual (VC) para enseñar a estudiantes con necesidades especiales en aulas inclusivas durante y después de Covid-19 desde las perspectivas de sus maestros. Se utilizó un método de encuesta. Las variables independientes son la utilidad percibida (PU), la facilidad de uso percibida (PEOU), mientras que la variable dependiente es la intención de comportamiento del estudiante (BI). Los datos fueron recolectados a través de un cuestionario estructurado autoadministrado, que se basó en el modelo de aceptación de tecnología (TAM). Se utilizaron la correlación de Pearson (r) y la regresión múltiple (MRA) para analizar los datos. Los resultados indicaron que el BI se ve afectado positivamente por PU, PEOU. PU, PEOU arrojaron un coeficiente de regresión múltiple (R) y un cuadrado de correlación múltiple. Esto muestra que PU, PEOU explican una variación total en BI.

Palabras clave: Aula Virtual. Alumnos con Necesidades Especiales. Aulas Inclusivas. COVID-19. Modelo de aceptación de la tecnología. Perspectivas docentes.

Abstract: Encouraging and continuing inclusive learning environments is important to allow all students to be able to fully participate, engage, and learn. The online learning environment obliges educators to think creatively about how to achieve this goal. The aim was to investigate using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers. Teachers of special education from integration schools in the middle stage in Makkah were targeted. A 15-item survey instrument was developed particularly for this research study. Quantitative research is carried out with the aim to investigate using virtual classroom (VC) for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers. A survey method was used. Data were collected through a structured self-administered questionnaire, which was based on the technology acceptance model (TAM). Pearson correlation (R) and multiple regression (MRA) were used to analyze data. Results indicated that the BI is positively affected by PU, PEOU. PU, PEOU yielded a coefficient of multiple regression (R) and a multiple correlation square. This shows that a total variance in BI is accounted for by PU, PEOU. In conclusion, the findings in this study contribute to the literature on TAM and its use in special education in particular.

Keywords: Virtual Classroom. Special Needs Students. Inclusive Classrooms. COVID-19. Technology acceptance model. Teachers' Perspectives.

Introduction

Special education is concerned with educating students with special needs who suffer from shortcomings or a chronic illness that affects their abilities, whether the disability is physical, sensory, mental or social. These disabilities prevent the individual from taking full advantage of the educational and professional experiences that his/her typically developing peers can benefit from (Eissa & Borowska-Beszta, 2019; Glodkowska et al., 2018; Hayesand, 2017; Özaydın et al., 2021). They also prevent him/her from equal competition with other typically developing individuals in society. Therefore, he/she is in dire need of a special kind of educational programs, retraining and developing his/her capabilities despite the shortcomings so that he/she can live and adapt to the society of the typically developing peers as much as possible (Benkohila et al., 2020; Mariga et al., 2014).

Teachers and professors have worked on the best ways

and means to provide an interactive learning environment to attract the attention of learners with special needs and urge them to exchange opinions and experiences (Aktepe et al., 2021; Okumuş, 2021; Radianti et al., 2020).

COVID-19 has disrupted the teaching-learning process of learners and teachers because of the closure of schools and colleges in the face-to-face mode. COVID-19 disrupted learning, increased student debt, limited access to education facilities, increased job loss in the education sector, and reduced loss of learning among students (UNESCO, 2020).

E-learning is one of the most successful means to provide this rich educational environment. Education policies seek to promote teachers to implement online teaching activities and help their students to get engaged in learning and teaching activities (Carrillo and Flores, 2020; Uluçınar, 2021). Teachers play a significant role in integrating technology in teaching and learning (Güngör et al., 2022; Huber and Helm, 2020). Students have the responsibility to search for information and formulate it, which develops their thinking skills and e-learning. E-learning is among of the most important features of the School of the Future (Apsorn et al., 2019; Türker & Silman, 2020).

