

Article

# Assessing Teachers' Practices in Providing Inclusive Online Education: Development and Validation of an Instrument Based on Inclusive Practices among Teachers in Malaysia

Way Kiat Bong <sup>1,\*</sup>  and Kah Heng Chua <sup>2</sup> <sup>1</sup> Department of Computer Science, Oslo Metropolitan University, 0166 Oslo, Norway<sup>2</sup> Department of Mathematics and Science Education, University of Malaya, Kuala Lumpur 50603, Malaysia; chuakh@um.edu.my

\* Correspondence: wayki@oslomet.no

**Abstract:** All students should have equal opportunities to pursue education. When the COVID-19 pandemic began, almost all teaching activities had to be switched from the traditional face-to-face format to digital platforms. Although it is now the post-pandemic period, many online teaching and learning practices have been maintained. It is, therefore, crucial to ensure that teachers are doing their best to make online teaching inclusive, and an instrument assessing their practices is essential. This study aims to develop this instrument and validate it. Referring to relevant works and universal design for learning (UDL) guidelines, we developed an instrument that consists of five domains: affective, behavioural, cognitive, competence and awareness. Through expert assessment of face, content and construct validity, a pilot study, and data analysis of 505 respondents teaching in different educational levels from primary schools to higher institutions in Malaysia, using exploratory factor analysis (EFA) and correlational testing, the findings show that the instrument has high validity and reliability in assessing teachers' practices in delivering inclusive online education. While the instrument has implications for policymakers and researchers, it needs further validation in the context of different countries. Necessary amendments might be required to make it more context specific.



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**Keywords:** inclusive education; online teaching; instrument; teachers' practices

## 1. Introduction

The importance of providing equal opportunities to all children in pursuing education is self-evident. Not only is education crucial for one's personal growth and development but ensuring inclusiveness of education also plays an important role for the progress of society as a whole. According to the United Nations International Children's Emergency Fund, "inclusive education means all children in the same classrooms, in the same schools. It means real learning opportunities for groups who have traditionally been excluded—not only children with disabilities, but speakers of minority languages too" [1]. When teaching moves to digital platforms, there are other groups of students who can be excluded, as happened even before the pandemic. Not having equal access to software [2], equipment [3], and a stable internet connection (especially among countries in Africa, Asia and the Middle East) [4] and having disparate computer literacy [5] are some factors identified as contributing to students not all being able to participate fully in online classes.

The COVID-19 pandemic has accelerated online teaching and learning. Due to COVID-19 restrictions, traditional face-to-face teaching had to be switched to online teaching. It has been a challenge for many teachers to ensure that all students attending classes on digital platforms receive the same and equal opportunities to learn, as they did before the pandemic, in physical classrooms [6–9]. On 5 May 2023, the World Health Organization announced that COVID-19 was no longer a public health emergency of international concern [10], and many schools had even returned to traditional face-to-face teaching when restrictions were lifted before this

announcement. However, some online teaching and learning practices have remained (either partially or completely) due to their advantages, such as students being able to watch recorded videos [11], saving commute time [12], and providing flexibility to adults and non-traditional students [13], as well as to teachers if unexpected events occur [14]. Despite the pros that online education can offer, we would like to emphasise at the same time that it has its cons as well, such as increased stress and workload among teachers, dissatisfaction among students, and lower attendance [9].

It is crucial to ensure that online teaching and learning environments are inclusive for all students, and teachers play a very important role in ensuring inclusivity. Previous studies have shown that teachers who were more aware of students not having equal access to resources required to attend online classes such as internet, laptops and/or computers, and space at home, tended to do more to ensure that students were offered equal opportunity to learn [3,6,7,9]. Teachers in these studies demonstrated themselves willing to record videos (as compensation for those who faced difficulties in attending synchronous online teaching), offer private communication channels, and provide resources such as self-explanatory notes, PowerPoint materials, links to useful websites, and YouTube videos. These practices contributed to a more inclusive online teaching and learning environment. We argue that it is important to have these practices assessed so that the status of current practices and hence, areas for improvement, can be identified.

