Research Article

Teachers' behavior and attitude towards using traditional chinese toys in preschool instruction: A TAM inquiry

Jinghong Zhou, Mageswaran Sanmugam, Bosede Iyiade Edwards

Centre for Instructional Technology & Multimedia, Universiti Sains Malaysia, Gelugor, Penang, Malaysia

* Corresponding author: Mageswaran Sanmugam mageswaran@usm.my

ABSTRACT

Preschool education is a critical stage of children's growth. However, teachers face many challenges including inequitable access to teaching resources in preschool environments. This not only affect teachers' job quality, willingness to teach, and career development, but may also indirectly affect children's physical and mental health, as well as educational outcomes. Educational approach emphasizing child-directed learning, hands-on activities, and a prepared environment including concepts like play as pedagogy has been shown in many studies to improve learner engagement. Such approaches form the basis of methodologies like the Montessori and the use of toys in pre-school education. The limitation of modern toys has led to the exploration of alternatives like Traditional Chinese toys (TCT) with their potential for ease of use, graphic cognition, and diverse play. Users' acceptance, perceived usability, ease of use and intention to use technology has however been central to the introduction of technologies in various contexts, including education. Based on the Technology Acceptance Model (TAM), this study explored preschool teachers' satisfaction and willingness to use TCT in teaching. A questionnaire was administered to 235 preschool teachers teaching with TCT. Data were analyzed using Structural Equation Modelling. The results indicate that teachers' overall satisfaction and willingness to continue using the TCT are high. Perceived usefulness (PU) and perceived ease of use (PEU) were the main factors influencing teachers' satisfaction and the main drivers of their willingness to continue using, with PEU having a stronger influence. Among the preschool teachers who were tested, the mean values of teachers from preschool major backgrounds were higher than those of teachers from non-preschool major backgrounds, reflecting the higher acceptance of TCT among teachers from preschool major backgrounds. Findings suggest that more easy-to-use and interesting teaching resources should be developed to reduce teachers' cognitive load, promote children's development, and facilitate sustainable education. Future research should focus on designing instructional adaptations of TCT in different cultural contexts and longitudinally tracking and evaluating their long-term effects on teachers' and preschooler's multidimensional development.

Keywords: Traditional Chinese toys; preschool education; TAM; preschool teacher; cultural perception

1. Introduction

Culture is a defining force in an era [1]. Cultural education nourishes the growth of young children in a subtle way. At the preschool level in China, traditional education and culture in kindergartens is unfolding in

a unique way. Traditional toys, as part of China's excellent traditional culture, contain rich cultural connotations and educational knowledge, and have an important impact on young children's cognitive, emotional, and social development [2]. The following aspects have been explored in the research on the theme of toy education and game teaching: characteristics and current status of development of toys [3], traditional toy re-education [4], traditional toy games [5], innovative methods of game teaching [6,7], Challenges in Early Childhood Education [8].

Chen [9] analyzed the advantages and disadvantages of various ways of toy categorization in terms of the nature, materials, functions and age-appropriateness of toys, taking into account children's experiences of using them and the role of toys in their development and education. Bartan and Alisinanoglu [10] explored the benefits of sensory education in the developmental zone of children from the perspective of preschool teachers, and noted that preschool teachers reported that they did not fully grasp the concept of the senses and did not have enough materials to implement sensory education. This suggests that TCT itself has both playful and educational significance, making it an ideal teaching tool and material. However, there is still a gap in developing research on traditional toys in the field of preschool education, which is now still less applied to teaching practice, and there is also a lack of exploring the pedagogical behaviors and attitudes towards toys in teaching from the perspective of early childhood teachers. As supporters and guides of children's development, early childhood teachers' satisfaction and willingness to use TCT are key factors that influence children's play with toys and the value of toys. It is of practical significance how to apply the theory to preschool teaching reform in conjunction with TCT to improve teachers' teaching quality and efficiency, and how to accurately measure teachers' behaviors and attitudes towards traditional Chinese toys, and accordingly to judge the main modes that should be adopted in the next stage of preschool teaching.

Therefore, this study used TCT as an entry point to analyze preschool teachers' satisfaction and willingness to use Chinese traditional toys, and proposed a modified technology acceptance model (TAM) applicable to Chinese traditional toys based on the technology acceptance model (TAM) and theory proposed by Davis [11] to further analyze the internal mechanisms leading to differences in satisfaction and willingness to continue using TCT.

2. Related research

2.1. Background of preschool teachers in China

The *National Education Development Report* released by the Ministry of Education of China mentions that there are 2,763,100 full-time kindergarten teachers in China, of which the proportion of full-time preschool teachers who graduated with a major in early childhood education is 71.3 per cent. From this, it can be deduced that there are 790,000 full-time kindergarten teachers who do not specialize in preschool education. In view of the different specializations of preschool teachers, it is very important that the teaching materials in the education process are easy to use, easy to read and easy to learn in order to guarantee the quality of preschool education [12].

The essence of education is a social activity to cultivate human beings, and the purpose is to promote the comprehensive development of human beings, thus paying attention to the preferences and choices of preschool education stakeholders plays an important role in leading the implementation of the education system, and the current value of the education system also pays more attention to the development of individual learners [13]. In the historical changes of China's preschool education system, educational concepts and values have undergone a dynamic development from social to early childhood orientation, and early childhood-oriented thinking has gradually taken over the mainstream, following the physical development of

children, determining the content of preschool education and choosing appropriate teaching methods [14]. At the same time, the report *Opinions on the Implementation of the Project for the Inheritance and Development of Chinese Excellent Traditional Culture*, released by China, states that Chinese excellent traditional culture will be comprehensively integrated into all fields of initiation education, basic education, vocational education, higher education, and continuing education. Focusing on the teaching materials for early childhood, primary school, and secondary school, a Chinese culture curriculum and teaching materials system is being constructed [15]. In this context, preschool teachers face great challenges. The next section will talk importantly about the current situation of preschool teachers.

2.2. Current teaching situation of preschool teachers

Teachers are being rediscovered at a time when human society is facing profound changes [16]. The term "rediscovered" means that the teaching profession is experiencing changes and challenges, and these changes have led teachers to think deeply about the development of teaching and learning.

First, the educational behavior and psychological state of early childhood teachers are closely related to the growth and development of young children [17]. Previous research has found that preschool teachers face both emotional and work-related stress [18], and that young children, with their cognitive and behavioral diversity, face multiple challenges in conducting group activities and individualized their care [19]. Baulos [20] criticize today's teaching and learning materials for focusing too much on form at the expense of the individual and cognitive characteristics of the students themselves. Therefore, teachers' use and application of instructional materials is of concern, as overly simple and complex instructional materials are not conducive to teachers' instructional design and curriculum activities [21], and can easily lead to consequences of teacher burnout and individual stress. Examining teachers' satisfaction and behaviors with instructional materials has practical implications for enhancing teachers' self-efficacy, which more profoundly affects young children's learning outcomes and overall development.

Secondly, teachers are faced with increasingly complex teaching environments, the diversity of educational content and the challenging nature of educational materials [22,23], which require them to continuously improve their professionalism and teaching competence. At the same time, the rise of digital technology has led to changes in the way and content of education [24], and preschool teachers' lack of proficiency in technology has led to insufficient accumulation of educational resources and materials, and their inability to make full use of all kinds of teaching resources, resulting in poor teaching quality [25]. Meanwhile, the inheritance and application of traditional culture in the field of education is facing a new crisis [26]. In this context, TCT contains rich cultural and educational knowledge, and its conversion and application in the preschool classroom can help to alleviate the technical pressure on teachers. Cochran-Smith and Lytle [27] pointed out that teacher knowledge is not passively acquired in the environment, but is actively created by the knower.

Finally, the professional competence of preschool teachers. Ye [28] emphasizes the professional competence of preschool teachers and discusses the new professional development pressures and challenges faced by preschool teachers in the context of meeting externally prescribed requirements and standards. Teachers' motivation for self-professional development and their capacity for continuous professional development have received attention [29]. Nowadays, there is specialized play instruction in Chinese preschool education and attention is paid to the importance of play activities to young children's learning and life [30]. Then, most preschool teachers are stuck in copying existing play processes and using the same play materials for curriculum design, and some teachers also do not understand the teaching materials, which affects children's learning and knowledge effects [31]. Although teachers are advocating for play-based

instruction at the national policy level, they are caught up in the simplification of educational play, which leads to ineffective play by students due to the inability of the materials to meet the teacher's design of the play activities and the expected expectations of young children's play-based learning [32].

2.3. Cultural perceptions of preschool teachers

Wilson [33] categorized a country's comprehensive national power into hard power, soft power and smart power. Hard power is constituted by four major factors, namely resources, economy, military and science and technology, and soft power is defined as national culture, lifestyle, ideology, etc. It is also pointed out that soft power has the power of infinite tension. This shows the importance of culture to countries and individuals. In preschool education, teachers' perception and identification of traditional culture has a good role in enlightening early childhood education [34].

