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Special Education Teachers' Commitment Towards Digital Gamified Learning: An Exploratory Factor Analysis Procedure on Educational Technology

(Komitmen Guru Pendidikan Khas dalam Pengajaran Berasaskan Permainan Digital: Prosedur Analisis Faktor Penerokaan Mengenai Teknologi Pendidikan)

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ABSTRACT

Teacher's commitment will affect their students and school education's quality. This study intended to develop an instrument to measure special education teachers' commitment towards digital gamified learning. A cross-sectional research design was conducted. A questionnaire with a 10-point Likert scale was used to collect data randomly from 110 teachers who teach students with learning disabilities in Malaysian public schools. In pre-test, experts check and validate the items through content validity, face validity and criterion validity. Exploratory Factor Analysis (EFA) was performed using IBM-SPSS-AMOS version 24.0 for all the adapted items. The sampling adequacy for Kaiser-Meyer-Olkin shows .908, and Bartlett's Test shows high significance with .000. The Cronbach's Alpha for all items shows high internal reliability with a threshold value of .972. Factor loadings between item and factor ranged from .924 to .966, which indicates a high correlation coefficient. 5 items in measuring the construct explain 90.03% of total variances. This study contributes a validated and reliable instrument for measuring the special education teachers' commitment towards gamified learning. Besides that, commitment proved to be an important construct that should be considered by future scholars and school administrators when developing a framework, model or intervention on integrating educational technology.

Key Words: Special education, Teachers' commitment, Digital gamified learning, Exploratory Factor Analysis, Educational technology

ABSTRAK

Komitmen guru membawa kesan kepada murid dan kualiti pendidikan di sekolah. Kajian ini bertujuan membangunkan satu instrumen yang mengukur komitmen guru pendidikan khas dalam Pengajaran berasaskan Permainan Digital. Reka bentuk kajian keratan rentas telah dijalankan. Soal selidik dalam skala Likert 10-mata digunakan untuk mengumpul data secara rawak daripada 110 guru yang mengajar murid masalah pembelajaran di sekolah awam Malaysia. Dalam ujian pra, para pakar menyemak dan mengesahkan item melalui kesahan kandungan, kesahan muka dan kesahan kriteria. Analisis Faktor Penerokaan (EFA) menggunakan IBM-SPSS-AMOS versi 24.0 dilakukan ke atas item-item yang diadapatasi. Sampel kajian adalah mencukupi dengan keputusan Kaiser-Meyer-Olkin menunjukkan .908 dan Ujian Bartlett menunjukkan kesignifikan yang tinggi .000. Cronbach Alfa menunjukkan semua item mempunyai kebolehpercayaan dalaman yang tinggi dengan nilai .972. Pemuatan faktor antara item dan konstruk mempunyai nilai julat .924 hingga .966 yang bermaksud pekali korelasi tinggi. Konstruk yang diukur melalui 5 item boleh menjelaskan 90.03% daripada jumlah varians. Kajian ini memberi sumbangan dengan menghasilkan satu instrumen yang mempunyai kesahan dan kebolehpercayaan untuk mengukur komitmen guru pendidikan khas terhadap Pengajaran berasaskan Permainan Digital. Selain itu, komitmen terbukti sebagai konstruk penting yang harus dipertimbangkan oleh bakal penyelidik dan pentadbir sekolah semasa membangunkan kerangka, model atau intervensi dalam mengintegrasikan teknologi pendidikan.

Key Words: Pendidikan khas, Komitmen guru, Pengajaran berasaskan Permainan Digital, Analisis Faktor Penerokaan, Teknologi pendidikan

INTRODUCTION

Integration of digital technology into the education system shift presents opportunities for innovative approaches with the use of games to enhance motivation and engagement in fostering positive emotion toward learning (López-Neira et al. 2020). However, technology is less integrated into teaching and learning due to the obstacles in infrastructure and facilities, and the most essential factor is due to teacher who are less skilled in adapting the use of technology in the teaching (Faisal & Adnan 2021). Students have different learning styles, and today they are more likely to assess information from the Internet (Norok & Khairuddin 2022). Conventional approach is unable to suit all the student's need nowadays (Sutherland et al. 2024). Students easily get distract and lose interest in learning if the lesson is boring and meaningless (Dai et al. 2024; Halim et al. 2020).

