EFFECTIVENESS OF GAMIFIED TEACHING BASED ON PIAGET'S FOUR TYPES OF GAMES TO DEVELOPING FOR YOUNG CHILDREN IN CHONGQING, CHINA

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ABSTRACT
The objectives of this study were: 1) To study the effectiveness of gamified teaching based on Piaget's four types of games to young children in Chongqing, China. 2) To study the level of interest in Piaget's four types of games among young children in Chongqing, China. 3) To compare interest in Piaget's four types of games among young children in Chongqing, China. This research was quantitative research. The conceptual framework of cognitive development. The population consists of 4012 teachers from 120 kindergartens in Chongqing, China. The samples were 351 teachers determined by Krejcie and Morgan tables. The research instrument was a 5 rating scale questionnaire. Statistics used for data analysis included frequency, percentage, mean, variance, and correlation. The research results revealed that: 1) effectiveness of gamified teaching based on Piaget's four types of games to development for young children in Chongqing, China as a much level. When considering each aspect from high to low including praising its mental health and physical development, can develop young children's ability to perceive, ability to develop and enhance young children's senses, motor abilities, body control and coordination. 2) The level of interest in Piaget's four types of games as a whole was at statistically significant level of .01.
Keywords: Effectiveness, Gamified Teaching, Piaget's Four Types of Games, Developing

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INTRODUCTION

All the things that every child is exposed to as he or she grows up will affect not only the child's character and personality but also the development of the child's brain, especially the young children. Therefore, young children education is an important part of education and a critical period for young children's growth. As a Chinese social and cultural phenomenon, young children's games have been created since the beginning of human society. Until the 19th century, under the influence of Darwin's theory of evolution, people began to pay attention to young children's games and put forward many game theories, such as the early figures of the United States of America, Appleton, Gilmore, and others put forward the growth of the theory: game is a mode of young children's ability development, the game is the result of the growth of the organism to practice the abilities of a means of growth. Game stems from the internal drive to practice growth, and young children grow through game. With the development of the times, the value of games in young children's growth has been gradually discovered. For example, Bateson's metacommunicative theory of game was proposed in 1952 based on using anthropological and logical theories to study game. Game is believed to be a meta-communicative process, i.e., in communicative activities, both parties recognize and understand the meaning implicit in each other's performance. As a metacommunicative activity, the value of game lies in transmitting to young children a framework for behavior in a specific culture, teaching them how to view behavior in the context in which it occurs and how to evaluate things about it, rather than teaching young children certain cognitive abilities or assuming certain roles. Game is a precursor to young children's understanding and build of the representational world. The Soviet psychologist Vygotsky once pointed out that game creates the "zone of nearest development" for young children. Game is the primary source of preschool young children's development. Therefore, game is a tool for young children's development, which is constantly built and generated in game. Integrating games into young children education and forming a gamified teaching method, compared with traditional teaching, gamified teaching can better enhance young children's interest in learning and promote the development of young children's emotions, attitudes, abilities, knowledge, skills, and other aspects of different perspectives. Therefore, gamified teaching is a prevalent teaching method in young children education, and its application value in young children education is extremely high. Gamified teaching has received more and more attention and concern worldwide. In foreign countries, gamified teaching has become an important trend in education, and many schools and educational institutions are actively promoting and applying gamified teaching. For example, education departments and schools in the United States, the United Kingdom, Canada, Australia, and other countries have begun the practice and research of gamified teaching and have achieved some initial results. In China, in order to promote the comprehensive and harmonious development of young children's body and mind, on October 9, 2012, Chinese Ministry of Education formally promulgated the Guidelines for Learning and Development of Young children Aged 3-6 (http://www.moe.gov.cn/srcsite/A06/s3327/201210/t20121009_143254.html), which provide specific methods and suggestions for preventing and overcoming the phenomenon of "primary schooling" in young children education, including the need to understand the learning styles and characteristics of young children. Young children's learning is based on direct experience and occurs in game and daily life. It is important to cherish the unique value of game and life, to create a rich educational environment, to rationalize daily life, to support and satisfy, to the maximum extent possible, the needs of young children to acquire experience through direct perception, practical operation, and personal experience, and to prohibit over-education and intensive training strictly. The Outline of Guidance for Kindergarten Education issued by the Chinese Ministry of Education in September 2001 (http://www.moe.gov.cn/srcsite/A06/s3327/200107/t20010702_81984.html) also reflects that young children education should be based on game