However, to the best of our knowledge, a commonly accepted instrument that can be used to assess practices among teachers with regard to providing inclusive online education has not hitherto been developed. Such an instrument is also essential as a standard tool that can be used to assess practices across schools and institutions, regionally, nationally, and internationally. The main objective of this study is, therefore, to develop an instrument serving this purpose and examine its reliability and validity.

### *1.1. Theoretical Frameworks*

When developing the instrument, we first reviewed relevant works about providing digitally accessible [15] and inclusive education [16], emergency remote education [17] and universal design for learning (UDL) guidelines [18]. As online education requires teachers to deliver education on digital platforms, it is crucial that they are digitally competent. One of the main challenges reported about emergency remote teaching has been teachers lacking necessary digital skills [17,19]. Two frameworks describing what digital competence for teachers signifies, i.e., the European Framework for the Digital Competence of Educators [20] and the United Nations Educational, Scientific and Cultural Organisation Information and Communications Technology (ICT) Competency Framework for Teachers [21], were adopted by Gilligan [15] in his work describing a framework for digital accessibility competencies for teachers. In addition to highlighting the importance of teachers receiving adequate training and guidance to be digitally competent, these frameworks underscore the importance of them being aware of students' digital competence so that they can design lessons based on that awareness. Gilligan [15] also noted the lack of UDL being extensively incorporated into the use of digital technologies in education.

Mahat [16] developed an instrument called Multimodal Attitudes toward Inclusive Education Scale (MATIES) that aims to assess teachers' attitudes toward inclusive education based on the theory of planned behaviour [22,23]. The instrument comprises three dimensions of attitudes: affective, cognitive, and behavioural. According to Mahat, the multidimensional attitudes toward behaviour, subjective norms, and perceived ease or difficulty of performing the behaviour can influence one's intention to make education inclusive. Although the developed statements in MATIES focus on students with disabilities and special needs, Mahat's work emphasised that the context of inclusive education is not limited to these students alone. It also encompasses the idea of having no students excluded due to other learning differences, such as those that might derive from students' sociodemographic backgrounds. A review on questionnaires assessing teachers' attitudes towards inclusive education reported that MATIES can be a helpful instrument for ex-

aming how teachers intend to adapt their classroom and teaching practices to achieve inclusiveness [24]. Both MacFarlane and Woolfson [25] and Mudhar, Ertesvåg [26] adopted MATIES as part of their self-developed instruments when investigating teachers' attitudes and behaviour towards students with special needs.

Previous studies have indicated that teaching digitally poses greater challenges for addressing diversity and/or inequality among students, as the teaching occurs remotely [3,19,27]. UDL can be an appropriate framework for helping teachers overcome this problem. UDL is a framework that utilises research findings about human learning to enhance and optimise teaching and learning for all individuals [18,28]. The guidelines highlight multiple means of engagement, representation, action, and expression, which can contribute to meeting diversity in a class.

### 1.2. The Instrument

Based on the above-mentioned theoretical frameworks, affective, behavioural, cognitive, competence, and awareness were listed as the five domains in our instrument. *Affective* refers to teachers' attitudes, *behavioural* refers to how they feel, think and act, and *cognitive* refers to their mental processes and resulting actions regarding the practices that make online teaching and learning environments more inclusive for students. The terms *competence* and *awareness* refer to teachers' proficiency and consciousness in providing an online teaching and learning environment that is inclusive, respectively.

We developed statements that would reflect teachers' practices based on relevant works that referred to our theoretical framework [15,16,18,20,21] and the identified domains accordingly. A Likert scale was used to score each statement (1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither agree or disagree, 5 = somewhat agree, 6 = agree, and 7 = strongly agree). In addition to the scale of 1 to 7, the option of n/a (not applicable) was offered. Table 1 lists the statements for each domain.