Every student is unique. They have different interests, and it is a challenge for the teachers to make all students intrigued and stimulated by the lesson (Tomar & Sharma 2022). To foster better education, teachers should leverage technology while incorporating their previous knowledge in teaching. Producing a skilled and innovative generation is possible through a quality educational environment provided by competent teachers (Derbala & Yasin 2022; Tahar et al. 2023). A top-notch education system and policy give no meaning if teachers are not committed to their work.

Studies have shown that special educators have an elevated risk of work fatigue and burnout if compared to normal stream teacher (Antoniou et al. 2024; Babaei et al. 2020; Saloviita & Pakarinen 2021). Special educators need to face with student's behavioural problems, like aggressive, disturbing attitudes, emotional problems, social skills and adaptation skills (Khalil et al. 2020). In special needs settings, gamified learning sparks student interest in the lesson, enhances their problem-solving skills, improves learning confidence while raises their social and communication skills (Hussein et al. 2023). Besides that, digital game-based learning helps to improve cognitive ability, working memory and perceptual reasoning skills among students with learning disabilities (Kim & Lee 2021).

There is an issue of teachers in Malaysia who stops their profession before retirement age. Besides health issues, teachers are stress and prefer to retire early because they face difficulties in adapting to innovative technologies. Teachers need to spend many times and master different skills to modify the learning content and adapt the technology in their teaching session. Previous educational technology research focuses more on students compared to teachers, especially on teachers who teach students with special needs. There is still a lack of instruments to measure special education teachers' commitment in educational technology.

THE OBJECTIVE OF THIS STUDY IS:

Objective 1: To explore the teachers' commitment towards digital gamified learning through Exploratory Factor Analysis (EFA).

Objective 2: To assess the validity and reliability of the questionnaire that measure teachers' commitment towards digital gamified learning.

BASED ON THE OBJECTIVES, THE RESEARCH HYPOTHESIS IS:

H_{01} : Teachers' commitment towards digital gamified learning can be explore through Exploratory Factor Analysis (EFA).

H_{02} : Questionnaire that measure teachers' commitment towards digital gamified learning has good validation and high reliability.

LITERATURE REVIEW

DIGITAL GAMIFIED LEARNING

Digital gamified learning refers as a teaching method that integrates digital game mechanics and gamification elements into digital learning environment to provide a playful and immersive learning atmosphere while encourage an active self-involvement in learning (Beck et al. 2020; Capogna et al. 2022; Dengel et al. 2021; Topping et al. 2022). This approach incorporates different game genres such as board game, casual game, arcade game, puzzle game (Kho et al. 2022; Pao & Surat 2021; Plass et al. 2015; Thomas & Mahmud 2021) and gamification elements such as points, badges, leaderboards, challenges and level (Martin et al. 2020; Sajinčič et al. 2022).

Integration of digital gamified learning transform conventional teaching methods into an interactive and engaging learning experience (Amran et al. 2019; Solviana 2020). It fosters student's motivation and problem solving skills. Students can develop their potential through opportunities offered in the context of digital games and enhance students' understanding (Ali et al. 2021; Thomas & Mahmud 2021). Students give an opportunity to gain experience from failure by making repeated mistakes in the digital game and learn according to their own pace in digital gamified learning.

TEACHER'S COMMITMENT

Commitment defined as enthusiasm feeling and dedication towards one's work (Kasim et al. 2022). Teachers' commitment defined as the teachers' attitude toward their work and the teachers' emotional intelligence when teaching (Ahad et al. 2021). Teachers' attitude and knowledge are the key factors that influence the gamification process in education (Bicen et al. 2022). Qualified education depends on hard effort from each teacher. Teachers must take the initiative to refine their professionalism by enhancing their knowledge and teaching enthusiasm (Qu et al. 2023).