This era is characterized by scientific and technological progress (Konca & Hakyemez-Paul, 2021), so it has become necessary to keep pace with the educational process of these

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changes in order to face the problems that may result from them, such as the large number of information, the increase in the number of students, the lack of teachers and the distance, in addition to the shortcomings of people with special needs and their abilities to integrate into society (Alpaslan et al., 2021; Düzyol & Yildirim, 2022; Serdyukov, 2017; Tanju & Hakkoymaz, 2022). These changes have led to the emergence of many patterns and methods in education, especially in the field of education for people with special needs - in which the learner depends according to his ability, ability and speed of learning and according to his previous experiences and skills, as solutions in the face of these changes (Paul and Jefferson, 2019).

This interest contributed to the development of educational and rehabilitation programs for people with special needs that would improve the educational level of these people, which helped increase their various educational and career opportunities (ElAdl and Eissa, 2019). Due to the nature of people with special needs, it is necessary to teach them different teaching methods and methods and to adapt teaching methods according to the type of their disability, or more flexible classroom practices, or remedial activities that focus on strengths (Bernard et al., 2009).

Through e-learning and the virtual education system, student can control his learning and practice scientific experiments (Barbour and Reeves, 2009). Virtual education provides various options for education through the virtual meeting with the largest experts of the educational process in the world and benefiting from the best curricula of global educational institutions in a virtual way (Göçen and Aslan, 2022; Jang et al., 2021). This requires qualification and training of teachers on all methods and tools of virtual education, because virtual education requires that it be based on the agreed practices in this field, where a set of standards and guidelines are available regarding educational practices in virtual learning environments, especially those standards issued by leading institutions and bodies in the field of learning (Barker and Wendel, 2001) such as the American Federation of Teachers, the Sloan International Conference on Online Education, the American Institute for Distance Learning, the Regional Education Council, the National Education Association, and the American Institute for Online Education, to ensure the success of the virtual education system and play its real role in modernizing the educational process and facilitating and developing the educational system in general (Barbour, 2019).

As in many countries in the world, the Kingdom of Saudi Arabia, especially the Ministry of Education, has recognized the effective role of information and communication technology in the development of the educational process, and in recent years has focused on the need to integrate traditional educational methods with e-learning tools in different ways. The most important of which is the virtual education system, as virtual education has become a basic choice and a dominant approach for students. in the present era; however,

there is a need for more research regarding methodologies for using modern technology in the educational process (Grace and Gravestock, 2009).

This requires the necessity of studying the reality or understanding the nature of the external factors that affect the use of these technological innovations in encouraging students to benefit from them and the permanence of their employment in learning. Investigate these factors and rank them according to their importance, while identifying and proposing alternatives in order to mitigate negative factors related to the e-learning process, and making suggestions for the optimal use of this technology during the learning process, in a way that ensures the efficient use of virtual learning tools and encourages its wider use (Al-Qahtani, 2020).

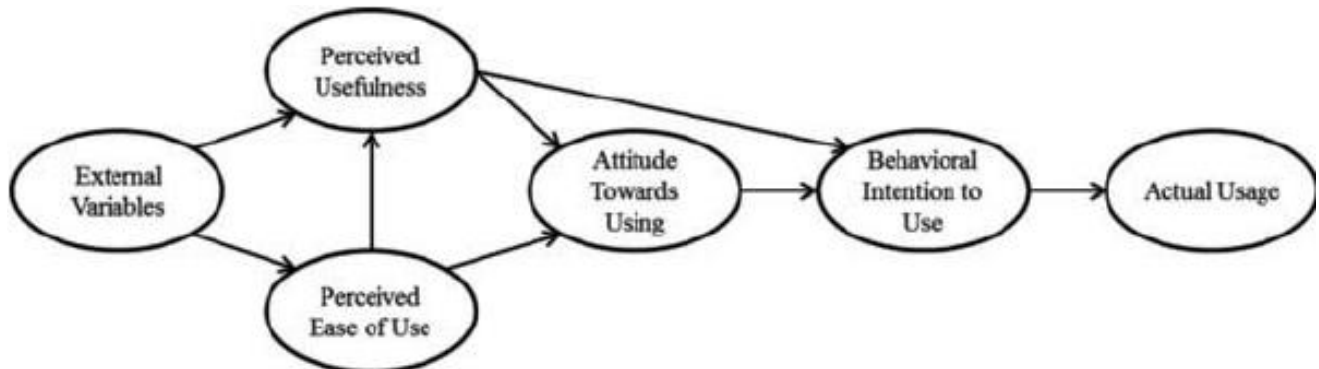
We become able to exchange, receive and send knowledge to millions of people with just a small step (Wang et al., 2018). That is, with a simple click on the computer. Technology has have an important impact on the emergence of education and the subsequent computerized evaluation, which depends on the use of modern communication mechanisms such as computers, networks, multimedia, audio and video, and mechanisms, whether inside or outside the organization (Radianti et al., 2020)