Enlightenment function is an important part of preschool education [35], how to play the enlightenment function of TCT for preschool children and get good effectiveness of the game is very important. The penetration of rich spiritual and cultural connotations in play will bring out the educational significance of play for a long time and continuously [36]. This requires preschool teachers to establish a perception of traditional culture and traditional toys, and provides a space for preschool teachers to enhance their abilities.

Alıncak et al. [37] concluded that most preschool teachers believe that teaching games contributes to children's motor, cognitive, linguistic, and socialization development, and that teaching in a playful way is an important tool for children's cognitive development, and that there is a need to improve teachers' training in the field of educational games. Previous studies have shown that educational play is a multifaceted and complex play activity, and the majority of preschool teachers believe that play contributes to, and are opposed to, the use of technological products by preschool children, believing that traditional play is more effective than digital play in supporting children's cognitive, emotional, social, and physical development [38-39].

In addition, the importance of traditional culture to the development of national identity and the construction of economy and culture [40], the integration of traditional culture into pre-school education practice enriches the knowledge system of pre-school education and fosters young children's interest in traditional culture. Children pass on culture and develop children's physical coordination in the process of playing with toys. Teachers design play activities around toys, which is conducive to realizing children's cognitive learning in multiple domains. Perception of traditional culture is an individual's depth of understanding of the connotations of traditional culture and the values it shapes, which is of profound significance in promoting teachers' professional development and teaching quality [41,42].

2.4. Use of toys in preschool instruction

Toys are materials for children's learning and can promote the development of their multiple intelligences [43,44]. DeCortin [45] systematized the educational nature of toys that enhance learners' spatial skills, stating that children need complementary support from teachers, adults and peers in playing with toys. Önder's [46] study emphasized the importance of play and toys for children's education, activities that support children's mental health and help them build and develop emotional relationships.

The Guidelines on Vigorously Promoting the Bridging of Kindergarten and Primary School Science and the *Guidelines for Kindergarten Education* issued by the Chinese government state that children's interest in learning and social competence should be nurtured in a playful and life-like manner at the preschool stage to lay the foundation for later learning. This indicates the importance of play and teachers' focus on play-based teaching and learning activities [47,48].

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Toys can open children's eyes, enhance their intelligence, and accelerate their physical development, as well as develop their cognitive skills and contribute to the development of good character through visualization, imagery, and children's physical participation [49,50]. Children learn while playing with toys, which provides a very important early experience for their cognitive enlightenment. Montallana et al. [51] listed representative toys of eastern Visayan people and described the educational benefits of toys. Hashmi's [52] team study also incorporated tablet play, but there are important differences between such play and playing with dolls in a traditional way, where children playing tablet games are limited by the programming of the game, whereas doll-like traditional play is not limited in this way and results in physical interaction. Compared to other toys, TCT is safe, intuitive and educational, and teachers are able to freely choose toy materials according to children's cognitive level.

Piaget [53] stated that play environments and materials need to be appropriate to children's age and cognitive stage. Montessori's [54] research revealed that teachers need to make full use of children's interests and senses to provide engaging and meaningful play experiences. Güven et al. [55] suggest the use of historical toys in contemporary preschools to foster children's creativity, problem solving, and social interaction, and recognize the potential of traditional toys to promote cultural heritage preservation and pedagogical diversity. There is a current willingness to develop and utilize them in preschool education, but there is a lack of systematic investigation. Therefore, this paper investigates preschool teachers' satisfaction with and willingness to use traditional Chinese toys to enable better instructional design.

2.5. TAM modelling of preschool teachers' domain related discussions

Davis proposed the Technology Acceptance Model (TAM) based on behavioral theory, suggesting the important role of perceived usefulness (PU) and perceived ease of use (PEU) on satisfaction and behavioral intentions. In essence, the TAM model is a cognitive model that predicts people's acceptance of technology, embodies the cognitive idea of people's transformation of the inner world, and is characterized by collective intentionality, social constructs and system openness [56]. The key to the use of TAM lies in the selection, combination and readjustment of the basic units of the model. PU and PEU are two of the variables [57], PU refers to the user's perception that the use of a particular technology will help to enhance or improve the user's performance and work efficiency. PEU refers to the degree to which the user perceives that a particular technology is easy to use. With the use and depth of the TAM model, its explanatory power is gradually increasing and is widely used in various fields of research [58].

Şakir's [59] study used the TAM model and theory as a framework to analyze preschool teachers' behavioral intentions to use augmented reality across Turkey with the aim of exploring how preschool teachers can provide better learning experiences for young children in their teaching practices. In addition, Xu et al. [60] study combined TAM and Expectation Confirmation Model (ECM) to examine preschool teachers' satisfaction with online instructional video cases in order to optimize their teaching and learning experience.

Ibrahim and Shiring's [61] study pointed out that intra-individual perception is an important driver in promoting preschool teachers' technological competence. In addition, related studies have found that culturally perceived factors in preschool education also profoundly influence the level of technology acceptance. Su et al.'s [62] study on teachers' acceptance of mobile-assisted language learning technology found that teachers' in-depth understanding of their own traditional culture significantly enhanced their perceptions of perceived ease of use and perceived usefulness of the technology.

In summary, the use of TCT in the field of preschool education is of value and significance, and the existing research mainly focuses on cultural perspectives, with fewer perspectives on preschool education,

and even more lack of research on teachers' behaviors and attitudes towards TCT. In preschool teaching, research has mostly focused on cultivating students' interest and creativity, and there is still a gap in the research on teachers' teaching behaviors and attitudes, but their teaching behaviors and attitudes are crucial to students' learning [63]. This study cuts through the teachers' teaching perspective on TCT to explore the effects of pre-school teachers' satisfaction with it and their willingness to use it continuously, and analyses in depth the mechanism of the two variables, PU and PEU, in order to provide a new research perspective for the study of pre-school education, to promote the teachers' reflection on their own teaching, and to provide support for the comprehensive development of pre-school education.

3. Research framework

TAM categorizes user acceptance factors of information technology into intrinsic variables such as PU, PEU, satisfaction, and behavior, and extrinsic variables such as cognitive tools, learning expectations, and effort expectations, and explores the patterns of information technology application and efficacy by analyzing the extent to which each factor contributes to the acceptance of the technology by the user and the correlation between the factors. Among them, PU is highly correlated with PEU, and both factors, PU and PEU, are highly correlated with user satisfaction, which determines the user's behavioral intention and ultimately influences the user's behavioral representations [64, 65].

In this paper, TAM is used as the research framework, PU and PEU are used as independent variables, and six potential variables are added according to the actual characteristics of TCT, and satisfaction and willingness to continue to use are the dependent variables, so as to construct a research model of pre-school teachers' satisfaction and willingness to continue to use TCT (Figure 1). PU in this study refers to teachers' comprehensive judgement of TCT's pre-teaching resource, middle classroom teaching, and late Evaluation of teaching. PEU refers to teachers' comprehensive judgement of the difficulty of TCT's teaching operation and technical operation, including familiarity, teaching training and technical use. In addition, satisfaction in this study refers to teachers' comprehensive value evaluation of the results of the implementation of traditional Chinese toys teaching compared to the teaching expectations, and willingness to continue using refers to teachers' judgement of the continued use of traditional Chinese toys as one of the main teaching methods.
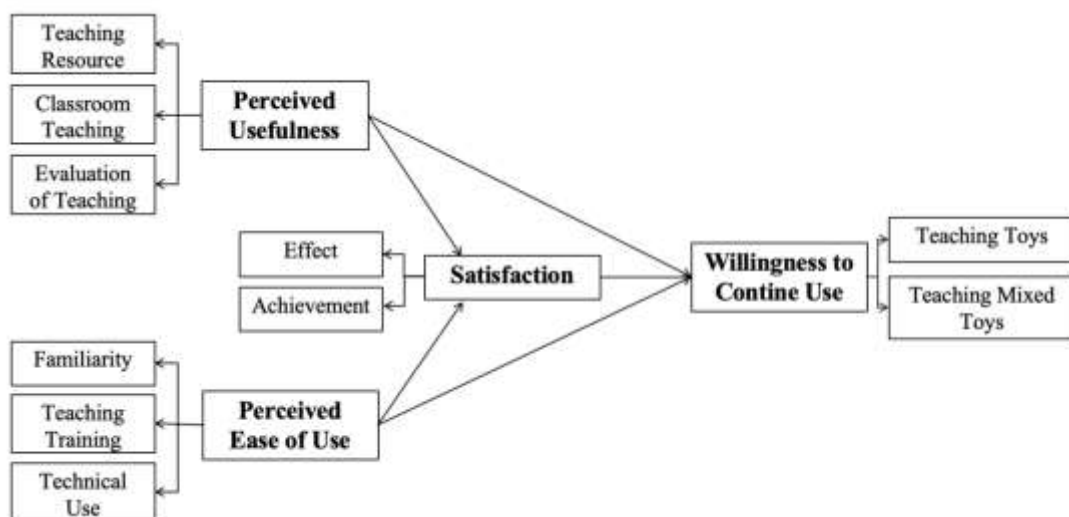

Figure 1. Research framework

4. Research hypotheses

H1: PU has a positive effect on teachers' satisfaction in using TCT.