Teachers' commitment considered a psychological bond between teachers and their profession. Teachers with high commitment have strong intrinsic motivation that encourages them to be dedicated to solve challenging tasks while teaching (Eğinli 2021). It is important to study teachers' commitment towards digital gamified learning due to the expenses involved in preparing materials, providing training to teachers, and the costs of the educational technology applications, internet or digital tools. Challenges like workload, time constraints, classroom management, learning environment, support from norms and teachers' attitude that still adhere to conventional approaches will reduce teacher commitment.

According to the previous study, teachers' commitment is still at a medium level (Billy & Taat 2020; Derbala & Yasin 2022). Commitment can evaluate through behaviour towards their organizations. According to the Kanter Commitment Theory (1968), commitment can evaluate through three types of behaviour, which is continuance commitment, cohesion commitment and control commitment. Mowday (1982) classified the commitment into attitudinal commitment and behavioural commitment (Loan 2020).

However, the latest study suggests that commitment should not look differently, but it should overview the commitment construct as one whole dynamic system (Rossenberg et al. 2023). Commitment System Theory explains (a) the interaction between commitments, including coupling and nature; (b) three nature dimensions in commitment systems – balanced system, conflicting system and detached system (Klein et al. 2022). The correlation level for a commitment factor was interconnect and parallel to other commitment factors.

METHODOLOGY

RESEARCH DESIGN

This study uses a cross-sectional research design to measure the construct - teachers' commitment towards digital gamified learning. This research has obtained ethical approval from Universiti Kebangsaan Malaysia (Reference: UKMPPI/111/8/JEP-2023-916) and Malaysian Ministry of Education (Reference: KPM.600-3/2/3-eras (17888)).

RESEARCH SAMPLE/PARTICIPANTS

A total of 113 primary school teachers who teach students with learning disabilities selected randomly from public school in Kuala Lumpur and Putrajaya. Data collected using cluster sampling to ensure the homogeneity for the research population. All the special education teachers that teach in special education school or integration program in three districts in Kuala Lumpur and one district in Putrajaya are the target sample. Sample chosen randomly from each district. Dataset checked and three samples that provide non-differentiated data removed to ensure the reliability of the imputed dataset. After removing erroneous data using SPSS statistical software, 110 special education teachers included in further analysis.

DATA COLLECTION METHOD/ INSTRUMENTATION

Items were adapted and data obtained using a self-administered questionnaire. For the adapted questionnaire, EFA was employed to determine the dimensionality of the items. This instrument uses 10-point interval scales to measure the construct, where 1 is "strongly disagree" and 10 is "strongly agree" (Awang 2012; Shkeer & Awang 2019a). The validity and reliability of the instrument will report in findings.

DATA ANALYSIS METHOD

Data collected was analysed by the pre-test, validity and Exploratory Factor Analysis (EFA) as below. To perform EFA, software IBM-SPSS-AMOS version 24.0 used.

1. Pre-test

Pre-test is used to validate adapted items through content validity, face validity and criterion validity before the instrument is used in a real study (Hair et al. 2013). Ten experts from educational technology, special education and curriculum check the content validity of the instrument. Valuation for the item's fitness executed, and all items modify according to the expert's view. Since the questionnaire translated from English, face validity needs to check. Two experts in Malay Language and one experienced English teacher were appointed to validate the

part for vocabulary, sentences, grammar and terms that are used in the item. Face validity assessed to ensure item statements were easily understandable, had no double barrel and were able to evaluate the target group appropriately. For criterion validity, one expert from the measurement and statistics field validated the measurement scale in the questionnaire.

2. Validity

The validity test used Cronbach's Alpha to evaluate the internal consistency of a construct. Data collected from the pilot study analysed using Statistical Packages for Social Science (SPSS) Version 25.0 software to measure validity. High-validity items need to achieve a co-efficient index of at least .70 to accept the item.

3. Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis starts with the Kaiser-Meyer-Olkin (KMO) test and the Sphericity Bartlett test to discover the factor structure of a measure and to examine its internal validity. Besides that, EFA aims to measure the appropriateness of the sample size and determine the factorability of the matrix or data index in general (Hair et al. 2019; Shrestha 2021).

