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Research Article

GAME DESIGN FOR PRESCHOOL CHILDREN BETWEEN 5-6 YEARS OLD IN HO CHI MINH CITY BASED ON STEAM APPROACH

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ABSTRACT

STEAM education for preschool children is considered an educational strategy to help develop a child's capability comprehensively according to the motto "playing by learning, learning by playing". *The article investigates the current situation for preschool children between 5 to 6 years old based on the STEAM approach with 278 managers and preschool teachers in Ho Chi Minh City. Results of the surveys show that the majority of managers and preschool teachers had correct but incomplete judgments about games concept, basic characteristics, and structure of games; games objectives, the importance of games, standards, scientific basis, and game design process for competence development of preschoolers between 5 to 6 years old. The STEAM based design and organization of games is relatively new to managers and preschool teachers; therefore, it is only sometimes held at kindergartens. The difficulties that managers and preschool teachers faced were the lack of official mechanisms or policies on macro-level regarding STEAM education, and the application of game methods in teaching preschool children between 5 to 6 years old has not been exploited or not adequately invested.*

Keywords: 5-6 years old preschoolers; games with STEAM approach; game design according to STEAM approach

1. Introduction

Play is the main activity of preschoolers where they "playing by learning, learning by playing" (Nguyen, 2000). Being able to approach STEAM education in early childhood education programs is an approach that brings effectiveness, and practical meaning to the comprehensive development of capability for preschoolers between 5-6 years old. STEAM is an integration of STEM (Science, Technology, Engineering, Math) and Art. STEAM education emphasizes learning based on experiences and practice, thus, creating meaningful

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products for the child in his every day life (Munawar, 2019). The STEAM based game design for preschoolers between 5-6 years old creates opportunities for children to explore, practice, and gain experience with science, technology, engineering, art, and math. Thereby, preschool children between 5-6 years old develop abilities such as cooperation, communication, problem-solving, and critical thinking, and expand one's interest, attention, and concentration. All of these create favorable conditions for the development of science, technology, engineering, mathematics, and art in a better way (Nguyen, 2019). Therefore, design and organization of games according to STEAM approach is an important and essential topic for competence development for preschoolers between 5-6 years old.

However, the reality at kindergartens shows that the application of game methods in teaching preschool children between 5-6 years old has not been exploited or not appropriately invested. In addition, at kindergartens, teachers often use the game as a means of strengthening school hours. Still, they are not fully aware of the importance and characteristics of the game in the context of comprehensive development of a child's capabilities and preparing him to enter first grade under the new National Education Program 2018 (Tran, 2021). In this article, the study's results on the current situation of game design for preschool children between 5-6 years old in Ho Chi Minh City according to the STEAM approach are analyzed and served as a practical basis for the research topic.

2. Research contents

Game design for preschoolers between 5-6 years old based on the STEAM approach

Games for preschoolers between 5-6 years old based on the STEAM approach is a type of game with rules, which is structured as learning games, geared towards awareness to expand, accurize, and systematize existing symbols to develop intellectual capability and educate the child's curiosity, in which learning content is integrated into the form of play (Huynh, 2005). The purpose of developing scientific, technological, engineering, art, and math competencies and skills such as critical thinking, communication, collaboration, and creativity is the central purpose of games for preschoolers between 5-6 years old based on the STEAM approach.

This type of game design is appropriate for the child's psychophysiological characteristics and the objectives of the Early Childhood Education program. STEAM games need to be designed according to the child's interets, understanding, and abilites; it must always create challenges to stimulate children to think and apply STEAM knowledge to solve situations in the game. Thereby, it helps children understand the meaning of using STEAM knowledge to life and promote children to develop creative thinking.

Six principles that should be followed: (1) In line with its purpose; (2) Comprehensive; (3) Developmental: (4) Appropriate with game structure and characteristics; (5) Diversified; (6) Ensuring popularity (Pechegova, 2008).

A variety of steps can be taken to design the game in a STEAM approach for preschoolers between 5-6 years old. Tran (2011) lists six steps process: (1) *Determine* the *current cognitive level of preschoolers between 5-6 years old; (2) Identify criteria, and content; (3) Prepare environment and means of play; (4) Determine the rules of the game; (5) Determine criteria for game evaluation; (6) Development orientation of the game*. The research team followed Iarezkaia Anna Iurevna's research about the game design process for preschoolers between 5-6 years old. This process consists of three steps: (1) Preparation, which includes setting goals for the game, rules of the game, game content, determining criteria to evaluate the effectiveness of the game, determining limits on time, space, material selection, toys; (2) Organize the game; (3) Analyze and evaluate the game to adjust the objectives, content, rules of the game; improve the product through problem-solving thinking; analyze the achievement of the objectives of the game according to the criteria and effectiveness of the game (Iarenkaia, 2016; Maria et al., 2020).