**Table 1.** Lists of statements for each domain.

Domain	Statements
Affective	A1: I have experienced students having difficulty communicating with me in the virtual classroom. A2: My students in the virtual classroom cannot keep up with the day-to-day curriculum. A3: My students are having difficulties understanding my teaching in the virtual classroom. A4: I face challenges adapting the virtual classroom to meet the individual needs of all students. A5: My students' participation in the virtual classroom is low compared with their participation in the physical classroom. A6: My students are willing to speak when they are in the virtual classroom.
Behavioural	B1: I am willing to encourage my students to participate in all activities in the virtual classroom. B2: I am willing to adapt the curriculum to meet the individual needs of all students in the virtual classroom. B3: I am willing to modify the virtual learning environment to adapt to the needs of my students. B4: I am willing to adapt my communication techniques to ensure that all students in the virtual classroom can participate in the learning process. B5: I am willing to adapt the assessment of individual students in the virtual classroom to achieve the learning objectives.
Cognitive	C1: I believe that students have a similar learning experience whether they learn in the virtual classroom or physical classroom. C2: I believe that all students can learn the regular curriculum in the virtual classroom. C3: I believe that the virtual classroom provides appropriate learning experiences to all students. C4: I believe that students should be taught in the physical classroom to obtain the best learning outcomes.
Competence	D1: I am able to use ICT tools and/or apps to provide quality education via the virtual classroom (such as Google classroom). D2: I have received the necessary training and assistance from my school to teach in the virtual classroom. D3: I attend courses to increase my knowledge of the use of ICT tools and/or apps. D4: My colleagues help me when I face challenges in using ICT tools and/or apps. D5: I explore available resources to equip myself to conduct the virtual classroom.
Awareness	E1: I have been informed by students regarding their difficulties in attending the virtual classroom. E2: I have been informed by parents regarding student difficulties in attending the virtual classroom. E3: I am aware that not all students have equal access to attend virtual classrooms. E4: My school has attempted to ensure that all students have equal access to attend virtual classrooms.

### 1.3. Hypothesis

Our hypothesis is that teachers who (1) have an emotional response to the objective that all students receive equal and quality education (*affective*), (2) conduct themselves in accordance with the aim of including all students (*behavioural*), and (3) can assess teaching situations based on understanding, experiences, and along the lines of good senses (*cognitive*) tend to have higher *competence* and *awareness* in providing inclusive online education to their students. To validate this hypothesis, it was necessary to undertake some assessments which include face, content and construct validity through expert, exploratory factor analysis (EFA) and to further them through correlational testing.

## 2. Materials and Methods

### 2.1. Pre-Data Collection

After developing the statements in the instrument, we distributed the instrument to an English-language expert with a PhD in Teaching English to Speakers of Other Languages (TESOL) and three content experts from higher education institutions to assess its face, content and construct validity. Face validity pertains to how clear and relevant the instrument statements appear, and it can be enhanced through a language expert review and a pilot study phase involving participant feedback [29]. Content and construct validity involve ensuring that the instrument statements align with the underlying domains being measured. This correspondence can be accomplished by engaging content experts, such as researchers in the respective field [29]. To further ensure the instrument's reliability and validity, a pilot study was conducted with non-participating teachers. This pilot study enabled researchers to further evaluate the face validity and construct validity of the instrument. The data gathered during this phase were subsequently subjected to rigorous statistical measures (i.e., Cronbach's alpha) to evaluate the internal consistency and reliability of the instrument.

### 2.2. Sample of the Study

To gain a comprehensive understanding of the five domains we identified in our instrument, we included teachers from primary schools to higher education institutions in Malaysia and utilised a convenience sampling strategy to reach potential respondents. By including teachers from all educational levels and demographic backgrounds, we hoped to gain valuable and broader insights concerning factors influencing their practices in delivering inclusive online teaching. The teachers included in this study are from Malaysia, as one of our authors is working in the Faculty of Education in a university in Malaysia. By focusing on these teachers, we aimed to collect data in a way that would result in highly reliable findings, given the author's background in the pedagogical field in Malaysia. These teachers cover various subjects, including languages, social sciences, humanities, arts, commerce, science, and mathematics, and play a vital role in delivering online education. Table 2 shows the demographic data of respondents who participated in this study.