The next step is to use the extraction approach - Principal Component Analysis (PCA) with Varimax Rotation to differentiate the basic factors. EFA procedure with the use of PCA and Varimax Rotation can measure the usability of each construct item using factor loading, the amount of variance described for each construct and the component of each item (Awang 2012; Shkeer & Awang 2019a). Extracted components checked using PCA to reduce items and identify the number of components that need to retain.

FINDINGS AND DISCUSSION

The research findings for Objective 1 and Objective 2 are analyse and will present in descriptive analysis, EFA procedure and internal reliability.

RESEARCH QUESTION 1: TO EXPLORE THE TEACHERS' COMMITMENT TOWARDS DIGITAL GAMIFIED LEARNING THROUGH EXPLORATORY FACTOR ANALYSIS (EFA)

The table below shows the descriptive analysis for five items measuring construct commitment towards gamified learning among special education teachers. From Table 1, the standard deviation for items C11 to C15 ranged between 1.866 to 2.055. This indicates that data points spread out over a wider range. Special education teachers show a significant degree of variation in their commitment towards gamified learning.

Table 1. Descriptive analysis for construct teachers' commitment towards gamified learning.

Descriptive Statistics			
Item	**Statement**	**Mean**	**Std. Deviation**
C11	I'm willing to take the time to set up a digital gamified learning session.	6.87	1.996
C12	I can fully commit to the success of digital gamified learning.	6.98	1.995
C13	I can generate a variety of ideas in the process of planning digital gamified learning.	6.87	2.046
C14	I am committed to ensuring that self-development takes place continuously.	7.31	1.866
C15	I feel committed to using digital technology in the realization of digital gamified learning.	7.15	2.055

EFA employed PCA with Varimax Rotation on 5 items to evaluate Special Education Teachers' Commitment towards Gamified Learning. Table 2 displays a KMO score of .908 and p-value for Bartlett's Test of Sphericity is .000. KMO measures the sampling adequacy and the threshold for KMO in this study is exceptional and above the acceptable value of .60 (Awang 2012; Dehisat & Awang 2020; Munisamy et al. 2022; Shkeer & Awang 2019b). Bartlett's Test of Sphericity is highly significant since the p-value is less than .0001 (Matore et al. 2019). The KMO and Barlett's Test results show the data are adequate to proceed with the data reduction procedure in EFA.

Table 2. KMO and Bartlett's test for construct teachers' commitment towards gamified learning.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.908
Bartlett's Test of Sphericity	Approx. Chi-Square	758.255
	df	10
	Sig.	.000

Figure 1 shows the scree plot of five statement items grouped into a single component.

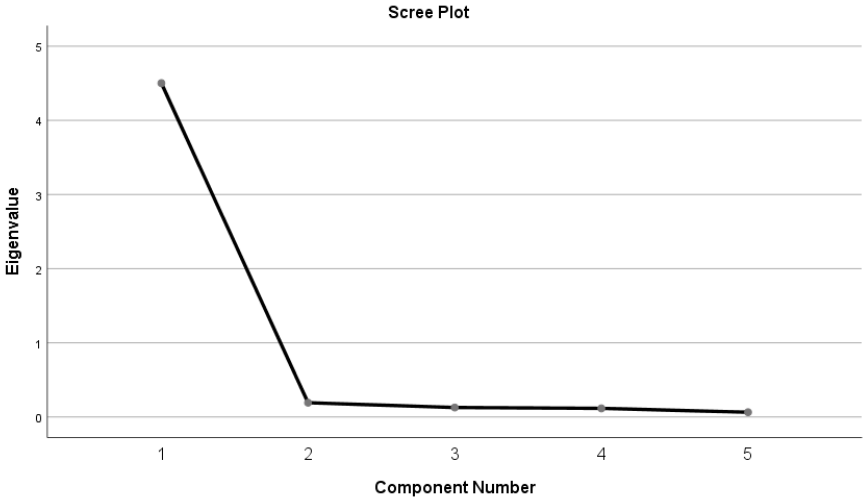

Figure 1. Scree plot for construct teachers' commitment towards gamified learning.