The structure of the game consists of three components: cognitive tasks (game content), game actions (game manipulations), and game rules (rules of the game). All the games designed based on the STEAM approach always exists a relationship between the teacher and the child, between the child and their peers, and group work activities, all of which are the primary activity in the game playing process. This relationship is determined by the game tasks, actions of the game, or the rules of the game. The difference between STEAM games and learning games is the child's independence and initiative, most of which is shown during the child's play operations and play actions. Children choose their methods of action in the flexible, creative application of their insights to solve their playing tasks effectively (Iarezkaia, 2016; Комагова, 2012).

For preschoolers between 5-6 years old, through STEAM games, they will have the opportunity to experience, practice, and explore with available materials and toys. In addition, intellectual manipulations, intellectual qualities, and intellectual abilities are also stimulated and developed. Games for preschoolers between 5-6 years old based on the STEAM approach bring various benefits to the comprehensive development of the child's personality, help to form in children the essential qualities and competencies, and create a solid foundation for children to be ready to enter first grade with the National Education program 2018.

2.1. Methods and participants

***Survey purpose*:** Assess the awareness level of managers and preschool teachers about game design for preschool children between 5-6 years old in Ho Chi Minh City according to the STEAM approach

Survey content

(1) Awareness of managers and preschool teachers about the concept, basic characteristics, and structure of STEAM games for preschoolers between 5-6 years old; Recognize the purpose of organizing the games for preschoolers between 5-6 years old in Ho Chi Minh City.

(2) STEAM game design for preschoolers between 5-6 years old: Game design based on the STEAM approach; Scientific basis for STEAM game design for preschoolers between 5-6 years old; STEAM game design process for preschoolers between 5-6 years old according to the STEAM approach.

Survey area: District 3, 4, 8, 12, Binh Tan, Phu Nhuan, Tan Binh – Ho Chi Minh City.

Participants: 278 managers and preschool teachers.

Table 1. *Summary of the level of training, seniority of management/work of managers and preschool teachers*

Criteria	Subject of study	Managers (N=88)				Preschool teachers (N=189)					
		Public		Private		Public		Private		International	
		Qty	%	Qty	%	Qty	%	Qty	%	Qty	%
Training level	Intermediate	0	0	0	0	8	5.4	8	32	2	13.3
	College	7	10.3	7	35	38	25.5	7	28	2	13.3
	University	55	80.9	12	60	102	68.4	10	40	9	60.1
	Post-graduate	6	8.8	1	5	1	0.7	0	0	2	13.3
	Total	68	100	20	100	149	100	25	100	15	100
Working experiences	Less than five years	7	10.3	4	20	16	10.8	6	24	4	26.7
	5-10 years	11	16.2	8	40	45	30.2	7	28	5	33.3
	11-15 years	8	11.7	6	30	30	20.1	7	28	5	33.3
	Over 15 years	42	61.8	2	10	58	38.9	5	20	1	6.7
	Total	**68**	**100**	**20**	**100**	**149**	**100**	**25**	**100**	**15**	**100**

Survey period: from January 2021 to March 2021

Survey method:

The research team used quantitative research methods, and selected the target sample (in the form of a survey) of 278 managers and preschool teachers working in Districts 3, 4, 8, 12, Phu Nhuan, Binh Tan, and Tan Binh in Ho Chi Minh City. Researchers also combined qualitative research methods, including in-depth interviews with 40 participants,observation of 10 study activities and play activities, analyses of 10 monthly and weekly plans of the school; analysis of 10 daily plans of preschool teachers. The survey results collected from participating managers and preschool teachers at some kindergartens in Ho Chi Minh City, including STEAM education results, were processed using SPSS software, and in-depth interviews were transcribed, coded, and grouped into different topics. This helps the research team prove and clarify the research subjectivity and research contents.

Data processing tools (see Table 2)

All survey data were processed using SPSS statistical software version 20.0

For quantitative questions that gave the outcome as scores, only the mean value is used for calculation according to Likert 5 scale.

Range = (Maximum – Minimum)/n = (5-1)/5 = 0.8.

