

CULTIVATING THE TEACHING STAFF TO MEET THE REQUIREMENTS OF STEAM EDUCATIONAL ACTIVITIES AT PRESCHOOLS IN VIETNAM

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Abstract: the research aims to provide solutions for cultivating the teaching staff to meet the requirements of STEAM education for children at Vietnamese preschools. The author uses the theoretical research method based on the literature synthesis, the survey method using questionnaires, and the quantitative data processing method. The research sample to test the necessity and feasibility of the solutions was randomly composed of 200 managerial staff and teachers from many preschools in Vietnam. Research results are evaluated based on the indicators of \bar{X} under scales converted into equivalent points. Moreover, the research also focuses on developing 30 indicators equivalent to 4 professional groups to measure the preschool teachers' competency, helping managerial staff evaluate output standards after implementing the measures.

Keywords: education management, STEAM education, solutions, cultivating teaching staff, criteria for evaluating the teachers' competency.

ПОДГОТОВКА ПРЕПОДАВАТЕЛЬСКИХ КАДРОВ ДЛЯ СООТВЕТСТВИЯ ТРЕБОВАНИЯМ ОБРАЗОВАТЕЛЬНОЙ ДЕЯТЕЛЬНОСТИ НАУЧНО-ТЕХНИЧЕСКИХ ДИСЦИПЛИН И ГУМАНИТАРНЫХ НАУК В ДОШКОЛЬНЫХ УЧРЕЖДЕНИЯХ ВЬЕТНАМА

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Аннотация: исследование направлено на поиск решений по подготовке педагогического состава для удовлетворения требований STEAM-образования для детей во вьетнамских дошкольных учреждениях. Автор использует метод теоретического исследования, основанный на синтезе литературы, метод опроса с помощью анкет и метод количественной обработки данных. Выборка исследования для проверки необходимости и осуществимости решений была случайным образом составлена из 200 управленческих сотрудников и учителей из многих дошкольных учреждений Вьетнама. Результаты исследования оцениваются по показателям \bar{X} по шкалам, переведенным в эквивалентные баллы. Кроме того, исследование также направлено на разработку 30 показателей, эквивалентных 4 профессиональным группам, для измерения компетентности педагогов дошкольных учреждений, помогая управленческому персоналу оценивать стандарты результатов после реализации мер.

Ключевые слова: менеджмент образования, STEAM-образование, решения, воспитание педагогических кадров, критерии оценки компетентности преподавателей.

1. Introduction

In the context of the Fourth Industrial Revolution, professions in the STEAM field, such as computer science, energy, automation technology, artificial intelligence, space science, and aviation, tend to increase. Thus, we live in an era of a fierce race in science, technology, engineering, etc, between countries worldwide. In that context, a country that does not catch up with the development of science and technology will fall behind. Therefore, an advanced education system must create a high-quality workforce capable of meeting future demands and enhancing the country's competitiveness in the international market.

Creating solutions in educational management will support schools in STEAM-oriented development to achieve the goal of helping students become their best and happiest versions and find meaningful ways to help society by contributing good things and appreciating each other's efforts. Solutions must meet new requirements in global education: the balance between personal rights and community responsibilities, between national interests and the safety of humanity, and between financial expectations and a sustainable society.

In particular, training preschool teachers to meet the requirements when organizing STEAM educational activities is a crucial task of educational management.

2. Cultivating teaching staff to meet the requirements of STEAM educational activities at preschools

2.1 Content of measures

The first is to plan and build a roadmap for developing the teaching staff to meet the requirements of teaching STEAM educational activities at preschools.

Before planning, it is vital to evaluate the current situation of the school's teachers to determine the recruitment needs in terms of quantity and qualifications and meet the demands for implementing the STEAM education program. Thanks to that, it is possible to build a training roadmap to enhance the qualifications and competence of teachers to meet the capacity to organize STEAM educational activities at preschools.

The second is recruiting teaching staff who meet professional standards.

Initially, the recruitment criteria will be based on Circular No. 26/2018/TT-BGDĐT, which specifies the professional standards for preschool teachers [1]. At the same time, teachers must meet requirements about capacity in implementing STEAM education program, including:

The ability to create unique situations and stimulate children's inherent abilities and thinking ability to solve their problems.

The ability to stimulate children to come up with creative, feasible, and logical solutions and designs.

The ability to connect and coordinate relationships in the classroom to create efficiency in children's group work.

The ability to encourage and lead children to strive and persevere to the end to responsibly create their own products.

Knowing how to stimulate children with open questions so that children can find problems that need to be learned after implementation.

The ability to handle problems arising in children's activities and interactions without losing interest, concentration, and fairness between children.

Clearly demonstrating the role of coordinating, leading, and provoking rather than acting for and not intervening too much in the children's work process in the STEAM classes.

The third is training a team of teachers to carry out STEAM educational activities according to the content and duration of 300 hours, including theory, curriculum framework development, and direct teaching [2].