Researchers investigated and published a hypothetical model to clarify user's information technology acceptance and use, the most well studied of which was the technology acceptance model (TAM). This model was employed by researchers when trying to assess the recognition of the e-learning platform by learners (Samar, Li, Aka, and Bilal, 2020).

Davis (1989) presented a model for studying technology acceptance for the first time, and he called it the technology acceptance model (TAM), as the non-acceptance of users to work on information technology systems is an important obstacle to the success of these systems. It has been proven that one of the biggest challenges for researchers here is understanding the answer to the question why do people choose to accept or reject any technology? (Liao et al., 2022).

The TAM has been used by researchers worldwide (WannYih and Ching-Ching, 2015; Chung-Kuang, 2014; Teo, 2013; Sebetci and Aksu, 2014). TAM is consists of attitude towards behavior, behavioral intention, actual system use, perceived usefulness as well as perceived ease of use. The TAM principally relies on two factors, perceived usefulness in addition to perceived ease of use, to inspect persons' beliefs in addition to attitude toward computer technology approval (Liao, and Le, 2022). Ducey (2013) indicates that the TAM includes PEOU and PU which are the important determinants of technology acceptance and user behaviour. The TAM highlights that PU and PEOU are features that determine the behavioral intention of a new technology usage(See Figure 1).

Figure 1
The Technology Acceptance Model (TAM)



Aims

Encouraging and continuing inclusive learning environments is important to allow all students to be able to fully participate, engage, and learn. The online learning environment obliges educators to think creatively about how to achieve this goal. The aim was to investigate using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers.

Significance

This study could contribute to the literature on VCs. The study is concerned with using VCs for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers. It is anticipated that the use of VCs with special needs students in inclusive classrooms will facilitate their learning.

Research Questions

1. Are there is a positive correlation between perceived usefulness, perceived ease of use and student behavioral intention to use educational technology?
2. Does the combination of PU, PEOS affect student BITUET?

Do PU and PEOS contribute to student BITUET?

Hypotheses

The following hypotheses were tested

Hypothesis 1: There is a positive correlation between perceived usefulness, perceived ease of use and student behavioral intention to use educational technology.

Hypothesis 2: There are combined effects of PU, PEOS on student BITUET.

Hypothesis 3: PU and PEOS contribute to student BITUET.

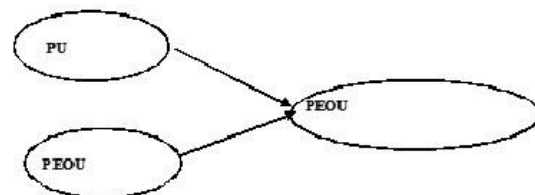
Methods

Quantitative research is carried out with the aim to investigate using VCs for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers. It uses a survey-based methodology to obtain data from the respondents. The research was conducted from Oct. 2021 to Feb. 2022

Design

A survey method was used. The independent variables are PU, PEOU, while the dependent variable is student BI. The research model then as follows in Figure 2.