H2: PU has a positive effect on teachers' willingness to use TCT for continued use.

H3: PEU has a positive effect on teachers' satisfaction in using TCT.

H4: PEU has a positive effect on teachers' willingness to use TCT for ongoing use.

H5: Teachers' satisfaction has a positive effect on the willingness to use consistently.

5. Research design

This study is using a mixed-methods approach, combining quantitative and qualitative research instruments, to conduct an in-depth study of preschool teachers' use and effectiveness of TCT. Specifically, the following two research instruments were used:

5.1. Questionnaire

A questionnaire was designed for the survey of preschool teachers' behavior and attitudes towards TCT, including three parts: basic information, teachers' TCT teaching, and teachers' behavioral attitudes towards TCT, and the scale was in the form of a 5-point Likert Scale, which consisted of 4 variables and 16 measurement questions. The structural equation modelling variables are shown in **Table 2**. Pre-administered tests of reliability of the scales using SPSS (**Table 2**) indicated that the scales had considerable reliability.

Table 1. TCT Factorial variables and questions

Variables	Sub-variables	Observed Variables and Questions	Corresponding questionnaire item number
Perceived Usefulness (C1)	Teaching Resource (C1-1)	A01: Individualized design of teaching programmers for play activities	Q01
		A01: Effective lesson planning according to the characteristics of different toys	Q02
		A03: Easy access to TCT teaching resources	Q03
	Classroom Teaching (C1-2)	A04: Effective organization of TCT classroom	Q04
		A05: TCT classroom demonstration	Q05
		A06: Discussion of TCT classroom games	Q06
	Evaluation of Teaching (C1-3)	A07: Analyzing Play Behavior through Children's Play	Q07
		A08: Observing children's interest in TCT play	Q08
Perceived Ease of Use (C2)	Familiarity (C2-1)	A09: Teachers' proficiency in TCT modus operandi	Q09
		A10: Children's proficiency in TCT manipulation methods	Q10
	Teaching Training (C2-2)	A11: Teachers' learning of TCT teaching methods	Q11
		A12: Training support for TCT teaching environment	Q12
	Technical Use (C2-3)	A13: Kindergarten's technical support for teachers to use TCT in teaching	Q13

Variables	Sub-variables	Observed Variables and Questions	Corresponding questionnaire item number
Satisfaction (C3)	Effect（C3-1）	A14: Overall satisfaction with TCT	Q14
		A15: TCT is more effective in teaching than other teaching materials	Q15
	Achievement（C3-2）	A16: Teachers use TCT to develop different teaching and learning games independently.	Q16
		A17: Children develop a variety of learning styles in the TCT learning environment.	Q17
Willingness to Contine Use (C4)	Teaching Toys（C4-1）	A18: Continuing to use TCT as the main teaching method.	Q18
	Teaching Mixed Toys （C4-2）	A19: Blended learning using TCT and technology.	Q19

Table 1. (*Continued*)

Table 2. Reliability analysis of the questionnaire data

Item	value
Amount of valid data	132
Number of research items	19
Cronbach's alpha (research items)	0.947
Number of observed variables	10
Cronbach's alpha (observed variables)	0.912

5.2. Focus group interviews

A random sample of 10 teachers was selected to learn about teachers' personal feelings, experiences of using TCT and specific needs through semi-structured focus groups. Special attention was paid to the potential impact of factors that may affect teachers' satisfaction and continued use, such as training support, technology acceptance, educational experience, and cultural differences on TCT use. In-depth knowledge and identification of specific components that influence teachers' behavior and attitudes towards TCT acceptance.

5.3. Participants

In this study, preschool teachers in J city, a city in the central region of southern China, were investigated. In City J, which is a prefecture-level city, it is characterized by mixed urban-rural development. The preschool education system in this city consists of both public and private institutions. Among them, the public kindergartens in the town have a certain degree of representativeness and stability in the allocation of teaching resources and teacher training system, and the sample size of teachers is sufficient, so this type of kindergarten was selected as the sample source for this study.

A total of six urban public kindergartens in City J were included in this study. In order to ensure the representativeness of the sample and the rationality of the structure, the study adopted the stratified random sampling method. The kindergartens were first stratified on the basis of their size and the region in which they were located to ensure that kindergartens with different operating conditions and regional characteristics were included. Subsequently, within each kindergarten, the sampling was stratified again according to the professional background of the teachers (preschool education majors versus non-preschool education majors),

and finally a total of 240 in-service teachers were randomly selected from the six kindergartens to participate in the questionnaire survey.

Out of the 240 teachers sampled, 50 were from non-pre-school education background and 190 were from pre-school education background. A total of 235 valid questionnaires were actually collected. The average number of hours per week that the teachers carried out to conduct TCT was 3-4 hours, and they had a certain base of teaching practice, which could provide effective empirical data to support the study.

Table 3. Participation

Location	Number	Gender		Pre-school majors	Non-pre-school majors
		Male	Female		
S1	39	3	36	31	8
S2	39	2	37	31	8
S3	39	1	38	30	9
S4	39	3	36	32	7
S5	39	3	36	31	8
S6	40	4	36	32	8

5.4. Data analysis

The study used TAM as a framework for statistical data and structural equation modelling using SPSS 25.0 and structural equation (SEM) modelling software SPSS AMOS 24.0. By analyzing the role of PU and PEU variables on attitudes and behavioral intentions towards TCT, the study explored the influencing factors and characteristics of preschool teachers' teaching behaviors towards TCT.

6. Results

6.1. Analysis of questionnaire results

6.1.1. Common method bias test

Common method bias is a covariate phenomenon that refers to measurement error due to the same subject background or raters (e.g., self-reported bias due to default tendency, thematic congruence, social desirability, etc.), or measurement environment (e.g., errors that may result from measuring at the same time, at the same place, or using the same medium), and the context of the items (e.g., context-induced mood, scale length, embeddedness of the questions, etc.), artificial covariation between predictor and validity variables due to item characteristics (e.g., measurement error due to ambiguity of the questions, suggestiveness of the questions, order of forward and reverse coding, etc.).

As this paper adopts an online questionnaire filling in to collect the data information of the research subjects, thus it may cause the questionnaire data to produce common methodological bias to a certain extent. In order to maximise the authenticity and accuracy of the data collected in this study, this paper statistically uses the Harman one-way test to conduct an exploratory factor analysis on the four variables of perceived usefulness, perceived ease of use, satisfaction and willingness to continue to use. As shown in Table 4, the KMO value is 0.867, the approximate chi-square value of Bartlett's test of sphericity is 2519.851, the degree of freedom (df) is 171, and the significance (sig) is 0.000, which is less than 0.050, which indicates that the measured variables of the study passed the test of sphericity by KMO and Bartlett, and the structural validity is good. As shown in Table 5, the first factor explains 34.259% of the variance variance, which is less than the critical criterion of 40%, and the four principal components with initial eigenvalues greater than 1

obtained from the data analysis do not have a particular factor with a value greater than 40% or only a single factor, which is in line with the empirical requirements of the thesis. Therefore, it can be assumed that although this study uses a questionnaire survey, the data are to a large extent rigorous and reliable.

Table 4. Tests of KMO and bartlett

Tests of KMO and Bartlett		
KMO values		0.867
Bartlett's Test of Sphericity	Approximate Chi-squared value	2519.851
	df	171
	p- values	0.000

Table 5. Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance	Cumulative	Total	Variance	Cumulative	Total	Variance	Cumulative
1	6.509	34.259	34.259	6.509	34.259	34.259	4.768	25.096	25.096
2	3.220	16.947	51.206	3.220	16.947	51.206	3.572	18.801	43.898
3	2.166	11.402	62.607	2.166	11.402	62.607	3.036	15.976	59.874
4	1.171	6.164	68.771	1.171	6.164	68.771	1.690	8.897	68.771
5	0.654	3.444	72.215						
6	0.631	3.319	75.534						
7	0.576	3.033	78.567						
8	0.560	2.949	81.517						
9	0.510	2.683	84.200						
10	0.443	2.334	86.534						
11	0.390	2.053	88.587						
12	0.385	2.028	90.615						
13	0.327	1.722	92.337						
14	0.293	1.540	93.878						
15	0.276	1.450	95.328						
16	0.243	1.278	96.605						
17	0.242	1.272	97.877						
18	0.223	1.176	99.054						
19	0.180	0.946	100.000						

*Extraction Method: Principal Component Analysis.

6.1.2. Confirmatory Factor Analysis (CFA)

This study conducted a Confirmatory Factor Analysis (CFA) using the structural equation modeling software AMOS 24.0 to examine the relationships between latent variables and observed indicators, and to assess the overall model fit. As shown in Table 6, all fit indices meet the recommended thresholds: χ^2/df = 1.843, which is below the cutoff value of 3; GFI = 0.901 and AGFI = 0.871, both exceeding 0.80; IFI = 0.950, TLI = 0.941, and CFI = 0.949, all above the recommended value of 0.90; RMSEA = 0.060, which is

below 0.08. These results indicate a good model fit, suggesting that the hypothesized model aligns well with the observed data.

