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Pre-service teachers' attitudes towards integrating technology in inclusive education

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ABSTRACT

Pre-service teachers' attitudes influence their integration of technology into their inclusive practices, yet there is still a lack of research in academia assessing their level of attitudes. This study aimed to design an instrument to measure and investigate pre-service teachers' attitudes toward integrating technology in inclusive education in Malaysia. One hundred and seventy-nine teacher trainees from a public university in Malaysia participated in this study. Two dimensions were identified through exploratory factor analysis, supported by a strong model fit in confirmatory factor analysis. Convergent validity was also satisfactory. Furthermore, all reliability coefficients exceeded 0.8. The outstanding reliability and validity of the instrument indicated its suitability for evaluating the attitudes of pre-service teachers. The results of the assessment showed that teachers' attitudes were positive. Pre-service teacher training should be actively strengthened to promote the effective integration of technology in inclusive classroom.

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1. INTRODUCTION

Digital technologies have enormously affected the world and are gaining prevalence in education. Future educators are anticipated to be able to design creative pedagogical practices by employing technology [1]. One of the aims of inclusive education (IE) is to integrate students with special education needs into the mainstream classroom [2], teachers need to be learner-centered and proactive in adapting the curriculum to accommodate all learners [3]. The literature on digital technology and IE highlights that digital technology can facilitate inclusive teaching practices for teachers and learn for students [4]. The importance of developing the digital skills of PST has been mentioned by academics [5], [6]. Although incorporating technology into IE can help create an inclusive classroom, technology alone is insufficient for a thriving IE environment.

One factor affecting teachers' effectiveness in integrating technology into their teaching practice is their attitude towards IE [7]. To ensure the future of inclusion in their classrooms, pre-service teachers (PST) require the skills and knowledge to create inclusive environments and a cheerful attitude toward their work [8], [9]. In addition, studies of attitudes toward IE have revealed that attitudes can start to develop among PST [8]. The positive attitude of PST towards integrating technology in IE is also of interest as a preparation stage for their becoming permanent teachers. It is necessary to assess and determine PST' current level of attitudes so that effective measures can be taken to help them develop positive attitudes for better teaching practice. However, in the existing literature, there are few studies on the knowledge, skills, and attitudes of PST, and there is still a lack of experience and a basis for judging the degree of their attitudes [10]. Therefore, efforts must be made to design a

dependable and accurate tool for assessing the attitudes of PST regarding the utilization of technology in IE settings. The research objectives are: i) to design and validate a tool for evaluating PST' attitudes regarding the incorporation of technology in IE and ii) to assess PST' attitudes towards integrating technology in IE.

2. THEORETICAL FOUNDATION

This study is guided by the technology acceptance model (TAM) and the theory of planned behavior (TPB). The TAM was one of the earliest frameworks to incorporate psychological variables influencing the adoption of technology and specifies the connections between attitude toward technology and behavioral intention of employing technology [11]. The TAM has been used to investigate the significance of psychological variables in acceptance of technology, proposing that users' attitudes toward technology are correlated with their level of adoption of its use [12]. While the TAM provides a theoretical basis for PST to incorporate technology in their future inclusive classrooms, the TAM's emphasis on attitudes influencing users' behaviors in using technology supports the idea that PST' incorporation of technology in their inclusive practices correlates with their level of attitudes.

The TAM is based on the TPB which is a practical framework for rationalizing the correlation between attitudes and actions [13]. In simpler terms, behavior is influenced by the intention to act, attitudes, social norms, and perceived control over the behavior [14]. Attitudes consist of cognitive, emotional, and behavioral dimensions [15]. The formation of the research hypothesis of this study, that PST' behavior (incorporating technology in IE) is influenced by their attitudes, is consistent with the claims of the TPB. Furthermore, attitudes are not fixed at birth, and attitudes can be acquired later [16]. Therefore, PST should pay attention to the impact of attitudes on their teaching practice, and should also receive training to shape their positive attitudes towards integrating technology in IE. TAM and TPB are important for the formation of positive attitudes, as well as in the context of IE teachers, and also there have been some studies [13], [14] like this one that use them as a theoretical basis for studying IE.

3. METHOD

The measurement scale was designed based on the computer technology integration survey [17]. The participants were composed of PST involved in IE from a public teacher training school in Malaysia. A total of 179 participants participated in this study using a random sampling method, and There are 103 datasets left after data cleaning. The researcher invited experts in the field to determine the instrument' s content validity. Once the initial questionnaire was designed, the construct validity of the scale was evaluated by conducting both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Furthermore, the instrument's convergent validity was assessed through the computation of average variance extracted (AVE) and composite reliability (CR). In addition, Cronbach's internal consistency assessment was calculated to test the instrument's reliability. After testing the reliability and validity of the initial tool, the level of participants' attitudes was assessed.