Table 2. *Meaning of mean value for the Likert scale*

Mean value	Meaning
1.00 – 1.80	Completely disagree/Completely ineffective/Completely no impact/Completely Unfeasible/Never
1.81 - 2.60	Disagree/Ineffective/No Impact/Unfeasible/Rarely
2.61 – 3.40	Confused/Somewhat effective/Somewhat an impact/Less feasible/ Occasional
3.41 – 4.20	Agree/Effective/Decent impact/Feasible/Often
4.21 -5.00	Completely agree/Completely effective/Completely an impact/Entirely feasible/Always

In addition, the research team evaluated the scale's reliability using the Cronbach's Alpha reliability factor, regression analysis, and cognitive level testing of the two groups. ANOVA was also used to determine differences in awareness levels of managers and preschool teachers. If the Sig value is less than 0,05, it is statistically sufficient. The following hypothesis: (1) H0: there is no difference in the level of awareness between the two groups of managers and preschool teachers; (2) H1: there is a difference in cognitive level between the two groups. If the Sig value <0.05, H0 is rejected and H1 is accepted; Conversely, if the Sig value >0.05, H0 is accepted and H1 is rejected. In addition, the topic uses validation calculations of the correlation between variables (Chi-Square for qualitative variables and T-Test for quantitative variables).

2.3. Findings

2.3.1. Topic 1. Awareness about the game for preschoolers between 5-6 years old based on the STEAM approach

a) Awareness of the concept of "STEAM games for preschoolers"

Table 3. *Comparison of the awareness level between managers and preschool teachers about the concept of games according to the STEAM approach*

No.	Concept of STEAM game	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level of meaning	Ranking	Mean	Level of meaning	Ranking	
1	It is the type of action in which the "engine" is not in the performance but in the process of creating the product	3.89	Agree	7	4.30	Completely agree	3	0.000
2	It is a game that helps develop a child's capability of science, technology, engineering, aesthetics/art, mathematics	4.17	Agree	5	4.17	Completely agree	6	0.982

3	It is a game that requires children to apply much knowledge, skills to solve problems, create products, teamwork, socialization. This helps children learn and develop better	4.25	Completely agree	2	4.29	Completely agree	4	0.584
4	It is a game that requires children to mobilize their own hidden artistic abilities to solve a problem or create a product	4.21	Completely agree	4	4.44	Completely agree	2	0.003
5	It is a game that helps children experience feelings of failure as well as success in the process of learning and playing	4.09	Agree	6	4.19	Agree	5	0.243
6	It is a game to help children and students develop optimally in terms of aptitude, creativity, active learning methods	4.22	Completely agree	3	4.19	Completely agree	5	0.754
7	It is a game that uses science, technology, engineering, art, and mathematics to guide children to learn, discuss, collaborate and develop critical and creative thinking	4.39	Completely agree	1	4.51	Agree	1	0.100
	Overall Mean	**4.17**			**4.30**			

Table 3 shows certain similarities in the level of game concept awareness according to the STEAM approach for preschoolers of the two groups, mean values range from 4.17 to 4.30, which corresponds to the level of complete agreement. The majority of the participantsof the two groups completely agreed with the concept of "*STEAM game is a game using Science, Technology, Engineering, Art and Math to guide children to learn, discuss, collaborate and develop critical thinking, creative,"* and ranked it 1st in Table 3.

The T- Test results in Table 3 show that the majority of the criteria (5 out of 7) have Sig>0.05, so H0 hypothesis was accepted, and H1 was rejected. This means there is no difference in opinion of the concept of the game according to the STEAM approach for preschoolers of the two groups of preschool teachers and managers.

b) Types of games are usually held for preschoolers between 5-6 years old at kindergartens

Although 278 preschool teachers and managers have correct awareness of STEAM game concept, the results shown in Figure 1 below help to assess the difficulties in managing and organizing STEAM games at kindergartens.