as the primary activity in kindergartens. Specifically, it means that the activities carried out by kindergartens should have the nature of games. In terms of time and space, most of the time in kindergarten should be based on game activities. Young children start from morning games and have special game time in the morning and afternoon for regional games, sports games, outdoor games, and so on. From the perspective of methods and means, games are integrated into the daily activities of young children education as a method and means. For example, in education and teaching, we often use games as a means to start: color games, "colorful change," cognitive games, "Where are the small animals?", mathematical games, "Which ranks first?", Language games, and so on, with a variety of methods and means to enrich the teaching, with the help of young children's curiosity, stimulate young children's interest in learning. From the point of view of content and form, games are integrated into kindergarten education as a type of content and form. Games should not be isolated and divided but should reflect the complete experience of young children as the objective of the activity, and the purpose of arranging games is not to complete the game but to promote the development of young children with the help of the game, which is the most effective way of learning. Because games are one of the favorite activities of young children, they have the highest motivation to participate in game activities, and the learning effect is undoubtedly better. Mr. Chen Heqin (1892-1982), a famous expert in young children education in the history of modern Chinese education, proposed that it is a natural tendency for young children to like games, and young children should be given all types of game tools at their age so that they can have appropriate games. Teachers should respect willingness of young children to game, and they should be friends with young children, close to them, and play with them to understand each child's temperament and ability to guide them better and promote their development. According to Mr. Chen Heqin, "Game is the life of young children," which can give them happiness, experience, knowledge, thoughts, and health. It has crucial educational value and should be the primary way of young children education. In recent years, the implementation of gamification in the kindergarten curriculum has gradually become a hot topic in education. Good gamified teaching can help young children learn knowledge more enjoyably, and at the same time, it can also cultivate young children's curiosity, independent learning ability, social abilities, moral character, and creativity. There are many different types of games, and different games can enable young children to develop differently and directly gain experiences corresponding to the objectives of the games. In order to promote the development of young children, applying suitable types of games to teaching has become a critical issue that teachers should pay attention to. In Yingyue Fang's (2022) study on the classification of games, according to Piaget's theory of cognitive development, young children's games can be classified into four categories: Sensorimotor, symbolic, structural, and rule-based games. According to American psychologist Patton's social development theory, young children's games can be divided into six categories: inactive behavior, standby behavior, solitary games, parallel games, joint games, and cooperative games. Sara Smilansky, a famous scholar of young children research in Israel, proposed six elements for diagnosing and evaluating role games, and according to the characteristics of the game, it can be classified into four stages: functional games, building games, role games, and rule-based games (Yingyue Fang. 2022). Li Ma and Yufeng Tao (2019) published a book that mentioned that China's Professor Liu Yan, a famous young children education expert, once classified young children's games into free game activities, corner game activities, and group activities according to the difference in the degree of teachers' intervention and control of young children's activities. This book summarized that the classification of young children's games has different classification methods and standards depending on the objectives. Therefore, when exploring the application of the classification of games, it is important to incorporate specific educational and teaching objectives (Li Ma & Yufeng Tao. 2019). Based on the above development background and problems, the researcher is interested in studying

the effectiveness of gamified teaching based on Piaget's four types of games to developing for young children in Chongqing, China, in order to bring benefits for the enhancement of China's young children education and apply it to the daily teaching of young children, as well as to help the majority of teachers to enhance the effect of gamified teaching, so that young children can enhance their interest in learning in the process of engaging in the games and gain more knowledge and experience. The young children's interest in learning is enhanced by participating in the games. They gain more knowledge and experience, enrich their life abilities and emotions, and realize healthy physical and mental development. This will make young children education better meet the needs of the national development program.