**Table 2.** Respondents' demographic data.

Variable	Total Sample (n = 505)
<i>Gender</i>	
Male	179
Female	322
Prefer not to say	4
<i>Age</i>	
Below 30	55
31–40	225
41–50	150
51–60	72
Above 60	3

**Table 2.** *Cont.*

Variable	Total Sample ( <i>n</i> = 505)
Years of Teaching	
Less than 10	168
11–20	201
21–30	102
31–40	31
More than 40	3
School Location	
Urban	298
Suburban	151
Rural	56
Highest Academic Qualification	
Certificate/Diploma	54
Degree	289
Master's or higher	161
Prefer not to say	1
Main Subject Thought	
Science	189
Mathematics	71
Language	105
Other (art, social science, humanities, etc.)	140

### 2.3. Data Collection

Due to the COVID-19 pandemic and the Malaysian government's introduction of the Movement Control Order, we formulated a Google Forms questionnaire as the data collection medium instead of a traditional paper and pencil questionnaire. This data collection method not only reduced the risk of physical contact between respondents and researchers but also allowed reaching a larger geographical area and more diverse demographic backgrounds. The first data collection was conducted from 8 March 2021 to 29 April 2022, in conjunction with a study focusing on secondary science teachers delivering inclusive education. The second data collection was conducted from 21 October 2021 to 28 April 2022, and was open to all teachers from all educational levels. This approach aimed to capture a wider spectrum of practices among all types of teachers.

To maximise accessibility, we used social media platforms to distribute the questionnaire link to all possible respondents and encouraged further sharing. In addition, we sought the support of the top management of some schools and educational institutions to facilitate the distribution of the questionnaires to their teachers. Upon completion of the data collection process, a total of 505 individuals responded to the questionnaire. Subsequently, we performed a data screening and data cleaning process to eliminate any redundant or invalid data. This process aimed to ensure that the data analysis phase would be conducted using accurate and valid data, resulting in reliable findings that validate the developed instrument.

### 2.4. Data Analysis

The data collected from 505 respondents were analysed using IBM SPSS Statistics (Version 26). An EFA was conducted to identify underlying factors within a set of observed variables, ensuring that the developed statements fell under the previously determined domains [30]. An EFA provides insights into the interrelationships among variables and serves as a basis for constructing a more concise measurement model. After completing the EFA, the data underwent correlation analysis. The authors' choice to perform a correlation analysis after the EFA served the purpose of hypothesis generation and context establishment. This approach aligns with an exploratory perspective, utilizing initial correlations to unveil patterns and connections among variables. Identifying correlations played a role in informing subsequent factor analysis, guiding the interpretation of derived factors. This method integrates correlations as a preliminary guide. By utilizing correlations for hypoth-

esis generation, the authors enhanced the meaningfulness of their EFA outcomes. This strategic synergy between correlation analysis and EFA reflects a comprehensive research approach, strengthening the study's credibility by constructing a better understanding of the dataset.

Since the data exhibited a normal distribution, a parametric testing approach was used. To examine the correlations between the research variables, a Pearson's correlation test was performed. The study included five variables associated with providing inclusive education during remote teaching: affective, behavioural, cognitive, competence, and awareness. To evaluate the strength of the relationships among these variables, the criteria proposed by Zou and Tuncali [31] were adopted. A correlation value above 0.80 indicated a high strength of relationship, and a value above 0.50 and less than 0.80 indicated a moderate strength, while values below 0.50 indicated a weak correlation.

### 3. Results

#### 3.1. Face, Content, and Construct Validity

The English language expert with a PhD in TESOL first ensured appropriate language usage in the instrument after reviewing the statements. The review encompassed areas such as grammar, vocabulary usage, and the clarity of the statements within the instrument. Amendments were made to enhance the readability and clarity of the statements. The final version of the instrument was pilot tested with 46 non-participating teachers to gather feedback on readability and comprehensibility. The feedback from participants was then used to revise and refine the instrument statements, addressing any ambiguities or issues identified during the pilot testing phase. Three content experts from the university then reviewed the instrument for its coverage, appropriateness, and representativeness. Their evaluation ensured that the statements aligned with the intended construct being measured. The feedback from the experts was invaluable in identifying any potential gaps, redundancies, or shortcomings in the instrument. The necessary revisions were undertaken based on the constructive feedback provided by the experts.