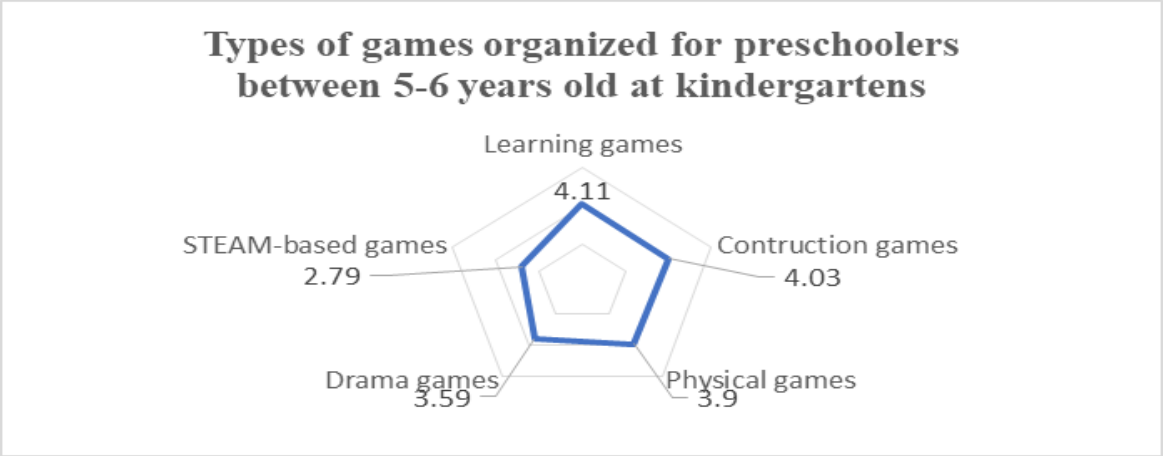

Figure 1. *Types of games organized for preschoolers between 5-6 years old at kindergartens*

Figure 1 shows a noticeable difference in the awareness the participants studying the organization of STEAM games with the basic types of games at kindergartens. The statistical significance of the overall mean value of the two groups of subjects was spread along with the range from 2.79 to 4.11. When the value is arranged based on the frequency level, different types of games such as learning, construction, physical, and drama games are ranked as “often” to “always”. It is worth emphasizing that the STEAM game corresponds to "Occasionally" with Mean = 2,79 in terms of implementation level.

Table 4. *Comparison of reality in terms of assigning game organization for preschoolers between 5-6 years old between managers and preschool teachers at kindergartens*

No	Game types	Managers (assignment) (N=88)			Preschool teachers (organization) (N=189)		
		Mean	Level of meaning	Ranking	Mean	Level of meaning	Ranking
1	Learning games	4.41	Always	1	4.11	Often	1
2	Contruction games	4.35	Always	2	4.03	Often	2
3	Physical games	4.34	Always	3	3.90	Often	3
4	Drama games	4.16	Often	4	3.59	Often	4
5	Roleplay game	4.07	Often	5	4.01	Often	5
6	STEAM-based games	3.06	Often	6	2.79	Occasionally	6

Table 4 shows the difference between the frequent assignment of managers and the reality that preschool teachers only sometimes organize for preschoolers between 5-6 years old to play games according to the STEAM approach. Preschool teacher 1 shared: "STEAM-based games are a type of game that aims to develop children's abilities, create conditions for children to practice, experience, create meaningful products but teachers like us have not been trained in the design and organization of this game, especially our school principal has

not assigned any STEAM games in the class." Meanwhile, manager 1 said, "We have encouraged teachers to design and organize a variety of games for children to promote their positivity, including games according to the STEAM approach." Futhermore, the research team read ten monthly and weekly plans of kindergartens; and 10 daily plans of preschool teachers. However, the evidence of frequent assignment and the occasional organization of the game according to the STEAM approach at kindergartens in the selected survey areas is quite vague:

c) Awareness about the game structure

Table 5. *Comparision of the awareness results in the structure of the game*

No	Structure of the STEAM game	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level of meaning	Ranking	Mean	Level of meaning	Ranking	
1	Game name	4.01	Agree	9	4.35	Completely agree	2	**0.000**
2	Purpose of the game	4.15	Agree	4	4.35	Completely agree	2	**0.001**
3	Toy	4.24	Completely agree	3	4.28	Completely agree	3	0.600
4	Play situation	4.04	Agree	8	4.35	Completely agree	2	**0.000**
5	Play content	4.27	Completely agree	2	4.35	Completely agree	2	0.216
6	Play theme	4.06	Agree	7	4.35	Completely agree	2	**0.000**
7	Role play	4.00	Agree	10	4.28	Completely agree	3	**0.003**
8	Play action	4.09	Agree	6	4.28	Completely agree	3	**0.023**
9	Rules of the game	3.99	Agree	11	4.28	Completely agree	3	**0.002**
10	Children's products	4.14	Agree	5	4.20	Agree	4	0.513
11	Direction of development, improving the game	4.28	Completely agree	1	4.38	Completely agree	1	0.150
	Overall Mean	**4.12**			**4.31**			

Table 5 results showed that the awareness level of the game structure had a mean value ranging from 3.99 (agree) to 4.28 (completely agree). Similarly, the mean value of managers ranges from 4.20 to 4.38, which is at "completely agree" level. The results of the T-Test in Table 5 show that the majority of the criteria (7 out of 11) have Sig value <0.05, so H1 hypothesis was accepted and H0 is rejected. In summary, according to STEAM approach, there is a meaningful difference berween the awreness level of preschool teachers and managers of the game structure for preschoolers between 5-6 years old.