LITERATURE REVIEWS

Piaget's theory of cognitive development was proposed by the famous developmental psychologist Jean Piaget and is recognized as the most authoritative theory in developmental psychology in the 20th century. According to Piaget, young children's cognition is a building process that builds on existing schemas and then continuously develops from lower to higher levels through mechanisms such as assimilation, Accommodation, and equilibrium. That is how individuals gradually understand the world through perception, thinking, and reasoning in adapting to the environment (Jun Lang. 2011).

Four fundamental concepts of cognitive development theory

1) Schema is a central concept in Piaget's theory. It refers to a cognitive structure or model used to organize and interpret an individual's experience and knowledge of the world. A schema is a mental structure based on an individual's experiences and perceptions that contains a set of concepts, ideas, thoughts, and memories that enable the individual to recognize, classification, and understand new information. Schemas plays an important role in cognitive development. According to Piaget's theory, young children form different schemas at different developmental stages, and these schemas gradually evolve and change with cognitive development. Initial schemas are generally based on concrete experiences and sensations, and young children build and modify schemas through continuous experimentation and experience. Young children develop more abstract and complex schemas as cognitive development progresses to better process and understand new information and experiences. The formation and development of schemas are also affected by the cognitive conflict and balance of the individual. When an individual encounters new information or experience, it causes cognitive equilibrium if it is compatible with the existing schema; if it is not compatible with the existing schema, it causes cognitive conflict. Individuals re-establish cognitive balance by adjusting or modifying schemas and gradually develop and improve their cognitive abilities.

2) Assimilation refers to the process by which an individual, when confronted with new experiences or information, incorporates the new experience or information into existing cognitive structures and knowledge frameworks. In other words, individuals make new experiences and information understandable and interpretable by comparing and matching them with pre-existing knowledge and experience. Assimilation helps individuals connect new experiences and information to their existing cognitive structures, enabling them to understand better and process the new experiences and information. Through assimilation, individuals can classify, sort out, and understand new experiences and information based on their pre-existing cognitive structures.

An important feature of assimilation is that individuals when confronted with new experiences and information, may attempt to classify them into pre-existing cognitive structures, even though such classify may be erroneous or inaccurate. In the early stages of cognitive development, this is because individuals often rely on pre-existing cognitive structures to interpret and make sense of new experiences and information.

3) Accommodation refers to the process by which an individual regulates his or her internal structure to adapt to a specific stimulus. When an individual encounters a new stimulus that cannot be assimilated with the original schema, he or she has to modify or reconstruct the original schema to adapt to the environment. This will force the individual to change the existing cognitive schema and form some new schema suitable for the new experience, causing the cognitive structure to evolve and change.

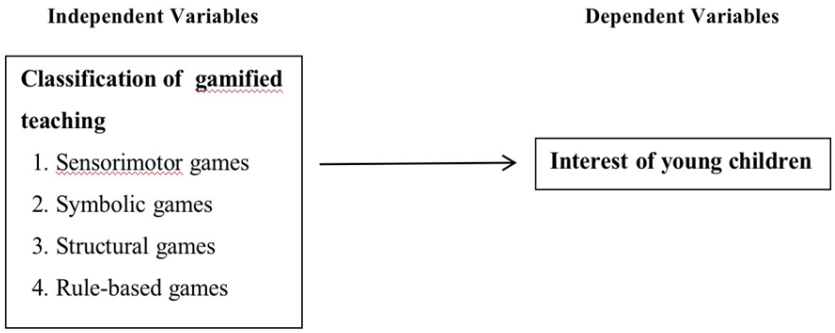

Figure 1 Conceptual Framework

RESEARCH METHODOLOGY

Population and sample Group

Population: 4012 teachers from 120 kindergartens in Chongqing Municipality as the research subjects. Sampling: The sample group consisted of 351 teachers from 120 kindergartens in Chongqing. The sample group was determined using Krejcie and Morgan (1970) tables to determine the number of young children and was selected using simple random sampling based on the size of the kindergarten.