#### 3.2. Pilot Study

Table 3 displays the Cronbach's alpha values for each domain, as well as for the overall questionnaire completed by the 46 non-participating teachers. The obtained alpha values ranged from 0.70 to 0.90, indicating that the questionnaire was considered reliable and that the statements were deemed suitable for use [32].

**Table 3.** The Cronbach's alpha value for each domain and overall questionnaire.

Domain	Cronbach's Alpha Value
Affective	0.76
Behavioural	0.72
Cognitive	0.77
Competence	0.84
Awareness	0.81
Overall	0.76

#### 3.3. Exploratory Factor Analysis (EFA)

A total of 505 teachers in Malaysia completed the questionnaire. In order to examine the underlying structure of the questionnaire administered to this sample, an EFA was conducted using all 24 statements in the instrument. The analysis involved applying oblique rotation (oblimin) to the factors. The suitability of the data for factor analysis was assessed using the Kaiser–Meyer–Olkin measure, which yielded a value of 0.90, indicating that the sample was adequate for the analysis. Bartlett's test of sphericity was also performed to assess the correlation structure of the data. The results of the test,  $\chi^2(180) = 6062.43, p < 0.001$ , indicated

that the correlation structure was suitable for conducting factor analyses. This suggested that the domains in the instrument were sufficiently correlated to explore their underlying factors.

Using the maximum likelihood factor analysis method, a cut-off point of 0.40 and the Kaiser's criterion of eigenvalues greater than 1 (as recommended by Field [33] and Stevens [34]), a five-factor solution emerged as the best fit for the data. These five factors accounted for a cumulative variance of 63.33%, indicating that they explained a significant portion of the variability in the responses to the questionnaire.

Table 4 shows the results of the EFA. The instrument's structure can be categorised into five correlated factors, as indicated by the interrelationships among the statements. These factors represent distinct domains of measurement within the instrument. Notably, the eigenvalues of the first five factors exceeded the threshold value of 1.00. Eigenvalues indicate the amount of variance explained by each factor. By having eigenvalues greater than 1.00, these five factors accounted for a substantial proportion of the total variance in the data. The results of the analysis suggest that the instrument's statements effectively captured and measured five correlated domains. This finding reinforces the validity and coherence of the instrument, as the identified domains correspond to the theoretical framework and constructs upon which it was built. Overall, the EFA provides empirical evidence supporting the instrument's structure, indicating that it effectively captures and measures the intended domains of interest.

**Table 4.** Exploratory factor analysis (EFA) of the statements.

Statement	Domain	Factor				
		1	2	3	4	5
A2	Affective	0.77				
A3		0.68				
A5		0.65				
A4		0.61				
A1		0.58				
A6		0.55				
B3	Behavioural		0.81			
B4			0.74			
B5			0.68			
B1			0.66			
B2			0.57			
C2	Cognitive			0.80		
C3				0.77		
C1				0.63		
C4				0.59		
D1	Competence				0.83	
D3					0.76	
D4					0.71	
D5					0.65	
D2					0.59	
E1	Awareness					0.70
E3						0.68
E2						0.65
E4						0.60

### 3.4. Correlational Testing

In this section, we present the results obtained from the analysis of correlations between the domains of the questionnaire. The statements in the questionnaire scored with a Likert scale were subjected to inferential statistical analysis to evaluate the teachers' perspectives on various variables associated with online teaching. By applying Pearson

correlation, the calculation of correlations among the five variables revealed positive and statistically significant relationships, as illustrated in Figure 1.