d) Awareness of basic characteristics of games

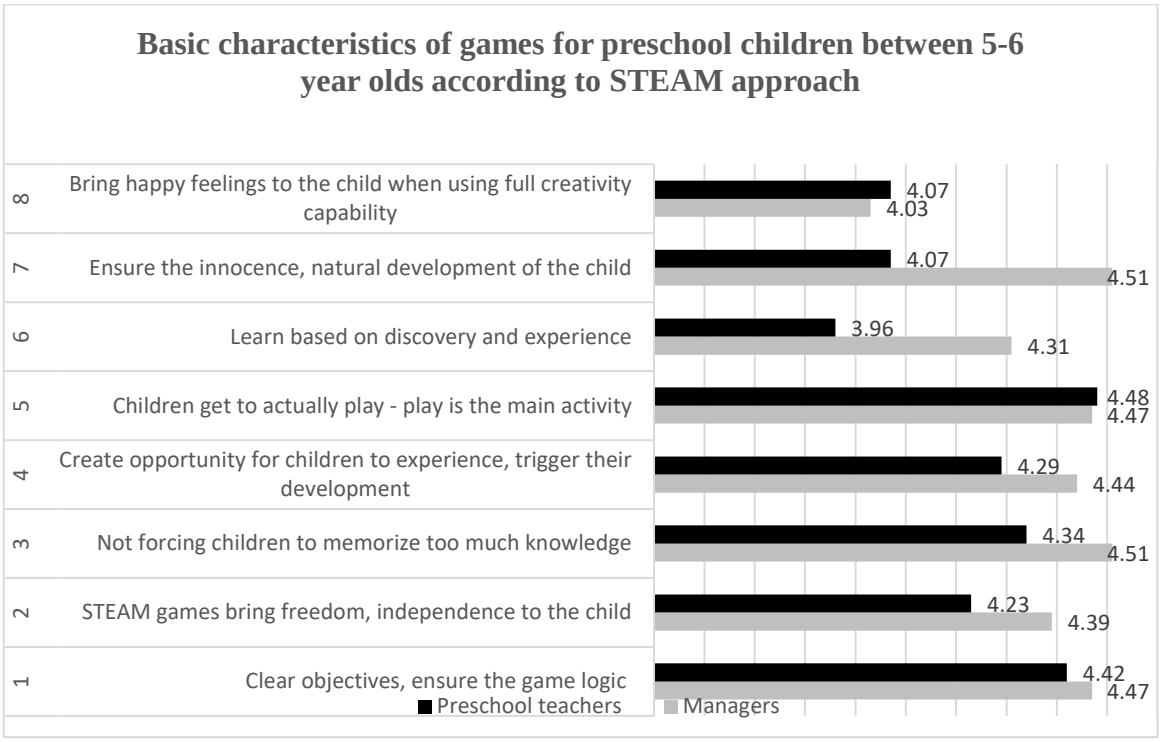

Figure 2. *Basic characteristics of games for preschool children between 5-6 year olds according to the STEAM approach*

Figure 2 shows a meaningful difference between the awareness level of preschool teachers and managers about the characteristics of the games according to STEAM approach. The results show that managers had a higher level of agreement than preschool teachers. The overall mean value of awareness level of preschool teachers is 4,17, which is at the "Agree" level. The overall mean value of managers is 4.30, which reflects the "Completely agree" level.

e) Awareness of the purpose of organizing games

Table 6. *Comparison of the awareness level between preschool teachers and managers on the purpose of organization games for preschoolers between 5-6 years old according to STEAM approach*

No	The purpose of organizing games for preschoolers between 5-6 years old in the STEAM approach	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level of meaning	Ranking	Mean	Level of meaning	Ranking	
1	Help children develop comprehensively	4.27	Completely agree	6	4.51	Completely agree	2	**0.002**
2	Create conditions for children to experience and practice	4.41	Completely agree	1	4.58	Completely agree	1	**0.010**
3	Satisfy the child's need of play	4.35	Completely agree	3	4.07	Agree	7	**0.015**
4	Meet the needs of parents	3.91	Agree	10	4.04	Agree	8	0.181
5	Develop creative thinking	4.37	Completely agree	2	4.47	Completely agree	3	0.192
6	Develop the ability to detect and solve problems scientifically and logically with integrated knowledge	4.30	Completely agree	4	4.36	Completely agree	5	0.495
7	Equip needed skills to become creative and independent-thinking individuals	3.97	Agree	9	4.35	Completely agree	6	**0.000**
8	Develop integrated learning and experiences for children to solve practical problems	4.08	Agree	8	4.35	Completely agree	6	**0.000**
9	Develop confidence to combine knowledge from all different fields in a creative way to explore to solve useful problems in practice	4.11	Agree	7	4.35	Completely agree	6	**0.004**
10	Develop creativity, critical thinking, collaboration, problem -solving, technological capability, science, engineering, mathematics, and the arts	4.28	Completely agree	5	4.38	Completely agree	4	0.258
	Overall mean	**4.21**			**4.35**			