Research Instruments

The research instrument used in this study was a questionnaire, which was divided into the following three parts:

Part 1: This is an important information collection, including the teacher's gender, age, kindergarten, and teaching class.

Part 2: Investigating the effects of gamified teaching based on Piaget's four types of games in Kindergartens in Chongqing, China, and ask teachers about young children's interest and participation in games and how games promote development of young children in gamified teaching. It is mainly categorized into the following four types of games:

1) Sensorimotor games
2) Symbolic games
3) Structural games
4. Rule-based games

Data collection

To achieve the objectives of this study, the researcher used the following methods to collect the sample data: The researcher requested a letter from the graduate school to apply to the local education authority to allow the researcher to conduct a questionnaire survey in 120 kindergartens in Chongqing on the sample of this study, and The researcher collected questionnaires from a sample of 120 kindergartens in Chongqing. Instruments for experiment.

Data Analysis

The statistics used in this study are as follows:

1) Frequency distribution
2) Percentage
3) Average value ($\bar{X}$)
4) Pearson correlation coefficient

RESEARCH RESULTS

This part is to investigate the effectiveness of applying sensorimotor games, symbolic games, structural games, and rule-based games to teaching in promoting the development of young children in kindergartens in Chongqing, China, and to analyze the mean, standard deviation, and the results of the analysis are as follows:

Table 1 Examining the effectiveness of gamified teaching based on Piaget's four types of games in promoting development of young children in kindergartens in Chongqing, China.

Effectiveness of gamified teaching based on Piaget's four types of games	$\bar{X}$	**S.D.**	**Level**	**Rank**
Sensorimotor games	4.39	1.003	high	1
Symbolic games	3.99	0.947	high	4
Structural games	4.28	1.044	high	2
Rules-based games	4.24	1.077	high	3
Total	**4.22**	**1.020**	**high**	

Table 1 Examine that the effectiveness of gamified teaching based on Piaget's four types of games to development for young children in kindergartens in Chongqing is at the high level ($\bar{X}$ = 4.22, S.D. = 1.020). When looking at each item individually, it is found that each item is at the high level which are in orders from the highest to the lowest as follows: Sensorimotor games ($\bar{X}$ = 4.39, S.D. = 1.003), structural games ($\bar{X}$ = 4.28, S.D. = 1.044), rule-based games ($\bar{X}$ = 4.24, S.D. = 1.077), symbolic games ($\bar{X}$ = 3.99, S.D. = 0.947).

Table 2 Examining the effectiveness of sensorimotor gamified teaching to development for young children

Effectiveness of sensorimotor gamified teaching	$\bar{X}$	**S.D.**	**Level**	**Rank**
Ability to develop and enhance young children's senses, motor abilities, body control and coordination	4.36	1.029	high	3
Can develop young children's ability to perceive objects, space, and time	4.38	1.023	high	2
Ability to promote the mental health and physical development of young children	4.41	0.983	high	1
Total	**4.38**	**1.011**	**high**	

Table 2 Examine that the effectiveness of sensorimotor gamified teaching to development for young children in kindergartens in Chongqing is at the high level ($\bar{X}$ = 4.38, S.D. = 1.011). When looking at each item individually, it is found that each item is at the high level which are in orders from the highest to the lowest as follows: Ability to promote the mental health and physical development of young children ($\bar{X}$ = 4.41, S.D. = 0.983), can develop young children's ability to perceive objects, space, and time ($\bar{X}$ = 4.38, S.D. = 1.023), ability to develop and enhance young children's senses, motor abilities, body control and coordination ($\bar{X}$ = 4.36, S.D. = 1.029).