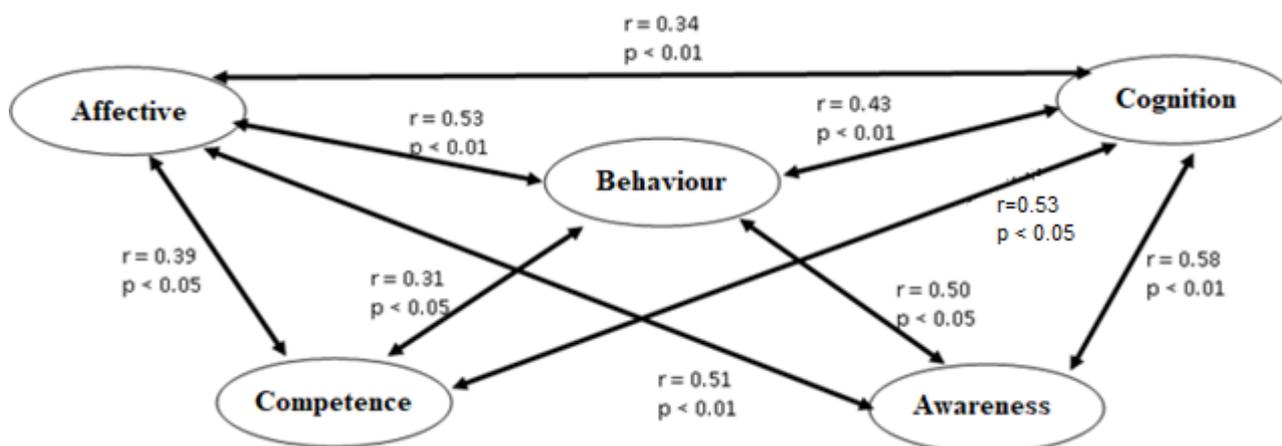


Figure 1. Correlation between the domains of the questionnaire.

The first variable (i.e., teachers’ competence in providing inclusive online teaching) shows significant correlations with variables of affective ( $r = 0.39$ ,  $p = 0.03$ ), behavioural ( $r = 0.31$ ,  $p = 0.04$ ), and cognitive ( $r = 0.53$ ,  $p = 0.02$ ) with regards to providing inclusive education digitally. Although these variables exhibit statistical significance, the strength of the correlations was relatively weak, as the r values were below 0.5.

Upon examining the second variable (i.e., awareness in providing inclusive online teaching), it was observed that the teachers’ awareness exhibited a statistically significant moderate correlation with their competence ( $r = 0.41$ ,  $p = 0.0001$ ). Similarly, three other variables, namely, affective, behavioural, and cognitive, were also found to be significantly correlated with teachers’ awareness in delivering inclusive online teaching to students, with moderate correlation strengths indicated by the r values ( $r = 0.51$ ,  $p = 0.0001$ ), ( $r = 0.50$ ,  $p = 0.0001$ ), and ( $r = 0.58$ ,  $p = 0.0001$ ), respectively. Table 5 summarises the correlation value for each construct.

Table 5. Pearson correlation among the domains.

	Affective	Behavioural	Cognitive	Competence	Awareness
Affective					
Behavioural	0.53 **				
Cognitive	0.34 **	0.42 **			
Competence	0.39 *	0.31 *	0.53 *		
Awareness	0.51 **	0.50 **	0.58 **	0.41 **	

\* indicates that  $p < 0.05$ ; \*\* indicates that  $p < 0.01$ .

#### 4. Discussion

The present study was designed to develop and validate an instrument that can be used to assess teachers’ practices in delivering inclusive online education. The instrument was first developed based on relevant studies on online teaching [15,17], inclusive education [16], and UDL guidelines [35,36], and five domains were identified to develop statements that comprise the instrument.

##### 4.1. Testing of Theoretical Frameworks Adopted in the Instrument

In Mahat’s [16] work, the theory of planned behaviour by Ajzen [23] was referred to when designing MATIES. In this study, we adopted some items from MATIES as well as its three main dimensions of attitudes: affective, behavioural and cognitive. A medium positive correlation between the affective and cognitive variables, and high positive correlations

between the affective and behavioural and the cognitive and behavioural variables were found in Mahat's work. Our findings support Mahat's work, demonstrating correlations between these three variables. We further discuss the correlations between all our domains in the next section.