Table 6 shows that the Overall Mean=4.21 for the awareness level of preschool teachers and the Overall Mean of managers = 4.35, both of which are at "Agree" level. Both groups agreed on purposes such as: *"Creating conditions for children to experience and practice,"; "Developing creative thinking", "Developing the ability to detect and solve problems scientifically and logically with integrated knowledge"*. However, on the statistical level of the T-Test, 6 out of 10 criteria are recorded with Sig<0.05, which shows a significant difference between the awareness level of preschool teachers compared to managers, or in other words, between the two groups studied were no similarity in purpose 1,2,3,7,8,9 when organizing games for 5-6 year olds according to STEAM approach.

2.3.2. Topic 2. Game design for preschoolers between 5-6 years old

a) Standards to be ensured when designing games for preschoolers between 5-6 years old according to STEAM approach

Table 7. *Comparison of awareness level between preschool teachers and managers about game design standards for preschoolers between 5-6 years old according to STEAM approach*

No	Designing games standards	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level of meaning	Ranking	Mean	Level of meaning	Ranking	
1	Ensure the goal of the game to develop comprehensive competencies for children	4.16	Completely agree	3	4.44	Completely agree	3	**0.000**
2	Play motto (which is an important factor in controlling a child's learning activities)	4.10	Completely agree	5	4.35	Completely agree	5	**0.004**
3	Achieve the goal, prepare preschool children between5-6 years old to enter first grade	4.01	Completely agree	7	4.31	Completely agree	6	**0.000**
4	Bring joy and happiness to children	4.16	Completely agree	3	4.47	Completely agree	2	**0.000**
5	Create curiosity, imagination, challenges, control ability of the child	4.17	Completely agree	2	4.51	Completely agree	1	**0.000**
6	Ensure visualization based on the child's experience	4.10	Completely agree	5	4.47	Completely agree	2	**0.000**
7	Ensure the child's creativity in the game	4.13	Completely agree	4	4.39	Completely agree	4	**0.001**
8	Clearly define the game mission, rules of the game	4.17	Completely agree	2	4.39	Completely agree	4	**0.003**
9	Ensuring competition and cooperation factor	3.90	Completely agree	9	4.25	Completely agree	8	**0.000**
10	Changes and adjustments available	4.02	Completely agree	6	4.25	Completely agree	8	**0.006**

No	Designing games standards	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level of meaning	Ranking	Mean	Level of meaning	Ranking	
11	Create conditions for children to roleplay or play simulated plays	3.96	Completely agree	8	4.25	Completely agree	8	**0.004**
12	Ensure feedback on the process of play, the game result	4.18	Completely agree	1	4.28	Completely agree	7	0.210
	Overall Mean	**4.09**			**4.36**			

Table 7 shows that there is a significant difference between the awareness level of preschool teachers and managers about the standards to be ensured when designing games for preschoolers between 5-6 years old according to the STEAM approach. Managers have a higher level of agreement than preschool teachers (Overall Mean = 4,36 vs 4,09). In addition, T-Test results from Table 7 show a statistically significant difference between the awareness level of preschool teachers and managers in the context of game design standards for preschoolers 5-6 years according to the STEAM approach, showing that with 11 out of 12 criteria have Sig value <0.05.

b) Awareness of the scientific basis for game design

Table 8. *Comparison of awareness level of preschool teachers and managers about the scientific basis to design games for preschoolers between 5-6 years old according to the STEAM approach*

No	Game design's scientific basis according to the STEAM approach	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level meaning	Ranking	Mean	Level meaning	Ranking	
1	Based on the objectives of the Early Childhood Education Program	4.10	Agree	6	4.48	Completely agree	2	**0.000**
2	Based on time distribution of implementation organization for the Early Childhood Education Program	4.11	Agree	5	4.47	Completely agree	3	**0.000**
3	Based on caring and education plans implemented according to daily routine	4.15	Agree	3	4.44	Completely agree	5	**0.000**
4	Based on regulations under the Standards of developmenf for 5-year-old children	4.07	Agree	8	4.42	Completely agree	6	**0.000**
5	Based on the purpose of promulgating the Standards of developemenf for 5-year-old children	4.08	Agree	7	4.39	Completely agree	7	**0.000**
6	Based on the alignment on caring and education of children between school, family and society	4.05	Agree	9	4.27	Completely agree	9	**0.005**
7	Based on the purpose of raising awareness of the development of children to have the coordination of capability development education for children between 5-6 years old	4.12	Agree	4	4.49	Completely agree	1	**0.000**