Informed consent of the participants was obtained before participation in the survey. The objectives of the study, the anonymity of participants' personal information and the confidentiality of their responses, and participants' freedom to opt out at any time during the survey, was explained. As this survey was a self-assessment by the participants, participants had an option to freely choose whether to participate in the survey at the beginning, after the explanation.

4. RESULTS

The initial instrument is an 11-item scale adapted from the computer technology integration survey [17]. Four experts comprising of two experts in IE and two in instructional technology, were invited to assess the content validity. This was in line with the requirement for content validity as a minimum of three experts was sufficient as suggested by Lynn [18]. The calculation method adopts Davis [19] formula, eleven items had a content validity index greater than 0.80, indicating no issues with the instrument's content validity. An 11-item 5-point Likert scale (1 strongly disagree to 5 strongly agree) was used. Later, researchers utilized the Cronbach Alpha analysis to ascertain the instrument's reliability. Table 1 presented the results of the Kaiser-Meyer-Olkin (KMO), Bartlett's and reliability tests. The Cronbach Alpha value was 0.912, which indicated that the instrument could be used for the next step of factor analysis. The KMO value was 0.882 (more than 0.6), which implied that the sample size was adequate [20]. The P value was 0.000 which suggested that the factor analysis might be beneficial for performing on the data set [20]. The results after the first rotation are shown in Table 1. It is not difficult to see that no items need to be deleted. Of the two factors extracted, item 1, item 2, item 3, item 10, and item 11 belong to one factor, and the remaining items belong to the other factor. And their combined contribution to the overall variance is calculated to be 70.925%, which was higher than 50% [21]. Based on the fact that the attitudinal component elements contain three dimensions: cognitive, affective, and behavior [13], [15]. As in [21], the cognitive aspect encompasses the beliefs, thoughts, and characteristics, so this study named factor 2 as cognitive and factor 1 as behavior.

The validity can be determined by interpreting the goodness of fit that has been established [22]. According to Shackman [23], covariance-based structural equation modeling assumes that the data follows a normal distribution. Normality can be evaluated by examining skewness and kurtosis, and a skewness of -2 to +2 and a kurtosis of -7 to +7 are acceptable [24]. All the items had a skewness of -0.809 to -0.038 and a kurtosis of -0.879 to 0.423 and them all fell within the acceptable range, as shows in Table 2. These values indicated that the data was normally distributed. Improving the model indices could be done by the following measures: firstly, to remove items with low factor loadings; secondly, correlations of error items could be constructed based on the modification indices [25]. This study successively removed items C1 and B1, and then established the relationship between error items (e10 and e11) based on their modification indices (MI=46.5). The results of this study after CFA were illustrated in Figure 1, the following values for these indicators: ChiSq/df=1.557(<5) [26], goodness of fit index=0.915(>0.9) [27], comparative fit index=0.971(>0.9) [28], root mean square error of approximation=0.074(<0.1) [29], which demonstrated an acceptable fit to the 9-factor instrument. The factor loadings of all nine items in the instrument were both above 0.5, as shown in Table 3, which met the requirements.

Table 1. The KMO, Bartlett's, reliability test, and the rotated factor matrix

Cronbach Alpha value	P value	KMO value	Items	The rotated factor matrix Component 1	2
0.912	0.000	0.882	A1		0.768
			A2		0.889
			A3		0.794
			A4	0.757	
			A5	0.787	
			A6	0.751	
			A7	0.830	
			A8	0.702	
			A9	0.877	
			A10		0.741
			A11		0.660

Table 2. Descriptive statistics for all items

Items	Mean	Std. Deviation	Skewness	Kurtosis
C1	4.45	0.668	-0.809	-0.446
C2	4.35	0.696	-0.777	0.139
C3	4.33	0.663	-0.483	-0.714
C4	4.20	0.759	-0.636	-0.115
C5	4.24	0.693	-0.545	-0.067
B1	4.18	0.682	-0.438	-0.047
B2	4.17	0.663	-0.208	-0.728
B3	4.16	0.638	-0.375	0.423
B4	4.03	0.692	-0.038	-0.879
B5	3.99	0.773	-0.372	-0.290
B6	4.03	0.692	-0.400	0.269

Table 3. The factor loadings, AVE, and CR

Items	Factor loadings	AVE	CR
C2	0.673	0.572	0.842
C3	0.760		
C4	0.808		
C5	0.777		
B2	0.583	0.475	0.814
B3	0.895		
B4	0.755		
B5	0.574		
B6	0.580		