Table 6. Model Fit Indices of Confirmatory Factor Analysis

Fit Index	χ2/df	GFI	AGFI	IFI	TLI	CFI	RMSEA
Estimated Value	1.843	0.901	0.871	0.950	0.941	0.949	0.060
Threshold	<3	>0.8	>0.8	>0.9	>0.9	>0.9	<0.08
Result	Met	Met	Met	Met	Met	Met	Met

Convergent validity refers to the extent to which multiple items measuring the same construct are in agreement, typically assessed by standardized factor loadings, Average Variance Extracted (AVE), and Composite Reliability (CR).

As shown in **Table 7**, all standardized factor loadings for the constructs of Perceived Usefulness, Perceived Ease of Use, Satisfaction, and Continuance Intention are above 0.600 and statistically significant ($p < 0.050$), indicating good measurement validity. The AVE values for all constructs are greater than 0.500, and CR values exceed 0.700, suggesting that all four constructs demonstrate satisfactory convergent validity.

Table 7. Convergent Validity Assessment

| Variables	Item	Standardized Loading	S.E.	C.R.	p	CR	AVE
Perceived Usefulness	Q01	0.740				0.902	0.536
	Q02	0.786	0.085	11.874	***		
	Q03	0.696	0.079	10.446	***		
	Q04	0.733	0.092	11.032	***		
	Q05	0.734	0.091	11.046	***		
	Q06	0.723	0.095	10.868	***		
	Q07	0.711	0.088	10.671	***		
	Q08	0.728	0.094	10.944	***		
Perceived Ease of Use	Q09	0.772				0.897	0.634
	Q10	0.798	0.075	12.659	***		
	Q11	0.762	0.072	11.993	***		
	Q12	0.825	0.085	13.142	***		
	Q13	0.823	0.074	13.101	***		
Satisfaction	Q14	0.879				0.882	0.652
	Q15	0.823	0.062	15.189	***		
	Q16	0.727	0.063	12.714	***		
	Q17	0.793	0.062	14.403	***		
Willingness to Continue Use	Q18	0.835				0.833	0.713
	Q19	0.854	0.099	9.800	***		
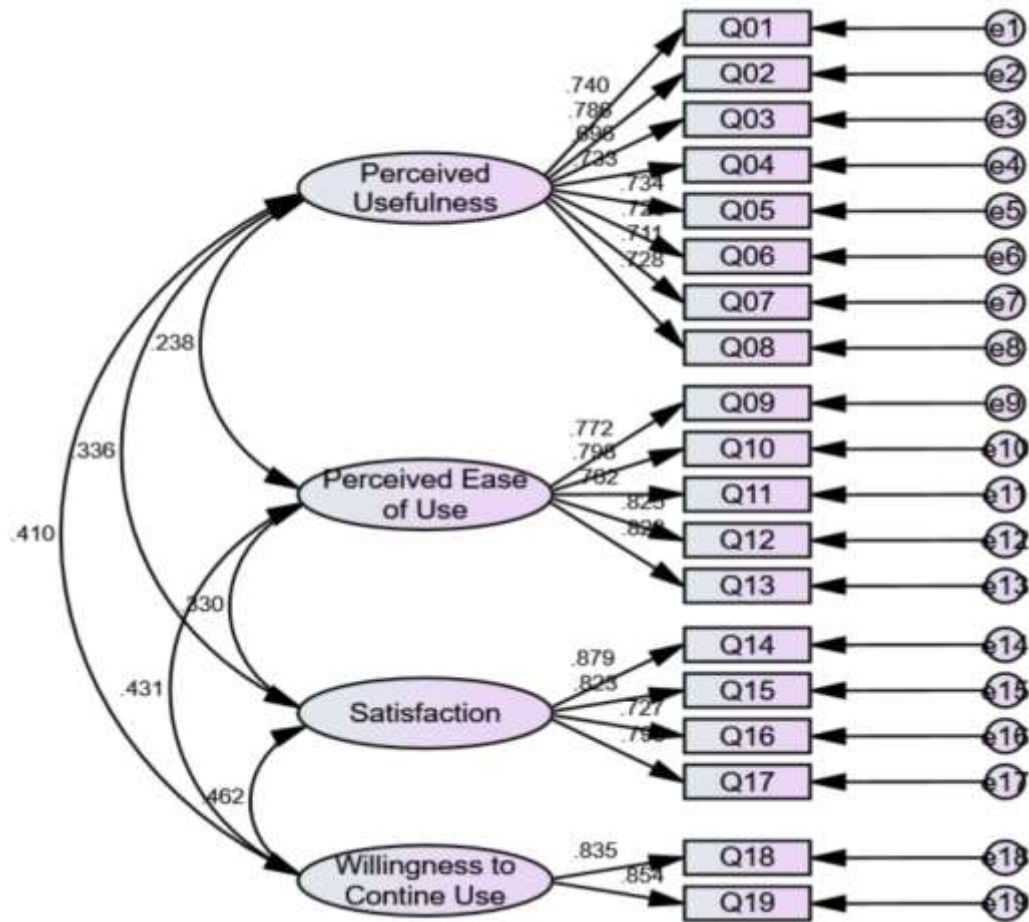
Figure 2. Validated factor analysis model

Discriminant validity refers to the extent to which constructs that are supposed to be unrelated are, in fact, distinct. This is typically assessed by comparing the square root of the AVE for each construct with the inter-construct correlations. If the square root of the AVE is greater than the corresponding inter-construct correlation coefficients, discriminant validity is supported.

As shown in **Table 8**, the square roots of AVE values (on the diagonal) for the constructs Perceived Usefulness (0.732), Perceived Ease of Use (0.796), Satisfaction (0.807), and Continuance Intention (0.845) all exceed their correlations with other constructs, demonstrating good discriminant validity.

Table 8. Discriminant validity assessment

Variables	Perceived Usefulness	Perceived Ease of Use	Satisfaction	Willingness to Continue Use
Perceived Usefulness	**0.732**			
Perceived Ease of Use	0.238	**0.796**		
Satisfaction	0.336	0.330	**0.807**	
Willingness to Continue Use	0.410	0.431	0.462	**0.845**

6.1.3. Multicollinearity test

To examine potential multicollinearity, this study conducted a regression analysis with Perceived Usefulness, Perceived Ease of Use, and Satisfaction as independent variables, and Continuance Intention as

the dependent variable. As shown in **Table 9**, the highest Variance Inflation Factor (VIF) value is 1.128, which is well below the commonly accepted threshold of 5. Therefore, it can be concluded that multicollinearity is not a concern in this model.

Table 9. Multicollinearity test results

Independent Variable	Unstandardized Estimates		Standardized Estimates)	t	Sig.	Collinearity	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.910	0.321		2.835	0.005		
Perceived usefulness	0.284	0.075	0.226	3.801	0.000	0.891	1.122
Perceived ease of use	0.226	0.055	0.245	4.101	0.000	0.887	1.128
Satisfaction	0.211	0.052	0.249	4.072	0.000	0.844	1.185
R^2	0.270						
ΔR^2	0.260						
F-value	28.421 （p<0.001）						

Dependent variable: Willingness to continue using

6.1.4. Analysis of differences in professional variables

As shown in Table 10, the significance of the differences between preschool majors and non-preschool majors on PU, PEU, satisfaction and willingness to continue using is all less than 0.050, which reaches the significance level, indicating that preschool majors and non-preschool majors have significant differences on PU, PEU, satisfaction and willingness to continue using. The highest score on the satisfaction dimension indicates that the teachers all comprehend and master the TCT teaching style and are able to effectively guide children's learning and organize play activities according to the TCT features. Comparatively, the scores of preschool majors were significantly higher than those of non-preschool majors. This indicates that teachers with a preschool major background are better able to perceive and master the teaching content of TCT. It is noteworthy that the dimension of Access to Teaching Resources was below the mean score level in the preschool teachers' group, and the dimension of Teaching Mixed Toys was below the mean score level in the non-preschool teachers' group, reflecting that teacher with different professional backgrounds have different concerns in their feedback.