No	Game design's scientific basis according to the STEAM approach	Preschool teachers (N=189)			Managers (N=88)			Sig
		Mean	Level meaning	Ranking	Mean	Level meaning	Ranking	
8	Based on the game characteristics according to STEAM approach	4.08	Agree	7	4.45	Completely agree	4	**0.000**
9	Based on the principle of game design according to STEAM approach	4.21	Completely agree	2	4.37	Completely agree	8	**0.040**
10	Based on the purpose of the game to developcomprehensive competencies for children	4.33	Completely agree	1	4.45	Completely agree	4	0.140
	Overall Mean	**4.12**			**4.42**			

Results in Table 8 show a significant difference in the evaluation level of the scientific basis for game design, according to which managers have a higher agreement level than preschool teachers. This is also demonstrated through 9 out of 10 criteria with Sig value <0,05. This emphasizes that there is a difference between the awareness level of preschool teachers and managers on the scientific basis in game design according to STEAM approach. Manager 2 states: "Based on the purpose of raising awareness of children's development to have the coordination of capability development education for children 5-6 years old is an important foundation for game design". Preschool teacher 2 shares a similar opinion: "*Based on the purpose of the game to develop comprehensive competencies for children is the basis of game design according to STEAM approach*".

However, preschool teacher 3 shared a difficulty in designing games according to the STEAM approach, saying that, "*Because I were not trained or read any professional documents on STEAM education, for example characteristics of STEAM games, so I have not identified the right scientific basis to design the game according to STEAM approach. Particularly, preschool teachers are not ready to design and organize STEAM games because they have not been directed by kindergartens' managers*."

c) Game design process for preschool children

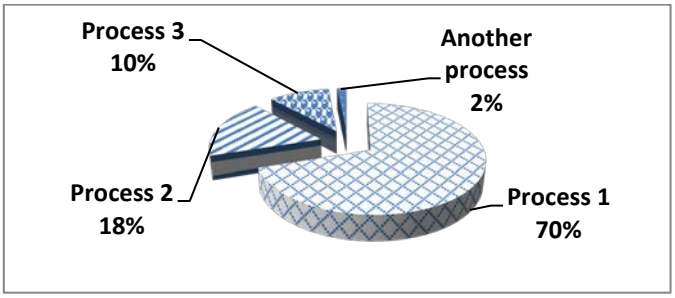

Figure 3. *Game design process for preschoolers between 5-6 years old according to STEAM approach*

Figure 3 results show that 70% of preschool teachers and managers chose to design games for preschoolers between 5-6 years old according to the STEAM approach, which includes the following steps: identify goals; name the game; game rules or game contents; game means and conditions; evaluate games; develop games.

Table 9. *Comparison of awareness level between preschool teachers and managers about game design process for preschoolers between 5-6 years old according to STEAM approach*

No	Game design process	Preschool teachers (N=189)			Managers (N=88)		
		Mean	Level meaning	Ranking	Mean	Level meaning	Ranking
1	Determine the objectives of the game	4.30	Completely agree	1	4.43	Completely agree	1
2	Orient game development	4.23	Completely agree	2	4.41	Completely agree	3
3	Define the rules of the game	4.21	Completely agree	3	4.43	Completely agree	2
4	Define play content	4.24	Completely agree	4	4.39	Completely agree	5
5	Prepare game means and conditions	4.22	Completely agree	5	4.44	Completely agree	4
6	Specify a game name	4.26	Completely agree	6	4.43	Completely agree	6
7	Define game review criteria	4.21	Completely agree	7	4.44	Completely agree	7
8	Evaluate the results of play and adjust	4.21	Completely agree	8	4.39	Completely agree	8
	Overall Mean	**4.24**			**4.42**		

Results in Table 9 show that both teachers and managers have a positive evaluation of the steps of the STEAM game design process reflected with many answers of "Completely agree". Most of them think that the first step "Determine the objectives of the game" should be ranked at the first place. Clear objectives will help identify the content that needs to be combined and integrated to develop STEAM capability for children. Overall Mean values are 4.24 and 4.42, both of which correspond to the level of "Completely agree".

Table 9 shows that preschool teachers and managers have the proper awareness with high rankings (2nd and 3rd) of "Completely agree" about the step "Define the rules of the game". However, in fact, many games introduced do not properly express the characteristics of the game according to the STEAM approach, most of which are too lengthy, not able to attract the child's attention from the beginning of the game organization. The game itself must gain the child's curiosity and interest, trigger them eager to learn, explore, experience, and develop their capability for cooperation and creativity.