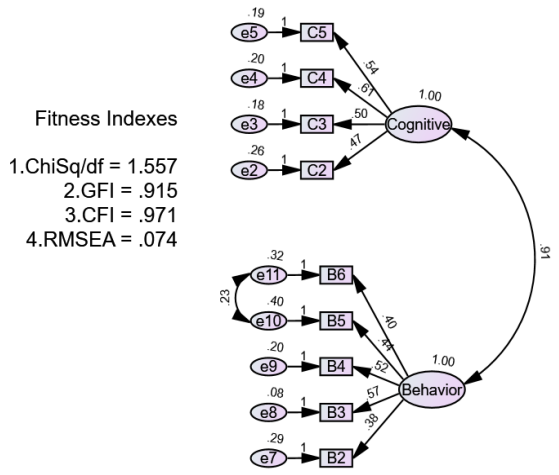

Figure 1. Results of the confirmatory factor analysis

Convergent validity can be determined when the AVE exceeds 0.5, and the CR is higher than 0.7 [30]. The cognitive AVE and CR values are 0.572 and 0.842, respectively; the behavior's AVE value is 0.475, and the CR value is 0.814 (see Table 3). While the AVE for behavior did not meet the recommended threshold of 0.50, it is worth mentioning that, according to Fornell and Larcker [31], a slightly lower AVE can still be considered acceptable if the CR of these factors exceeds 0.7. The reliability values for the individual components were 0.834, and 0.840, respectively; for a total instrument reliability of 0.895. These excellent reliability values indicate that the instrument is reliable.

The level of PST' attitudes regarding technology integration in IE is mainly represented by the means and standard deviations in the statistical analysis. The range of the mean score on the Likert scale: 1.0-2.4 for a negative attitude, 2.5-3.4 for a neutral attitude, and 3.5-5.0 for a positive attitude [32]. The mean values for all items were higher than 3.5 (mean=4.17; standard deviation=0.51), therefore, the attitudes of future educators about the incorporation of technology in inclusive classrooms are positive.

5. DISCUSSION

The findings indicated that the 9-item, two-factor scale could be used to assess attitudes towards the utilization of technology in IE. Although during the validation of the scale, items 1 and 4 were deleted, it is theoretically justified. Item 1 (I advocate for equitable access to digital learning opportunities for ALL students) was meant to reflect IE and not technology integration practices and was include in item 2 (I embrace diverse students including to the special needs students) and item 3 (I understand digital capabilities well enough to maximize them in the inclusive classroom). Further, the meaning of item 4 (I use digital technology to inspire special needs students into mainstream classrooms) is too general and has been included in other items.

The reviewed research demonstrated that there was a variety of conceptualizations regarding teachers' attitudes toward technology integration among researchers, which has led to the creation of multiple constructs that researchers utilized in developing attitude scales [33]. This study also showed the multidimensionality of the attitude instrument. Not all scales contain three dimensions, and some have only one or two [33]. The scale in this study does not include the affective dimension, which has been included in the cognitive and behavioral dimensions by the meaning of the affective dimension and the needs of the research objectives.

Huda *et al.* [7] demonstrated that prospective teachers also exhibited favorable attitudes toward integrating of technology and expressed a keen interest in furthering their understanding of it. Atabek and Burak [34] also hold the view that PST harbor positive attitudes regarding incorporating technology in the classroom and that technology can serve as a means to address deficiencies in music instruction. Omar *et al.* [35] also noted that Malaysian PST had positive attitudes towards online teaching platforms during the COVID-19 pandemic. Digital technology can help teachers to modify classroom materials to meet the characteristics of their students [36], PST involved in IE need to incorporate technology in their future classroom practice. At the same time, teachers' attitudes affect their inclusive practices [37]. Hence, PST in IE should be positive about integrating of technology into the inclusive classroom. The results of this study showed that PST in IE had positive attitudes towards technology integration, which was consistent with the results of some of the studies mentioned above. Malaysian PST were responsive to educational trends and were willing to improve IE through technology, and that future educational development should continue to improve their digital competence.

6. CONCLUSION

The instrument designed for this study was tested for reliability and validity, the results showed that this instrument, divided into two dimensions and containing nine items, is valid and reliable. And the results displayed that Malaysian PST had positive attitudes towards the integration of technology into IE, which may also imply that teachers involved in IE may make greater use of technology in their teaching practices in the future. Therefore, initial instruction for PST ought to incorporate digital technology into their classroom operations corresponding to IE, and the education system should provide appropriate training support so that the role of technology in IE can be fully released.

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