Table 10. Independent samples t-tests for professional variables

	Pre-school Teacher's Degree		Non-pre-school teacher's degree		t	P
	Mean	Std. Deviation	Mean	Std. Deviation		
Q01	3.951	0.690	3.538	0.803	3.365	0.001
Q02	3.984	0.633	3.519	0.804	3.840	0.000
Q03	3.809	0.622	3.519	0.671	2.789	0.007
Q04	3.896	0.715	3.538	0.803	2.901	0.005
Q05	3.951	0.713	3.654	0.926	2.139	0.036
Q06	3.945	0.652	3.577	0.871	2.833	0.006
Q07	3.847	0.702	3.481	0.828	2.906	0.005
Q08	3.858	0.720	3.346	0.814	4.102	0.000
Q09	3.973	0.946	3.615	0.953	2.400	0.017
Q10	3.891	0.811	3.404	0.995	3.235	0.002
Q11	3.896	0.774	3.481	0.980	2.817	0.006
Q12	4.142	0.962	3.596	1.034	3.552	0.000

	Pre-school Teacher's Degree		Non-pre-school teacher's degree		t	P
	Mean	Std. Deviation	Mean	Std. Deviation		
Q13	3.885	0.827	3.519	0.960	2.499	0.015
Q14	4.372	0.910	3.827	1.098	3.273	0.002
Q15	4.322	0.932	3.846	1.109	2.825	0.006
Q16	4.317	0.824	3.558	1.110	4.587	0.000
Q17	4.224	0.913	3.750	1.046	2.964	0.004
Q18	3.940	0.681	3.288	0.893	4.873	0.000
Q19	3.825	0.673	3.269	0.819	4.482	0.000

Table 10. (*Continued*)

6.1.5. Structural equation modelling

Structural Equation Modelling Fitting

Structural Equation Modelling (SEM) is a statistical method based on covariance matrix to analyze the relationship between variables and has become an important tool in management research. It combines the functions and methods of regression analysis, factor analysis and path analysis, and has the advantage of identifying the inherent logical relationships between many variables, and is able to simultaneously examine the relationships between explicit variables, latent variables, error variables, or interferences in the model, in order to obtain the direct, indirect, or total utility of the independent variable on the dependent variable.

In this study, the degree of fit of the structural equation model between each variable was analyzed and tested using the structural equation model analysis software AMOS 24.0, and the results are shown in Table 11 Structural Equation Model Fit Test Results. The $\chi 2/df$ of the model = 1.843, which is less than the test standard value of 3; GFI = 0.901, which is greater than 0.8; AGFI = 0.871, which is greater than 0.8; IFI = 0.950, which is greater than 0.9; TLI = 0.941, which is greater than 0.9; CFI = 0.949, which is greater than 0.9; and RMSEA = 0.060, which is less than 0.080. Base on the above results, it can be concluded that the structural equation model constructed in this study has a good fit.

Table 11. Structural equation model fit test results

Indicator	χ2/df	GFI	AGFI	IFI	TLI	CFI	RMSEA
Data Results	1.843	0.901	0.871	0.950	0.941	0.949	0.060
Fits Well	<3	>0.8	>0.8	>0.9	>0.9	>0.9	<0.08
Fit Judgment	P	P	P	P	P	P	P

Structural Equation Modelling Path Test

In this paper, the path coefficients of the model and their significance were analyzed and tested using AMOS 24.0 software, and the results were obtained as shown in Table 12 Structural Equation Model Test Results. The corresponding path coefficients graph in Table 11 is shown in Figure 2.

PU positively affects satisfaction and the corresponding path coefficient is 0.272 and P=0.000, so hypothesis H1 is verified.

PU positively influences the willingness to continue using, the corresponding path coefficient is 0.248 and P=0.000, so hypothesis H2 is verified.

PEU positively influences satisfaction, the corresponding path coefficient is 0.265 and P=0.000, so hypothesis H3 is verified.

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PEU positively influences the willingness to continue using, the corresponding path coefficient is 0.277 and P=0.000, so hypothesis H4 is verified.

Satisfaction positively influences the willingness to continue using, the corresponding path coefficient is 0.287 and P=0.000, so hypothesis H5 is verified.

In terms of the path coefficients of the latent variables on the dependent variable, PU, PEU and satisfaction all have a significant positive effect on the intention to continue using. Among them, satisfaction has the greatest effect on the intention to continue using (0.287), followed by PEU (0.277) and PU (0.248). In addition, PU (0.272) and PEU (0.265) also significantly influenced satisfaction. This suggests that the perceived value and ease of use of the TCT instructional materials enhances user satisfaction by increasing their willingness to continue to use the TCT, which in turn enhances their willingness to continue to use the TCT.

Therefore, improving teaching satisfaction is a key path to enhance the willingness to continue using the programmer, and the focus needs to be on improving the quality of teaching resources and teacher training support. It is recommended to further optimize the TCT course content design, evaluation system and teacher training mechanism to enhance the overall perceived value and experience of TCT teaching. The model provides an empirical basis for the sustainable promotion of TCT, which will help improve teaching strategies and resource allocation in future educational practice.

Table 12. Structural equation modelling results

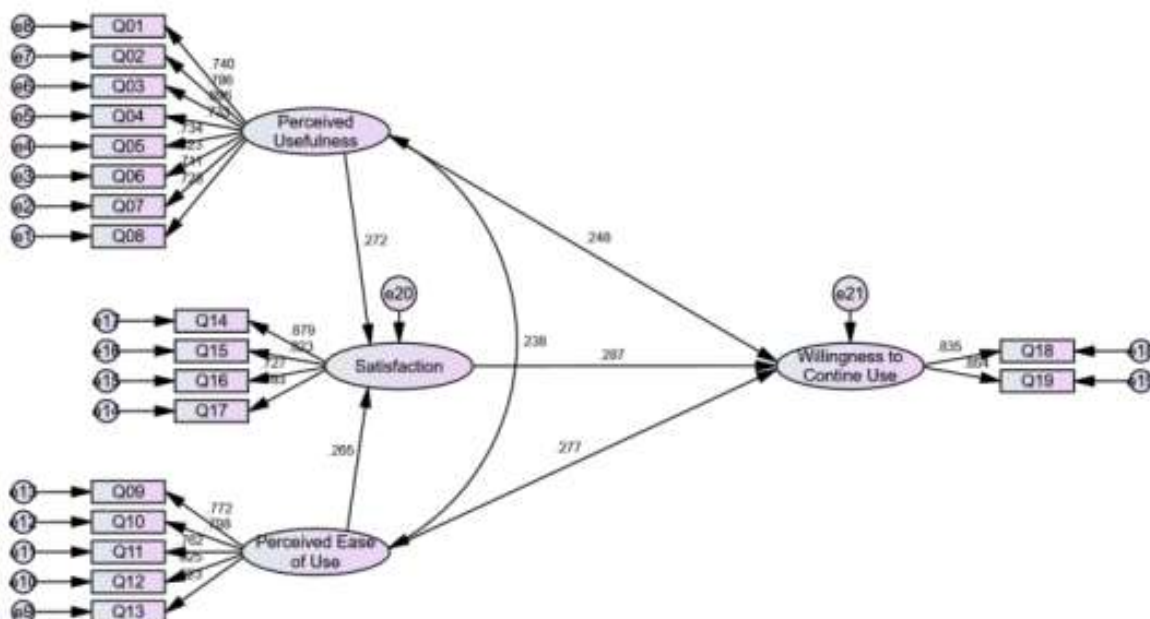| Hypothesis	Impact Path	Estimate (Standardized)	S.E.	C.R.	P	test results
H1	PU → Satisfaction	0.272	0.099	3.731	***	P
H2	PU → Willingness to Continue Use	0.248	0.085	3.402	***	P
H3	PEU→ Satisfaction	0.265	0.077	3.681	***	P
H4	PEU → Willingness to Continue Use	0.277	0.066	3.818	***	P
H5	Satisfaction → Willingness to Continue Use	0.287	0.065	3.787	***	P

Figure 3. Structural equation model

6.2 Analysis of interview data

Ten teachers were selected through random sampling and divided into two groups of five for two rounds of focus group interviews. The interviews were audio-recorded under the premise of soliciting teachers' uniformity, the recordings were converted into textual content, coded using thematic analysis, classified into categories and finally analyzed for themes. The results of the analysis of the interview data are presented below:

Theme 1: Satisfaction and Willingness to Continue Using

In terms of pre-school teachers' satisfaction with TCT and willingness to continue using it, the interview results showed that most pre-school teachers expressed a high degree of recognition of the use of TCT in teaching and learning. They generally believed that TCT was not only interesting, but also effective in stimulating children's creativity and cognitive development. For example, a teacher with ten years of teaching experience noted, 'Tangram toys allow children to learn by playing and recognizing patterns of different themes, and students connect figurative thinking with concrete experiences during the puzzle process.' Qualitative outcome analyses indicated that teachers' use of the TCT teaching process resulted in a positive teaching experience, enhancing their emotional identification with the tool, which led to increased satisfaction. In addition, several teachers mentioned that active exploration and independent play were evident during the TCT teaching process, and teachers were able to observe a gradual increase in children's cognitive levels of verbal, emotional, and creativity, which further enhanced their sense of teaching accomplishment. A female teacher said, 'I originally thought that traditional toys were rather "old-fashioned", but I did not realize that the children particularly liked them, and they would take the initiative to ask to continue to play with them, as well as exploring new ways of playing with their buddies.' This positive feedback prompted teachers to develop a willingness to continue using TCT for teaching and to invest more energy in instructional design and strategy optimization.