The research team conducted a direct interview with preschool teachers and managers in Districts 3, 8, 12, and Phu Nhuan. Preschool teacher 4 stated, "I understand the basics of

STEAM; organize practical activities, apply to teaching practice according to the motto of respecting and maximizing the creativity of children. Teacher is just the one who gives the problem, the direction, and the children will be the ones who solve the problem." Manager 3, who has 11 years of experience in the field, also shared her thought, "STEAM education program helps children learn not only to learn by heart, but also learn as quickly as possible when it is applied to their daily lives. Therefore, each knowledge or skill will become meaningful when it is associated with creating a specific product such as paragliding, pasta tower, rock shooting, adorable robots, etc. For each scientific principle to be specific and directly applied by the children, such as to invent their favorite toy. Thereby, this strongly affects children's interest and passion."Manager 4 mentioned some difficulties such as "the lack of official mechanisms or policies on macro-level regarding STEAM education and the limited capability of teachers in applying game methods to teach preschoolers between 5-6 years old".

3. Conclusion

Survey results can be summarized in the following primary points:

1) STEAM games are only occasionally held at kindergartens despite the high awareness level of preschool teachers and managers. They understand the importance and the positive impact of STEAM education and games to the development of comprehensive capability for preschoolers between 5-6 years old. The analysis mentioned above shows that there should be a steering mechanism for the organization of STEAM education for preschool level. It is necessary to organize professional training for teachers on how to design and organize STEAM games. This will help preschool children develop their capabilities and qualifications to prepare for first grade under National Education Program 2018.

2) The above figures show a meaningful difference between the level of awareness of preschool teachers and managers in terms of characteristics, structure, purpose, and standards to be ensured when designing STEAM games for preschool children between 5-6 years old. Awareness of the scientific basis, game design process according to the STEAM approach is suitable to the specific position, functions, and responsibilities of preschool teachers and managers.

3) Game design for preschoolers between 5-6 years old based on the STEAM approach is to bring Science, Technology, Engineering, Art, and Mathematics to children in a simple, gentle way, closely related to their daily items, toys or materials, brings joy and exciting things to children in different activities in their lives. According to preschool teachers and managers, besides methods and application, STEAM education will help teachers to be more active, promote creativity, bring various practical effectiveness in building and organizing the educational environment, and contribute to the implementation process of the current Early Childhood Education Program and help preschool children between 5-6 years old to develop their competencies.

❖ ***Conflict of Interest:*** *Authors have no conflict of interest to declare.*

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THỰC TRẠNG THIẾT KẾ TRÒ CHƠI CHO TRẺ MẪU GIÁO 5-6 TUỔI Ở THÀNH PHỐ HỒ CHÍ MINH THEO CÁCH TIẾP CẬN STEAM

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TÓM TẮT

Giáo dục STEAM với trẻ mầm non được xem là chiến lược giáo dục giúp phát triển toàn diện năng lực cho trẻ theo phương châm "chơi mà học, học bằng chơi". *Bài viết đề cập thực trạng thiết kế trò chơi cho trẻ mẫu giáo 5-6 tuổi theo tiếp cận STEAM trên 278 cán bộ quản lí, giáo viên mầm non ở Thành phố Hồ Chí Minh. Kết quả khảo sát thực trạng cho thấy đa số cán bộ quản lí, giáo viên mầm non có nhận định đúng đắn, nhưng chưa đầy đủ về khái niệm, đặc trưng cơ bản, cấu trúc của trò chơi theo cách tiếp cận STEAM, mục đích, tiêu chuẩn, cơ sở khoa học, quy trình thiết kế trò chơi, tầm quan trọng của trò chơi theo cách tiếp cận STEAM đối với sự phát triển năng lực của trẻ mẫu giáo 5-6 tuổi. Việc thiết kế và tổ chức trò chơi theo cách tiếp cận STEAM còn khá mới mẻ với cán bộ quản lí, giáo viên mầm non, và thỉnh thoảng được tổ chức ở trường mầm non. Những khó khăn mà cán bộ quản lí, giáo viên mầm non gặp phải là chưa có các cơ chế, chính sách chính thống ở tầm vĩ mô về giáo dục STEAM và việc vận dụng phương pháp trò chơi vào dạy học cho trẻ mẫu giáo 5-6 tuổi chưa được khai thác, chưa được đầu tư đúng mức.*

Từ khóa: trẻ mẫu giáo 5-6 tuổi; trò chơi theo cách tiếp cận STEAM; thiết kế trò chơi theo cách tiếp cận STEAM