Figure 2
Research Model



Participants and procedure

Sample

Teachers of special education from integration schools in the middle stage in Makkah were targeted. Criteria for inclusion were as follows: 1) They all had qualifications in special education, 3) All were from Makkah, and 3) they were willing to participate. Criteria for exclusion were as follows: 1) unwilling to participate, and 2) had no qualifications in special education. A structured self-administered questionnaire was used to collect data. The author received a total of 280 questionnaire responses. They were 260 males (92.8%, mean age = 25-37, SD = 9.86), and 20 females (7.2% mean age = 23-30, SD = 7.46). These teachers teach students with Intellectual disabilities, ASD, Physical disabilities, and sensory disabili-

ties. Those are included in regular classroom through the comprehensive integration strategy applied in the Kingdom. Each classroom has from 1-4 students.

Instrument

A 15-item survey instrument was developed particularly for this research study. It was administered to 150 special needs teachers. They were 10 females and 140 males. All of them had qualification in special education. Items were constructed according to TAM (Davis, 1989). The first part concerns with the demographic information, while the second parts concern with scale items for the three variables: perceived usefulness, perceived ease of use and behavioral intention. Each item was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Instrument reliability and validity

As shown in Table 1, the Cronbach's alpha of each construct and the whole questionnaire are greater than the recommended threshold of 0.7. Besides, all corrected item-total correlation values were higher than the acceptability value of 0.5, that is, the internal consistency of the questionnaire was fairly well.

Table 1

Reliability test for each item, variable and the whole questionnaire.

Variable/item	Corrected item-total correlation	Cronbach's α if item deleted	Cronbach's α
Perceived usefulness (PU)			
PU1	0.844	0.901	0.931
PU2	0.823	0.903	
PU3	0.846	0.906	
PU4	0.848	0.907	
PU5	0.850	0.911	
Perceived ease of use (PEOU)			
PEOU1	0.813	0.906	0.944
PEOU2	0.827	0.907	
PEOU3	0.835	0.911	
PEOU4	0.826	0.906	
PEOU5	0.827	0.907	
Behavioral intention (BI)			
BI1	0.850	0.911	0.951
BI2	0.826	0.906	
BI3	0.827	0.907	
BI4	0.823	0.903	
BI5	0.846	0.906	

Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were applied to test validity. As shown in tables 2 and 3, the KMO value of 0.948, and Bartlett's test of sphericity was strongly significant ($p < .001$), indicating the great suitability of this instrument for validity estimate. To further validate the instrument, the author calculated four commonly used indicators to assess convergent validity and discriminant validity: factor loading of each item, average variance extracted (AVE), composite reliability (CR), and the square

root of AVE for each construct. As it is indicated from the tables, the value of these four indicators were above the recommended value of 0.5, 0.5, 0.7 and 0.7, respectively, which indicates an acceptable convergent and discriminant validity.

Table 2

Convergent validity test

Variable	Item	Factor loading	AVE	CR
Perceived usefulness (PU)	PU1	0.822	0.832	0.921
	PU2	0.811		
	PU3	0.810		
	PU4	0.821		
	PU5	0.813		
Perceived ease of use (PEOU)	PEOU1	0.826	0.845	0.934
	PEOU2	0.827		
	PEOU3	0.823		
	PEOU4	0.846		
	PEOU5	0.826		
Behavioral intention (BI)	BI1	0.827	0.874	0.946
	BI2	0.835		
	BI3	0.826		
	BI4	0.827		
	BI5	0.827		

Table 3

Discriminant validity test

Variable	PU	PEOU	BI
Perceived usefulness (PU)	0.907		
Perceived ease of use (PEOU)	0.902	0.916	
Behavioral intention (BI)	0.900	0.864	0.923

Data collection

Data were collected through a structured self-administered questionnaire, which was based on TAM. With the support of each school's headmaster, each round for filling out the questionnaire was accompanied by the researcher to introduce the study purpose.