Theme 2: Challenges facing TCT teaching

Although teachers generally recognized the educational potential of TCT, the interviews also revealed a number of practical challenges that hindered the in-depth teaching practice of TCT. Many teachers reflected that there is still a lack of systematic evaluation tools for TCT teaching effectiveness, and that teaching evaluation relies on teachers' subjective judgement without scientific standards and references. One teacher confessed, 'Sometimes we are not sure how to assess what children have learnt from playing TCT.' To a certain extent, this reduced teachers' confidence in instructional design and reflection and weakened the systematic development of TCT. At the same time, some teachers reported a lack of systematic training in teaching and learning, and remained skeptical about how to design TCT teaching sessions in line with young children's development. One teacher pointed out, 'I haven't touched traditional toys for a long time, how to design play for different age groups in teaching and how to set teaching objectives, all these need more professional guidance.' The lack of training not only affects the quality of teaching, but also undermines teachers' confidence in using them consistently over time. In conclusion, inadequate teaching evaluation system and insufficient teaching training are the main problems affecting teachers' behavior and attitude towards using TCT.

7. Discussions

Through empirical analysis, this paper compares pre-school teachers' satisfaction with teaching and willingness to continue using TCT, and analyses the effects of PU and PEU on their satisfaction and willingness to continue using TCT and their pathways. It was found that TCT satisfaction was generally

good. Analyses of professional variables showed that both preschool and non-preschool teachers had higher satisfaction, indicating that TCT has good attributes of instructional materials. It also reflects that the TCT-based teaching model is favorable for teaching pre-school games.

PU is the most critical factor influencing satisfaction with TCT and willingness to continue using it. Teachers were more positive about the current stage of TCT "Teaching Resources" and "Classroom Teaching", but are cautious about "Evaluation of Teaching". Therefore, it is necessary to focus on improving the PU of TCT, from improving the evaluation of teaching system, to improving the teaching methods and countermeasures of teachers using TCT, in order to be able to better guide children's games and play, and to improve the effectiveness of TCT.

PEU have a positive effect on satisfaction with TCT teaching, and kindergarten campuses provide support for the use of TCT, teaching methods, and give teachers a platform for learning and operation. In actual teaching, teachers reflected that the TCT provided by kindergartens followed the cognitive developmental characteristics of young children, was suitable for teaching young children, and that the materials were safe and environmentally friendly, which had a positive effect on the willingness to continue to use them.

TCT has a high willingness to continue using it. The key factor influencing the willingness to continue using is satisfaction. The current main problem limiting the willingness to continue using is the low perceived usefulness, especially the low scores on content related to classroom teaching quality and teaching evaluation. Therefore, in order to increase the willingness to continue using TCT, the focus should be on optimizing classroom content design and teaching evaluation mechanisms. However, when comparing the two modes of 'TCT-based' and 'TCT-technology combination mode', it can be found that the latter has a higher recognition rate than the former, which indicates that teachers as a whole are inclined to adopt the combination of TCT and technology, thus indirectly illustrating the future direction of TCT teaching.

Bradley's [66] study described that playful teaching with toys is appropriate for the cognitive stage of pre-school children, that toys as instructional materials support children's active construction of knowledge, and that children's development enhances teachers' sense of efficacy, which in turn promotes behavior and attitudes [67]. This study supports the existing views and provides new perspectives on innovative teaching methods for TCT. From the analysis of the qualitative results, preschool teachers' use of TCT in teaching and learning revealed two interrelated dimensions: on the one hand, teachers generally held highly positive attitudes towards TCT, recognized its value in stimulating young children's sensory abilities and cognitive development, and showed a strong willingness to use it on an ongoing basis. On the other hand, teachers in the interviews clearly faced key challenges such as the lack of systematic teaching evaluation tools and specialized training support, which significantly affected the depth and sustainability of TCT application.

Overall, we found that TAM is applicable in the evaluation of TCT satisfaction, and the related conclusions provide a better answer to the research hypotheses, achieve the expected results, and are in line with the technology acceptance theory viewpoint, which is conducive to the expansion of TAM in the field of pre-school education.

8. Future recommendations

Firstly, TCT can stimulate children's interest in learning and promote hands-on skills and a sense of co-operation. However, if TCT are viewed only as 'fun toys', their value as cognitive scaffolds may be undermined, and they may not be effective in supporting the learning goals of cognitive development. Future research should return the function of TCT to a learning-oriented level, ensure that TCT plays a central role

in promoting knowledge construction and cognitive thinking through task design and guided activities, and construct a multidimensional TCT teaching evaluation system to strengthen process and generative evaluation [68].

Secondly, TCT materials are diverse and operable, which can help to meet the individual differences in students' cognitive styles, interest preferences and ability levels. However, this study found that teachers tend to adopt a 'standardized approach' in practice, neglecting process assessment and personalized feedback. Therefore, in the future, we need to strengthen teachers' training on differentiated design and implementation strategies [69,70], help them to play TCT flexibly according to students' individual characteristics, and explore the blended mode of teaching that combines TCT with modern information technology to enhance the interactivity and sustainability of teaching.

Thirdly, in the sample of six kindergartens in City J covered by this study, the teachers were predominantly female, with a low proportion of male teachers. This phenomenon is also common throughout China. This status of gender imbalance may have a profound impact on the development and effectiveness of TCT teaching and deserves to be further revealed in the implications of the study. Future research suggests incorporating gender-diverse perspectives in training, strengthening cross-gender teaching observation and cooperation mechanisms, and promoting complementary learning between female and male teachers in TCT teaching.

Finally, TCT is rich in cultural symbols and educational connotations, and is an ideal resource for cultural heritage and identity education. However, the researcher found that many teachers tend to ignore the cultural connotations of TCT and focus only on the way the toy is played with, thus failing to fully activate its cultural transmission function. In the future, teachers should be guided to organically incorporate cultural interpretation and contextualization into TCT teaching to enhance the effectiveness of culturally responsive teaching.

Ethical statement

The study strictly adhered to ethical norms and was approved by the Ethical Review Committee of Gannan Normal University (No. ZXY20250517). All teachers interviewed participated voluntarily in this study with informed consent, and the purpose of the study, the content of the questionnaire and its anonymity and confidentiality were clearly explained to them by the researcher, and the participants had the right to discontinue their participation at any stage. The data collected was used solely for the purpose of this study and all information was treated with strict anonymity during the analysis and dissemination process to ensure that it did not pose any potential risk to individuals or organizations.

Limitations

The limitations of this study are as follows: first, the bias of the sample population and the concentration of the sample on preschool teachers make it difficult to generalize the results to other levels of education. Secondly, the subjects' educational level and cultural environment may have an impact on their satisfaction with the lessons and their willingness to continue using them. Thirdly, the imbalance in the gender structure of teachers has a potential impact on the findings. In this study's sample, female teachers were in the majority, and this gender imbalance may, to some extent, have affected the understanding and evaluation of satisfaction with teaching and willingness to continue using. This study did not exclude these possible confounding factors or include them in the model, so there may be a lack of comprehensiveness in the influencing factors.

Conclusion

With the wave of globalization, the field of education is experiencing unprecedented exchanges and collisions [71], making it all the more important for preschool teachers to be deeply rooted in the soil of their local culture. The cultural context in which an individual is embedded is an important shaping force for his or her cognition and behavior [72]. Teachers' cultural immersion in the teaching environment of traditional Chinese toys promotes continuity and depth in the development of teaching and learning. And it can effectively enhance young children's perception of traditional culture and provide rich spiritual nourishment.

Teachers play an important role in supporting students to learn and play, and their involvement and planning are key to effective student learning [73]. Incorporating cultural education into classroom teaching and adopting flexible and diverse teaching methods can enhance the attractiveness and engagement of classroom teaching for students, and promote the formation of positive learning engagement by stimulating students' learning interests, which in turn promotes a sense of professional belonging in preschool education [74]. In the future, researchers and educators can further explore the unique value of traditional Chinese toys in the field of preschool education, while targeting the key issues of preschool education and providing rich soil for young children's play and learning life [75]. At the same time, they can explore the creation of localized toy play curricula and form educational content with regional characteristics, so that children can form a virtuous circle in which play and learning are mutually reinforcing, and interest and growth are mutually reinforcing.