As the theory of planned behaviour expresses essential individual values, it has been used in research studies in inclusive education [37]. A scoping review synthesizing studies on inclusive education using the theory of planned behaviour concluded that the link between the predictors and actual behaviours was unclear [37]. We argue that by incorporating the domains of competence and awareness with the domains of the three attitudes suggested by Mahat [16], it is possible to assess both the predictors and actual behaviours with increased depth. Through the findings, we managed to see the link between predictors and actual behaviours better. In this study, the cognitive, affective, and awareness domains reflect more on predictors, while the behavioural and competence domains focus more on actual actions.

Previous studies have shown success in incorporating UDL guidelines to ensure the education delivered is inclusive [28]. Espada-Chavarria and González-Montesino's [28] study investigated whether teaching strategies in line with UDL could contribute to learner motivation. Their results showed that UDL guidelines highlighting multiple means of engagement, representation, action, and expression were correctly implemented in their teaching strategies and could contribute to students feeling included and welcomed in their learning environment, and hence more motivated as well. Although this study only focused on students enrolled in a degree program for Spanish sign language and deaf communities, which is studied by a large number of deaf students, the sample size is considered very diverse since it considers gender, age, year of study, academic qualifications (some students have sign language as a mother tongue, while others have no prior knowledge of Spanish sign language), abilities, disabilities (such as attention deficit hyperactivity disorder and dyslexia), and varied needs when attending classes.

#### 4.2. Correlations between Domains

The findings demonstrate correlations between all five domains, which provide further support for the hypothesis that teachers who (1) have an emotional response to the objective that all students receive equal and quality education (*affective*), (2) conduct themselves in accordance with the aim of including all students (*behaviour*), and (3) can assess teaching situations based on understanding, experiences, and along the lines of good senses (*cognitive*) tend to have higher *competence* and *awareness* in providing an inclusive online education to their students.

**The affective domain.** Previous studies investigating online teaching have revealed that teachers who possessed a higher level of affection were more likely to be aware of the unique challenges faced by students in an online teaching and learning environment [6–8,19,38–40]. Some teachers in these studies were willing to learn more so that they could make necessary changes to adapt to the diversity among their students and address inequality by providing, for example, an asynchronous mode of teaching and learning and various digital contents that helped students to understand better, and so forth. By attuning themselves to their students' emotions, teachers can identify individual needs, concerns, and barriers to learning on digital platforms. This awareness can enable them to proactively address these issues and implement strategies that promote inclusivity. Our findings support these previous studies by demonstrating correlations between affective, awareness and competence domains.

**The behavioural domain.** In this study, the behavioural domain refers to how teachers feel, think, and act. It focuses more on actual action, as compared with predictors, which is our attempt to address the knowledge gap of the significant links between predictors and actual action [37] when adopting Ajzen's [23] theory of planned behaviour and Mahat's [16] MATIES in our work. Our findings demonstrate a stronger correlation between the behavioural and awareness domains than between the behavioural and competence domains. This indicates that when teachers in our study became aware that some students were

excluded from receiving quality education when teaching was switched to online platforms (awareness—predictor), they attempted to compensate for that exclusion (behavioural—actual action). However, they might not have received sufficient training to utilise digital tools to achieve this goal (competence—actual action). Studies have shown that many teachers struggled to adopt online teaching when emergency remote teaching occurred as they were not competent and familiar with that kind of teaching [9,17,41,42]. Despite not being competent, because they had an awareness of the importance of including all students and the intention to do so, just as they had in their traditional physical classrooms, they were willing to do more, from learning to produce educational videos and producing them, to providing alternative ways for students to reach them outside typical schooling hours.

**The cognitive domain.** One of the highest correlations found in this study was between the domains of cognition and awareness, with an  $r$  value of 0.58 and  $p < 0.01$ . Mahat [16] provided evidence that the cognitive domain plays a crucial role in enhancing teachers' awareness of student diversity, which increases their ability to create an inclusive online teaching and learning environment. Previous studies have demonstrated that a strong cognitive foundation enables teachers to comprehend the distinctive needs and challenges that students encounter in an online setting [43,44]. Teachers with extensive knowledge and understanding can identify and address the barriers to learning faced by students from diverse backgrounds. Teachers' expertise in instructional design and technology integration can empower them to implement strategies that cater to various learning styles on digital platforms and ensure equitable access to online education for all students. By being mindful of their students' challenges and requirements, teachers can proactively design instructional approaches that accommodate individual differences and foster equal learning opportunities.