Data analysis

The data were analyzed using SPSS Statistics, a software package frequently used for statistical analysis. Pearson correlation (R) and multiple regression (MRA) were used to analyze data. Invalid questionnaires, including those that were incomplete or provided the same response for all items or with many missing values, were eliminated.

Ethical Procedures

Participants were teachers of special education from integration schools in the middle stage in Makkah. They were informed about their role in the study, the purpose of the study and the data collection methods. The author wishes they can continue with him till the end of the study. However, they were free to discontinue at any time. Ethical approval for conducting this study was obtained from our university, in accordance to Royal Decree in 2001. All pro-

cedures performed in this study were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The participants provided their written informed consent to participate in this study.

Results

The aim was to investigate using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers.

Descriptive data and inter-correlations

Table 4 shows the means, descriptive statistics and inter-correlations of perceived usefulness, perceived ease of use and student behavioral intention to use educational technology. Table 1 shows that there are significant correlations between PU, PEOU and student behavioral intention to use educational technology. Perceived usefulness (PU) correlates positively with perceived usefulness ($r = .503$) and Behavioral intention ($r = .611$) respectively. PEOU correlates positively with BI ($r = .604$)

Table 4
Descriptive statistics and inter-correlations of PU, PEOU and student behavioral intention to use educational technology

Variable	PU	PEOU	BI
Perceived usefulness (PU)	-	.503**	.611**
Perceived ease of use (PEOU)	.503**	-	.604**
Behavioral intention (BI)	.611**	.604**	-

Table 7
The regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change statistics				
					R Square change	F Change	Df1	Df2	Sig. F change
1	.626a	.533	.544	4.02644	.550	28.962	2	237	.000

a. Predictors: (Constant), PU, PEOU
b. IV: BI

Table 8
Summary of Multiple Regression Analysis

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	795.803	2	265.962	28.962	.000 ^a
Residual	970.888	237	331.277		
Total	1766.691	239			

a. Predictors: (Constant), PU, PEOU
b. IV: BI

As shown in table 9, PU, PEOU contributed to the prediction of BI and beta weights were as follows: PU ($b = 0.394$, $t = 4.243$; $p < .01$), and PEOU ($b = 0.372$, $t = 4.074$, $p < .01$).

Measurement scores of PU, PEOU and BI

The mean score of BI was 3.22, and 48.16% scored above the mean value. PEOU and PU had a mean score of 3.66, and 3.11, respectively (Table 5). The proportion of the participants scored above the average value of variable scores was ranged from 46.04 to 56.08%.

Table 5
Measurement scores of participants

Variable	Mean	SD	Median	N (%) of scores > mean
PU	3.66	0.94	3.70	678(56.08)
PEOU	3.11	0.98	3.31	610(46.04)
BI	3.22	0.89	3.54	615(48.16)

Tests of direct and indirect effects

The results of the Bootstrap test showed that the indirect effects of PU and PEOU on BI was 0.123 ($p = .013$). Also, indirect effects of PEOU and BI on PU was 0.121 ($p = .048$).

Table 6
Direct/indirect Relationships.

Direct/indirect Relationships	Coefficients	M	SD	t	p
PU+PEOU -> BI	0.123	0.124	0.061	2.494	.013
PEOU+BI -> PU	0.121	0.120	0.049	1.98	.048

Predictors

As shown in table 7, PU, PEOU yielded a coefficient of multiple regression (R) of .533 and a multiple correlation square of .544. This shows that 54.4% of the total variance in BI is accounted for by PU, PEOU. F-ratio value, as shown in table 8, was significant ($F(2, 237) = 28.962$; $p < .01$).

Table 9
Relative Contribution of PU, PEOU to the Prediction of BI. Coefficients a

Model	Unstandardized coefficients		Standardized coefficients	t	p
	B	Std error			
1 (constant)	8.839	2.897		3.051	.003
PU	0.379	0.091	0.394	4.243	<.000
PEOU	0.363	0.090	0.372	4.074	<.000

a. Predictors: (Constant), PU, PEOU
b. IV: BI

Discussion

Encouraging and continuing inclusive learning environments is important to allow all students to be able to fully participate, engage, and learn. The online learning environment obliges educators to think creatively about how to achieve

this goal. The aim was to investigate using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers.