Table 3 Examining the effectiveness of symbolic gamified teaching to development for young children

Effectiveness of symbolic gamified teaching	$\bar{X}$	S.D.	Level	Rank
Can develop young children's imagination and creativity	3.95	1.042	high	3
Can promote the development of expressive language, social and emotional abilities in young children	3.97	0.905	high	2
Develops self-confidence and self-expression.	3.98	0.953	high	1
Total	**3.97**	**0.967**	**high**	

Table 3 Examine that the effectiveness of symbolic gamified teaching to development for young children in kindergartens in Chongqing is at the high level ($\bar{X}$ = 3.97, S.D. = 0.967). When looking at each item individually, it is found that each item is at the high level which are in orders from the highest to the lowest as follows: Develops self-confidence and self-expression ($\bar{X}$ = 3.98, S.D. = 0.953), can promote the development of expressive language, social and emotional abilities in young children ($\bar{X}$ = 3.97, S.D. = 0.905), can develop young children's imagination and creativity ($\bar{X}$ = 3.95, S.D. = 1.042).

Table 4 Examining the effectiveness of structural gamified teaching to development for young children

Effectiveness of structural gamified teaching	$\bar{X}$	S.D.	Level	Rank
Can exercise fine motor abilities, spatial cognition and creative thinking of young children	4.30	1.007	high	1
Ability to develop patience and concentration in young children	4.29	1.028	high	2
Ability to develop independent thinking and problem solving abilities in young children	4.27	1.064	high	3
Can enhance young children's interest in exploring the characteristics and structural attributes of objects	4.26	1.063	high	4
Total	**4.27**	**1.052**	**high**	

Table 4 Examine that the effectiveness of structural gamified teaching to development for young children in kindergartens in Chongqing is at the high level ($\bar{X}$ = 4.27, S.D. = 1.052). When looking at each item individually, it is found that each item is at the high level which are in orders from the highest to the lowest as follows: Can exercise fine motor abilities, spatial cognition and creative thinking of young children ($\bar{X}$ = 4.30, S.D. = 1.007), ability to develop patience and concentration in young children ($\bar{X}$ = 4.29, S.D. = 1.028), ability to develop independent thinking and problem solving abilities in young children ($\bar{X}$ = 4.27, S.D. = 1.064), can enhance young children's interest in exploring the characteristics and structural attributes of objects ($\bar{X}$ = 4.26, S.D. = 1.063).

Table 5 Examining the effectiveness of rule-based gamified teaching to development for young children

Effectiveness of rule-based gamified teaching	$\bar{X}$	S.D.	Level	Rank
Can foster the development of cooperation, competition, self-control and social interaction abilities in young children	4.27	1.051	high	1
Can develop logical thinking, decision-making and problem-solving abilities in young children	4.26	1.075	high	2
Can help young children learn to accept the psychological resilience of competitive failure	4.22	1.070	high	3
Total	**4.25**	**1.065**	**high**	

Table 5 Examine that the effectiveness of rule-based gamified teaching to development for young children in kindergartens in Chongqing is at the high level ($\bar{X}$ = 4.25, S.D. = 1.065). When looking at each item individually, it is found that each item is at the high level which are in orders from the highest to the lowest as follows: Can foster the development of cooperation, competition, self-control and social interaction abilities in young children ($\bar{X}$ = 4.27, S.D. = 1.051), can develop logical thinking, decision-making and problem-solving abilities in young children ($\bar{X}$ = 4.26, S.D. = 1.075), can help young children learn to accept the psychological resilience of competitive failure ($\bar{X}$ = 4.22, S.D. = 1.070).

Part 3 Level of interest in Piaget's four types of games among young children in kindergartens in Chongqing, China

This part is to investigate young children's interest in Piaget's four types of games, mainly including: investigation of young children's preference, whether the game can enhance children's learning interest, young children's participation and cooperation in the games, and analysis of the average and standard deviation, the analysis results are as follows:

Table 6 Examining the level of interest in Piaget's four types of games among young children in kindergartens in Chongqing, China

Level of interest in games among young children	$\bar{X}$	S.D.	Level	Rank
Sensorimotor games enhance young children's interest in learning, and young children enjoy this type of games	4.40	1.004	high	1
Symbolic games enhances young children's interest in learning and young children enjoy this type of games	4.04	0.884	high	4
Structural games enhances young children's interest in learning and young children enjoy this type of games	4.22	1.115	high	2
Rules-based games enhances young children's interest in learning and young children enjoy this type of games	4.21	1.116	high	3
Total	**4.22**	**1.030**	**high**	