Conflict of interest

The authors declare no conflict of interest

References

1. E. Laszlo, "Culture and development," World Futures, vol. 34, no. 3–4, pp. 225–230, 1992, doi: 10.1080/02604027.1992.9972308.
2. Y. Kuang, "Research on Chinese Traditional Toy Design Based on Sensory Experience," M.S. thesis, Xihua Univ., 2022. [Online]. Available: https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202301&filename=1022693269.nh
3. N. Chen, Y. Jiang, H. Li, and Y. Liu, "Playing to learn in China vs in the Western World," in Proc. 2021 Int. Conf. on Education, Language and Art (ICELA 2021), pp. 414–421, Feb. 2022. doi: 10.2991/assehr.k.220131.075
4. S. Fangping, "Labor in the game: The way of children's labor education," Front. Educ. Res., vol. 7, no. 4, 2024, doi: 10.25236/FER.2024.070418.
5. S. R. Fernsebner, "A people's playthings: toys, childhood, and Chinese identity, 1909–1933," Postcolonial Studies, vol. 6, no. 3, pp. 269–293, 2003. [Online]. Available: https://doi.org/10.1080/1368879032000162167
6. K. G. Alimovna and B. A. Abduraufovna, "Innovative approaches to creating a developmental environment for preschool children," Web of Teachers: Inderscience Research, vol. 3, no. 3, pp. 1–5, 2025. [Online]. Available: https://webofjournals.com/index.php/1/article/view/3458
7. M. Kalogiannakis and S. Papadakis, "Pre-service kindergarten teacher's acceptance of 'ScratchJr' as a tool for learning and teaching computational thinking and science education," The Journal of Emergent Science, no. 15, pp. 31–34, 2019, ASE in partnership with the Primary Science Teaching Trust (PSTT).
8. S. Papadakis, "Apps to promote computational thinking and coding skills to young age children: A pedagogical challenge for the 21st century learners," Educational Process: International Journal (EDUPIJ), vol. 11, no. 1, pp. 7–13, 2022.
9. J. Chen, Toys and Education. Beijing, China: Dolphin Books, 2012.
10. S. Bartan and F. Alisinanoglu, "Preschool teachers' views on sensory education," Southeast Asia Early Childhood, vol. 13, no. 1, pp. 81–94, 2024.
11. F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User acceptance of computer technology: a comparison of two theoretical models," Management Science, vol. 35, no. 8, pp. 982–1003, 1989.
12. M. Godsk, "Power to the teachers!: Empowering teachers to author web-based learning material with easy-to-use tools," in Proc. 12th Int. Conf. Eur. Univ. Inf. Syst., University of Tartu, 2006, pp. 278–282.

13. S. C. Kong and Y. Yang, "A human-centred learning and teaching framework using generative artificial intelligence for self-regulated learning development through domain knowledge learning in K–12 settings," IEEE Trans. Learn. Technol., early access, 2024, doi: 10.1109/TLT.2024.3392830.
14. Z. Jing, "The Evolution, Present Practices, and Future Directions of Early Childhood Education and Care in China," Eur. J. Educ., vol. 60, no. 1, Art. no. e12880, 2025, doi: 10.1111/ejed.12880.
15. X. Yu, D. Liu, and D. Li, "Visual Analysis of the Integration of Traditional Chinese Culture into Preschool Education," Educ. Rev. USA, vol. 7, no. 8, pp. 1171–1177, 2023, doi: 10.26855/er.2023.08.024.
16. K. M. Hall-Kenyon, R. V. Bullough, K. L. MacKay, and E. E. Marshall, "Preschool teacher well-being: A review of the literature," Early Childhood Educ. J., vol. 42, no. 3, pp. 153–162, 2014, doi: 10.1007/s10643-013-0595-4.
17. A. Henriksson, M. Fridberg, and L. Leden, "Preschool Children's Agency in Play-activities with Science Content," Early Childhood Educ. J., early access, 2024, doi: 10.1007/s10643-024-01729-2.
18. R. Stein, M. Garay, and A. Nguyen, "It matters: Early childhood mental health, educator stress, and burnout," Early Childhood Educ. J., vol. 52, no. 2, pp. 333–344, 2024, doi: 10.1007/s10643-022-01438-8.
19. Y. Li, B. H. H. Ching, H. X. Wu, T. T. Chen, and C. C. He, "Beneficial or debilitating: a qualitative inquiry into Chinese preschool teachers' workload-related stress mindset," Early Years, vol. 44, no. 1, pp. 61–78, 2022, doi: 10.1080/09575146.2022.2090518.
20. A. W. Baulos, J. L. García, and J. J. Heckman, Perry Preschool at 50: What Lessons Should Be Drawn and Which Criticisms Ignored? Cambridge, MA, USA: National Bureau of Economic Research, 2024, NBER Working Paper No. w32972. DOI: 10.3386/w32972
21. E. R. K. Waty et al., "Needs Analysis of Science and Mathematics Teaching Materials in Supporting Early Childhood Learning for Kindergarten Teachers," in *Proc. 6th Sriwijaya Univ. Learn. Educ. Int. Conf. 2024 (SULE-IC 2024)*, Atlantis Press, 2025, pp. 196–208, doi: 10.2991/978-2-38476-390-0_16.
22. M. Kalogiannakis and S. Papadakis, "The use of developmentally mobile applications for preparing pre-service teachers to promote STEM activities in preschool classrooms," in Mobile Learning Applications in Early Childhood Education, IGI Global, 2020, pp. 82–100, doi: 10.4018/978-1-7998-1486-3.ch005.
23. K. Yildirim, "A case study on the use of materials by classroom teachers," Ph.D. dissertation, Middle East Technical Univ., Ankara, Turkey, 2008. [Online]. Available: https://hdl.handle.net/20.500.12513/1793
24. A. Otterborn, B. Sundberg, and K. Schönborn, "The impact of digital and analog approaches on a multidimensional preschool science education," Res. Sci. Educ., early access, 2023, doi: 10.1007/s11165-023-10133-6.
25. T. Yang and X. Hong, "The Educational Technology Divide in Glocalisation: A Perspective for Interpreting Early Childhood Teachers' Practices of ICT Implementation," Early Educ. Dev., vol. 35, no. 1, pp. 150–168, 2023, doi: 10.1080/10409289.2023.2231321.
26. E. Zalli, "Globalization and education: exploring the exchange of ideas, values, and traditions in promoting cultural understanding and global citizenship," Interdiscip. J. Res. Dev., vol. 11, no. 1 S1, p. 55, 2024, doi: 10.56345/ijrdv11n1s109.
27. M. Cochran-Smith and S. L. Lytle, Inside/Outside: Teacher Research and Knowledge. New York, NY, USA: Teachers College Press, 1993.
28. H. Ye, "Research on Strategies for Improving the Quality of Talent Cultivation of Preschool Education Majors in Independent Colleges under the Guidance of the 'Strong Teachers Plan'," J. Lang. Cult. Educ., vol. 2, no. 1, pp. 1–8, 2025, doi: 10.70267/csa86k77.
29. L. Weng and S. Huang, "Research on Strategies to Enhance Professional Identity of Undergraduate Preschool Education Normal College Students," Adv. Vocat. Tech. Educ., vol. 6, no. 3, pp. 56–61, 2024, doi: 10.23977/avte.2024.060308.
30. Y. Qiu, "Research Review on Kindergarten Curriculum Gamification in China," Open Access Libr. J., vol. 6, Art. no. e5934, 2019, doi: 10.4236/oalib.1105934.
31. D. L. Ball and S. Feiman-Nemser, "Using textbooks and teachers' guides: A dilemma for beginning teachers and teacher educators," Curriculum Inquiry, vol. 18, no. 4, pp. 401–423, 1988. [Online]. Available: https://doi.org/10.1080/03626784.1988.11076050
32. T. Koval, N. Oliinyk, T. Kryvosheya, and A. Khilya, "APPLICATION OF GAMIFICATION IN HIGHER EDUCATION: TRAINING OF EARLY CHILDHOOD AND PRIMARY EDUCATION TEACHERS IN UKRAINE," in Proc. Int. Sci. Pract. Conf. ENVIRON. TECHNOL. RESOUR., vol. 2, 2024, pp. 183–187, doi: 10.17770/etr2024vol2.8051.
33. E. J. Wilson, "Hard power, soft power, smart power," Ann. Amer. Acad. Polit. Soc. Sci., vol. 616, no. 1, pp. 110–124, Mar. 2008, doi: 10.1177/0002716207312618.
34. A. Volchynskyi, Y. Smal, O. Malimon, and A. Kovalchuk, "Introduction of Folk Physical Culture Traditions in the Educational Process of Senior Preschool Children," Phys. Educ. Sport Health Cult. Mod. Soc., no. 2 (38), pp. 57–60, 2017, doi: 10.29038/2220-7481-2017-02-57-60.

35. M. W. A. de Medeiros, W. T. Hattori, and M. E. Yamamoto, "Priming effects on prosocial behavior of children: A systematic review," Trends in Psychology, vol. 29, no. 4, pp. 637–654, 2021. [Online]. Available: https://doi.org/10.1007/s43076-021-00076-0

36. L. Gan, "Exploring the pathway of integrating chinese fine traditional culture into pre-school education," Front. Educ. Res., vol. 6, no. 3, 2023, doi: 10.25236/FER.2023.060304.

37. F. Alıncak, A. Yıkılmaz, and F. M. Uğurlu, "Evaluation of pre-school teachers' opinions on teaching with games," European Journal of Alternative Education Studies, 2017. [Online]. Available: http://dx.doi.org/10.46827/ejae.v0i0.649

38. F. U. Uljaevna, "Didactic games in preschool educational system," Probl. Sovrem. Nauki Obraz., no. 4-2 (149), pp. 27–29, 2020.

39. D. Öner, "The using technology and digital games in early childhood: An investigation of preschool teachers' opinions," Inonu Univ. J. Grad. Sch. Educ., vol. 7, no. 14, pp. 138–154, 2020, doi: 10.29129/inujgse.715044.