In this study, correlation between the competence and cognitive domains provides some evidence demonstrating the high correlation coefficients, with an  $r$  value of 0.53. Our findings support the findings from a study [45] that also demonstrated a correlation between these domains. One possible explanation for this is that teachers' cognitive abilities, such as critical thinking and problem-solving, contribute to effective planning and delivering teaching that meets the diverse needs of their students. These cognitive abilities make them better equipped to identify and address barriers to online teaching and provide necessary support to students who are struggling with online learning. Teachers with a solid understanding of inclusive pedagogical approaches can effectively utilise various digital tools, instructional resources, and communication channels to create an inclusive online teaching environment. By leveraging their cognitive skills, teachers can tailor instruction, provide scaffolding, and support the learning process of every student, including those with limited resources and/or disabilities that may hinder their ability to access quality, inclusive online education.

## 5. Conclusions

This study set out to develop and validate an instrument that can assess teachers' practice in providing inclusive online education. The developed instrument consists of five domains: affective, behavioural, cognitive, competence, and awareness. Statements were formulated to reflect on practices for each domain, and a Likert scale from 1 to 7 was used to score each statement. Based on the data analysis of 505 respondents, it is evident that the identified domains are correlated with one another, although some correlations are less significant. The presence of inclusive affective, behavioural and cognitive abilities enhances teachers' awareness toward student diversity and equips them with the competence and necessary skills to create an inclusive online teaching and learning environment. By recognizing the importance of these domains, educational institutions can provide teachers with the necessary training and resources.

This study has its limitations. First, the validation of the instrument was only conducted among experts and teachers in Malaysia. Teaching practices and culture vary from

country to country. Therefore, not all the statements can be applicable to teachers from other countries. Second, as the questionnaire invited teachers from different educational levels to answer, the practices considered when developing this instrument were general. The extent of using ICT in teaching and learning and the adoption of online educational platforms can be very different when, for instance comparing education practices at primary schools and higher education institutions. In addition, while inclusive education very often refers to including students with special needs, such as students with disabilities and having learning differences (language barriers, culture differences, etc.), this study did not particularly focus on any of them. Our approach emphasised the inequality that was caused by the transition from traditional face-to-face education to online education. However, we could have included questions asking about the types of students the respondents had (i.e., if their students had a disability or were from a minority group). This might have provided us with more insights and richer data related to the types of students and teachers' practices involved in inclusive online education.

Therefore, future studies could include further validation in the context of different countries and at different educational levels. Amendments might be required to make the instrument more context specific. Additional questions asking about the experiences of teaching and students' sociodemographic background could be included in future studies when studying the associations between teaching experience and their practices for ensuring that online education is inclusive.

The instrument has implications for policymakers and researchers, as it provides a useful framework for understanding the role of these domains in the development of teaching practices for making online teaching more inclusive. By further exploring these domains, policymakers and researchers can help inform the development of policies and practices that promote inclusive online education and, hence, support the growth and success of all students to the greatest extent possible. By enhancing their affective, behavioural and cognitive attitudes, teachers can become more aware of students' special needs in using ICT and learning on digital platforms. In addition to providing teacher training on the use of digital technologies in teaching to enhance their competencies, digital accessibility should be emphasised as part of teachers' digital literacy. At the same time, their awareness of students' diversity and needs should be raised via pedagogical training and/or professional development programs.

In addition to identifying the domains of affective, behavioural, cognitive, competence, and awareness in this instrument and the associations between them, our study can hopefully inspire researchers within inclusive education to further investigate these domains and how both the instrument and the domains can contribute to better inclusive education research. Lastly, we also hope that this study can raise awareness among teachers, parents, policymakers, and researchers concerning other student groups who might be excluded from online education as digitalisation takes place.

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