Table 6 Examine that the interest in Piaget's four types of games among young children in kindergartens in Chongqing is at the high level ($\bar{X}$ = 4.22, S.D. = 1.030). When looking at each item individually, it is found that each item is at the high level which are in orders from the highest to the lowest as follows: Sensorimotor games enhance young children's interest in learning, and young children enjoy this type of games ($\bar{X}$ = 4.40, S.D. = 1.004), structural games enhances young children's interest in learning and young children enjoy this type of

games ($\overline{X}$ = 4.22, S.D. = 1.115), rules-based games enhances young children's interest in learning and young children enjoy this type of games ($\overline{X}$ = 4.21, S.D. = 1.116), symbolic games enhances young children's interest in learning and young children enjoy this type of games ($\overline{X}$ = 4.04, S.D. = 0.884)

DISCUSSION & CONCLUSION

The findings from this study highlight the significant effectiveness of gamified teaching, grounded in Piaget's four types of games—sensorimotor, symbolic, structural, and rule-based—on the developmental outcomes of young children in kindergartens. Each type of game demonstrated a high effectiveness level, indicating that incorporating these pedagogical strategies can significantly enhance various developmental areas in early childhood education.

1) Effectiveness of Different Game Types: The results reveal that sensorimotor games (mean = 4.39) ranked highest in effectiveness, followed closely by structural games (mean = 4.28), rule-based games (mean = 4.24), and symbolic games (mean = 3.99). The strong performance of sensorimotor games aligns with Piaget's theory, emphasizing the importance of hands-on, experiential learning in young children's cognitive and motor skill development. This finding underscores the relevance of active participation in fostering essential skills such as coordination, spatial awareness, and sensory processing.

2) Specific Benefits of Sensorimotor Games: Delving deeper into the effectiveness of sensorimotor games, results indicate that they not only enhance physical abilities (mean = 4.36) but also promote mental health and overall development (mean = 4.41). This multifaceted impact suggests that such games are critical for holistic development, addressing both physical and psychological needs in early childhood.

3) Role of Symbolic Games: Although symbolic games ranked lowest among the four types, their ability to develop children's imagination and creativity (mean = 3.95) and enhance expressive language skills (mean = 3.97) is crucial. These skills are foundational for effective communication and emotional expression, which are vital for social interactions and personal development.

4) Structural and Rule-Based Games: Structural games significantly contribute to fine motor skills and problem-solving abilities, which are essential for cognitive development (mean = 4.30). Meanwhile, rule-based games foster cooperation and social interaction (mean = 4.27), emphasizing the importance of social learning through guided play. The high engagement levels noted in these games indicate that they provide opportunities for children to learn important social skills in a fun and interactive context.

5) Interest Levels in Games: The study also assessed the interest levels of young children in these games, with sensorimotor games receiving the highest interest rating (mean = 4.40). This correlation between effectiveness and interest suggests that engaging children in enjoyable learning activities significantly enhances their motivation and participation, further promoting their overall development.

Conclusion

In conclusion, this research demonstrates that gamified teaching, based on Piaget's four types of games, effectively promotes the development of young children in kindergartens in Chongqing, China. Each game type serves distinct developmental purposes, contributing to a well-rounded educational experience that fosters cognitive, emotional, and physical growth.

The findings advocate for the integration of diverse gamified teaching strategies in early childhood education curricula. By prioritizing sensorimotor, structural, symbolic, and rule-based games, educators can create engaging learning environments that cater to the holistic development of children.

Future research could explore long-term effects of these teaching methods on child development and academic performance. Additionally, examining how these games can be

effectively implemented in various educational settings would provide valuable insights for educators and policymakers.

Overall, the results underscore the importance of innovative, play-based learning approaches in shaping the developmental trajectories of young children, preparing them for future academic and social success.

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