40. E. Seaga, "The Significance of Folk Culture in the Development of National Identity," Caribbean Q., vol. 43, no. 1–2, pp. 82–89, 1997, doi: 10.1080/00086495.1997.11829562.

41. L. Fang, "A study on the traditional folk culture in preschool education," in Proc. 2016 Int. Conf. Manage. Sci. Innov. Educ., Atlantis Press, 2016, pp. 586–588, doi: 10.2991/msie-16.2016.127.

42. S. S. Haraldson, "Role of education in preserving traditional cultures and as development factor," Health Policy Educ., vol. 3, no. 4, pp. 289–302, 1983, doi: 10.1016/0165-2281(83)90001-2.

43. P. R. Gondaliya, "Recommendations on how educational toys can help preschoolers to improve their social skills," Educ. Admin. Theory Pract., vol. 30, no. 3, pp. 975–979, 2024, doi: 10.53555/kuey.v30i3.1422.

44. L. C. Luen, Y. Guo, and L. Jian, "Engaging Play and Toys Foster the Development of Multiple Intelligence in Preschool Children," Int. J. Acad. Res. Bus. Soc. Sci., vol. 14, no. 2, pp. 2155–2162, 2024, doi: 10.6007/IJARBSS/v14-i2/21011.

45. C. E. DeCortin, What Makes a Toy Educational? The Impact of Educational Toys on Spatial Development in Preschoolers, M.S. thesis, Tufts University, 2015.

46. M. Önder, "Contribution of Plays and Toys to Children's Value Education," Asian J. Educ. Train., vol. 4, no. 2, pp. 146–149, 2018, doi: 10.20448/journal.522.2018.42.146.149.

47. X. Wang, P. Ye, and T. Qiao, "Free play and pedagogical play: a multiple-case study of teachers' views of play in Chinese early learning centers," Front. Educ., vol. 9, Art. no. 1359867, Mar. 2024, doi: 10.3389/feduc.2024.1359867.

48. C. Niu, "Research on play-based kindergarten curriculum reform in China: based on the analysis of three typical play modes," Int. J. Early Years Educ., vol. 31, no. 3, pp. 401–418, 2023, doi: 10.1080/09669760.2023.2168520.

49. D. W. Kritt, "Technology's covert socialization of children: High-tech toys," J. Thought, vol. 36, no. 3, pp. 53–61, 2001.

50. A. Henriksson, L. Leden, M. Fridberg, and S. Thulin, "Play-Activities with scientific content in early childhood education," Early Childhood Educ. J., early access, 2023, doi: 10.1007/s10643-023-01593-6.

51. C. L. Montallana, J. C. Tesado, D. L. Pagliawan, and F. D. C. Soniedo, "DOCUMENTING EASTERN VISAYAN INDIGENOUS TOYS AS EDUCATIONAL ALTERNATIVES TO ADDICTIVE MODERN GADGETRY," Acad. Res. Educ. Sci., vol. 4, no. 4, pp. 329–339, 2023.

52. S. Hashmi, R. E. Vanderwert, H. A. Price, and S. A. Gerson, "Exploring the benefits of doll play through neuroscience," Front. Hum. Neurosci., vol. 14, Art. no. 560176, 2020, doi: 10.3389/fnhum.2020.560176.

53. Piaget, J. (1962). The stages of the intellectual development of the child. Bulletin of the Menninger clinic, 26(3), 120.

54. M. Montessori, Dr. Montessori's own handbook. New York, NY, USA: Schocken, 1914.

55. G. Güven, O. Sakarya, and S. Yumugan, "Educational and cultural values of ancient toys: Integration into the 2024 Preschool Education Model," Pedagogical Perspect., vol. 4, no. 1, pp. 93–113, 2025, doi: 10.29329/pedper.2025.93.

56. J.-S. Lee, H. Cho, G. Gay, B. Davidson, and A. Ingraffea, "Technology acceptance and social networking in distance learning," Educ. Technol. Soc., vol. 6, no. 2, pp. 50–61, 2003.

57. B. Szajna, "Empirical evaluation of the revised technology acceptance model," Manage. Sci., vol. 42, no. 1, pp. 85–92, Jan. 1996.

58. S. Y. Yousafzai, G. R. Foxall, and J. G. Pallister, "Technology acceptance: a meta-analysis of the TAM: Part 1," J. Model. Manage., vol. 2, no. 3, pp. 251–280, 2007, doi: 10.1108/17465660710834453.

59. A. Şakir, "Augmented reality in preschool settings: a cross-sectional study on adoption dynamics among educators," Interact. Learn. Environ., vol. 33, no. 4, pp. 2954–2977, 2024, doi: 10.1080/10494820.2024.2428361.

60. R. Xu, A. Bautista, and W. Yang, "Learning Satisfaction with Online Teaching Video Cases Among Pre-Service Preschool Teachers in China," Early Educ. Dev., vol. 35, no. 1, pp. 77–95, 2023, doi: 10.1080/10409289.2023.2214163.

61. A. Ibrahim and E. Shiring, "The relationship between educators' attitudes, perceived usefulness, and perceived ease of use of instructional and web-based technologies: Implications from Technology Acceptance Model (TAM)," Int. J. Technol. Educ., vol. 5, no. 4, pp. 535–551, 2022, doi: 10.46328/ijte.285.
62. J. Su, Y. Wang, and Z. Li, "Investigating User Acceptance of Mobile Cultural Applications in China: An Expanded Technology Acceptance Model (TAM)," Int. J. Hum.-Comput. Interact., vol. 41, no. 5, pp. 2920-2935, 2024, doi: 10.1080/10447318.2024.2406614.
63. D. Rad et al., "A Preliminary Investigation of the Technology Acceptance Model (TAM) in Early Childhood Education and Care," BRAIN. Broad Res. Artif. Intell. Neurosci., vol. 13, no. 1, pp. 518–533, 2022. [Online]. Available: https://www.edusoft.ro/brain/index.php/brain/article/view/1247
64. I. Ajzen and M. Fishbein, Understanding Attitudes and Predicting Social Behaviour. Englewood Cliffs, NJ, USA: Prentice-Hall, 1980.
65. S. Brown, A. Massey, M. Montoya-Weiss, and J. Burkman, "Do I really have to? User acceptance of mandated technology," European Journal of Information Systems, vol. 11, pp. 283–295, 2002.
66. R. H. Bradley, "Social-cognitive development and toys," Topics in Early Childhood Special Education, vol. 5, no. 3, pp. 11–29, 1985.
67. J. Trawick-Smith, H. Russell, and S. Swaminathan, "Measuring the effects of toys on the problem-solving, creative and social behaviours of preschool children," Early Child Dev. Care, vol. 181, no. 7, pp. 909–927, 2010, doi: 10.1080/03004430.2010.503892.
68. N. A. Stepanova, L. N. Sannikova, N. I. Levshina, S. N. Yurevich, and G. V. Ilina, "Methodological performance evaluation by teachers in preschool educational institutions," Int. J. Cogn. Res. Sci. Eng. Educ., vol. 6, no. 2, pp. 67–80, 2018, doi: 10.5937/jerseeI802067A.
69. N. Melnyk et al., "The establishment and development of professional training for preschool teachers in Western European countries," Rev. Romaneasca Pentru Educatie Multidimensionala, vol. 13, no. 1, pp. 208–233, 2021, doi: 10.18662/rrem/13.1/369.
70. S. Handayani, A. Kartika, and S. Sugoto, "The overview of training needs on differentiated instruction for early childhood teachers," in Proc. 3rd Int. Conf. Early Childhood Educ. (ICECE 2016), Atlantis Press, 2016, pp. 75–83, doi: 10.2991/icece-16.2017.13.
71. C. I. Büyükbaykal, "Communication technologies and education in the information age," Procedia - Social and Behavioral Sciences, vol. 174, pp. 636–640, 2015. [Online]. Available: https://doi.org/10.1016/j.sbspro.2015.01.594
72. K. Vogeley and A. Roepstorff, "Contextualising culture and social cognition," Trends Cogn. Sci., vol. 13, no. 12, pp. 511–516, Dec. 2009, doi: 10.1016/j.tics.2009.09.006.
73. L. Mariani, "Teacher support and teacher challenge in promoting learner autonomy," Perspect. J. TESOL Italy, vol. XXIII, no. 2, 1997. [Online]. Available: http://www.learningpaths.org/papers/papersupport.htm
74. C. C. Yang, C. W. Fan, K. M. Chen, S. C. Hsu, and C. L. Chien, "As a happy kindergarten teacher: the mediating effect of happiness between role stress and turnover intention," Asia-Pac. Educ. Res., vol. 27, no. 6, pp. 431–440, Dec. 2018, doi: 10.1007/s40299-018-0403-4.
75. L. L. Johnson and G. M. Kim, "Experimenting with game-based learning in preservice teacher education," Engl. Teach. Pract. Crit., vol. 20, no. 1, pp. 78–93, Mar. 2021, doi: 10.1108/ETPC-10-2019-0125.