Results indicated that the BI is positively affected by PU, PEOU. This is aligned with the existing research examining the TAM (Scherer et al., 2019), as these are the two fundamental constructs that play a central role in the adoption process of a system (Liu et al., 2019). Davies (1989) claimed in his model that PU and PEOU could contribute to the students' behavioral intention to use a particular technology or information system. The findings further uncovered that PU and PEOU are both significant predictors of students' BI. It suggests that the students' perceptions regarding the usefulness and ease of using technology, or rather online learning environment, can explain their future intention and continue to use this environment.

This indicates that students with a higher perception of the usefulness and ease of use of the technology will, in turn, increase their willingness to use the said system. Hence, hypotheses are confirmed. This goes in the same line with other research studies in different environments (e.g. Dum-pit and Fernandez, 2017; Lao et al., 2018) which illustrated the PU and PEOU as robust predictors of usage behavior of students, and Huynh and Thi (2014) who explained that the mediating role of the perception on PU in the relationship between perceived ease of use and the acceptance of e-learning.

Valimont et al. (2007) demonstrated the significant role of VR technology in enhancing students' memory of knowledge. Yang et al. (2010) found that VR technology can effectively improve students' learning motivation and thus improve their long-term learning performance.

The ease of using virtual classes has helped them to accept the use of VCs as a basic alternative to traditional classes due to its easy-to-use features and tools. This result is aligned with other studies (e.g. Chang et al., 2017, Önal, 2017).

Consistent with previous studies, PEOU positively impacts behavioral intention to use educational technology was confirmed in our study. This result is supported by empirical studies (Cheung, and Vogel, 2013; Granić and Marangunić, 2019; Hong, 2020). Sui et al. (2020) used TAM to measure the IT-based teaching ability of higher education teachers in Hunan Province, China. They found that their "intention to continue IT-based teaching" had a direct significant positive effect on their "IT-based teaching ability." However, Qin and Zhou (2020) performed an empirical analysis of Chinese students' satisfaction with online teaching in different disciplines and found that students' continuous usage intention for online teaching was generally low.

Conclusions

The use of VC can help to close the digital literacy gap and prepare young people for the world of work. The present

study is the first to investigate using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of their teachers in Saudi society. Emerging information and technology provide a wide range of learning environments. Results of this study prove that students can learn from the VCs and have a good learning willingness, as indicated by their teachers. It was found that 54.4% of the total variance in BI is accounted for by PU, PEOU. In conclusion, the findings in this study contribute to the literature on TAM and its use in special education in particular. In this digital age, it is necessary to put PU, PEOU and BI into consideration for more research studies. It is the authors' expectations that the results of this study would play a significant role for policy makers in Saudi Arabia for adopting TAM model in inclusive classrooms.

Limitations

There are some limitations of this study that need to be addressed in future studies. First, because of the small number of the participants of this study and being teachers of special education from integration schools in the middle stage in Makkah, this condition may influence the generalizability of the finding of this study. Therefore, further research is needed to investigate using virtual classroom for teaching special needs students in inclusive classrooms during and beyond Covid-19 from the perspectives of both students and their teachers. Second, the present study revealed that PU and PEOU did have a significant positive effect on BI. Thus, future research should aim to explore this issue in the context of teachers and students as well in different other contexts. Finally, this study has one external factor, namely BI. However, additional external factors of behavioral intention may also exist.

Implications for Future Research

The study makes a significant contribution to the academic literature and provided a new direction for continuing using virtual classroom for teaching special needs students in inclusive classrooms during Covid-19. Covid-19 has also made a substantial impact on the education sector and future studies can further explore how digital tools and e-learning can improve the educational attainment for special needs students.

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Conflicts of Interest: The author declares no conflict of interest.

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