Table 3 shows the initial eigenvalue for one component is 4.502, which is greater than 1.0. The variance explained for one component is 90.031, which is excellent and fulfils the requirement of more than 60% (Matore et al. 2019; Yahaya 2018).

Table 3. Component and total variance explained for construct teachers' commitment towards gamified learning.

Total Variance Explained						
Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	4.502	90.031	90.031	4.502	90.031	90.031
2	.192	3.832	93.864			
3	.127	2.550	96.414			
4	.116	2.316	98.729			
5	.064	1.271	100.000			

Extraction Method: Principal Component Analysis.

Table 4 shows one component and its corresponding elements. Factor loading for an item should be more than .6 (Awang 2014; Yahaya 2018). Factor loading for all 5 statement items ranged from .924 to .966 and all items were accepted.

Table 4. Component matrix for item in construct teachers' commitment towards gamified learning.

Component Matrix[a]	
	Component
	1
C11	.947
C12	.966
C13	.955
C14	.924
C15	.951

continue ...

... cont.

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

RESEARCH QUESTION 2: TO ASSESS THE VALIDITY AND RELIABILITY OF THE QUESTIONNAIRE THAT MEASURE TEACHERS' COMMITMENT TOWARDS DIGITAL GAMIFIED LEARNING

Finally, the internal reliability of the retained items in the construct computed through Cronbach's Alpha. Internal reliability specifies the effectiveness level of a particular set of items in measuring the construct. Cronbach's Alpha that is greater than .7 shows the item achieves high internal reliability (Ehido et al. 2020; Zainal et al. 2020). Table 5 shows the threshold value for component C1 is .972, which achieved high internal reliability.

Table 5. Internal reliability for construct teachers' commitment towards gamified learning.

Component	No. of Item	Cronbach's Alpha
C1	5	.972

Consequently, the obtained results showed that reliability measures for the construct of special education teachers' commitment towards gamified learning has high internal reliability. The extracted components with respective items are internally consistent and reliable. Through EFA results, construct for teachers' commitment towards gamified learning has achieved its internal validity.

Research on teachers' commitment towards gamified learning as one of the main constructs is consistent with the previous study since education requires to develop together with global change (Lampropoulos et al. 2022; Saleem et al. 2022). In the area of globalization, education should integrate with the digital element to suit the students' needs (Falloon 2020; Hassan et al. 2024). Education curriculum needs to grow along with environmental change (Siegner & Stapert 2020).

Quality education was highly correlated with teachers' attitude and their commitment on work (Tembren & Tahar 2022). To cater diverse student's abilities and needs, teacher should committed to adapt content appropriately in gamify setting (Gallud et al. 2021). Digital gamified learning approach aligns with the Malaysian Education Development Plan, which emphasizes the importance of leveraging technology to enhance learning quality and accessibility for all students, including those in special education setting (Fei et al. 2023; Mat et al. 2024). Commitment plays a crucial role in facing challenges and changes, and it is important as it reflects a sense of responsibility towards the profession.

CONCLUSION

Teachers' commitment proven as an essential factor that will affect student with special need's occurrence through EFA procedure. All the five items validated and have high reliability to measure special education teachers' commitment towards digital gamified learning. Either the initial eigenvalue in total variance explained, factor loadings for each item statements or threshold value reported in Cronbach Alpha shows that all the items are valid and reliable in measuring. As a conclusion, commitment that focuses on teachers' behaviour should consider as an important variable in the study.

This study contributes a validated and reliable instrument for measuring special educators' commitment in the context of gamified learning using educational technology. Besides the impact of this study helps to enhance teacher's willingness while designing professional development and raise the issue on providing appropriate support to teacher on their teaching. This study only focuses on teachers who teach learning disabilities children in the Integrated Special Education Program or Special Education Service Centre. This study limit to national primary schools. Other levels or other types of schools, like private schools, international schools and homeschooling not include in this study. Future studies can evaluate teachers' commitment in different settings and target audiences.

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