Table 1. Content and duration of training on STEAM education for preschool teachers at non-public schools.

No.	Content of training	Duration	Form
1	The theoretical basis of STEAM education for preschool children.	10 hours	Theory
2	Content of STEAM education program: Science, Technology, Engineering, the Arts, and Mathematics.	20 hours	Theory
3	Instructions on organizing STEAM educational activities for preschool children according to the 5E model (Engage, Explore, Explain, Elaborate, and Evaluate).	20 hours	Theory
4	Methods to organize STEAM educational activities for preschool children.	10 hours	Theory
5	Instructions for designing lesson plans, weekly plans, monthly plans, and project plans for STEAM educational activities at preschools.	80 hours	Theory
6	Instructions on building an educational environment and preparing tools and equipment for STEAM education for preschool children.	20 hours	Theory
7	Guidance on assessing student capacity according to the output standards of the STEAM education program.	20 hours	Theory
8	Attend practical lessons and directly practice organizing STEAM educational activities for preschool children.	120 hours	Practice
Total duration (Hours)		300 hours	

The fourth is to let teachers implement STEAM educational activities.

The professional managers will assign specific tasks to each teacher in the class by age to ensure effective implementation of the STEAM education program. Every teacher needs to know how to connect the tasks of traditional education and the tasks of STEAM education logically to ensure that works do not overlap during implementation.

In addition, building a learning environment and program needs to go hand in hand with evaluating teachers, as well as effectively using resources inside and outside the school to support teachers in performing their duties.

Moreover, it is necessary to establish a coordination mechanism, creating a connection between teachers in a class, grade, or school to ensure that the teaching process is inherited and closely linked.

The fifth is to evaluate the teaching staff in implementing STEAM educational activities.

2.2 Implementation method

Firstly, it is necessary to determine the training objectives for each content in the theoretical and practical modules. Teachers need to understand the philosophy, goals, and content of STEAM education for preschool children. Besides, they shall identify implementation principles and methods for each activity. A theoretical foundation is vital so teachers do not get sidetracked when participating in the program's operating process. For the modules related to STEAM lesson design based on appropriate projects for each age group, teachers need to understand the structure of the lesson plan, plan the activities, and arrange them scientifically to balance the program's content. Actual observation and teaching practice are the final steps to practicing the skills and knowledge of teachers before they teach directly.

Secondly, it is to determine criteria to evaluate preschool teachers' competency in organizing STEAM educational activities. Within the research framework, the author will base on the professional standards of preschool teachers, including the following five competency groups:

- Group 1: Ability to understand and encourage children to participate in activities with interest.
- Group 2: STEAM knowledge and teaching methods for preschool children.
- Group 3: Attitude in the process of organizing STEAM teaching.
- Group 4: Skills to build a STEAM learning environment for preschool children.

2.3 Conditions for implementation

Firstly, the goals and strategies of non-public preschools will affect the goals of the training program and the level of investment in developing teaching staff. Via the organization's goals, the managerial staff can build a specific action plan and guide the organization, deployment, and evaluation of teachers' competency.

Secondly, preschool teachers shall have a degree and experience operating STEAM. They must meet the new professional standards prescribed by the Ministry of Education and Training for preschool education: to have graduated from college or higher with a major in early childhood education. In addition, they need to be trained systematically and fully in theory and practice to organize STEAM education suitable for early childhood education.

Thirdly, it is the spirit and approach of teachers in STEAM education at non-public preschools because the mindset and understanding of educators serve as the motivation, source of inspiration, and role model for each student to grow and develop positively.

Fourthly, the mechanisms and policies regarding remuneration for teachers implementing the STEAM program at non-public preschools play a crucial role in motivating them to truly believe in and commit to their mission. This is particularly significant given the financial challenges often faced by private schools.

Lastly, support from relevant authorities, particularly the Department of Education and Training and the Provincial Department of Education and Training, is essential for teachers. This support involves evaluating teachers' competency based on STEAM principles rather than assessment criteria used for traditional teachers.

3. Assessing the necessity and feasibility of measures to cultivate the teaching staff to meet the requirements of STEAM education at preschools

Assessing the necessity and feasibility of measures to manage STEAM education for preschool children at non-public schools was carried out in 4 schools in 4 provinces, namely Ho Chi Minh City, Tay Ninh, Binh Duong, and Dong Nai, with 200 managerial staff and preschool teachers (including 11 managerial staff and 189 preschool teachers).

Table 2. Table of survey subjects on the urgency and feasibility of measures to cultivate teachers to meet the requirements of STEAM educational activities at preschools.

No.	Name of school	Subjects			Provinces
		Managerial staff	Teachers	Total	
1	Tay Ninh Kindergarten	3	56	59	Tay Ninh
2	Binh Duong Kindergarten	3	62	65	Binh Duong
3	Dong Nai Kindergarten	3	42	45	Dong Nai
4	Tan Phu Kindergarten	2	29	31	Ho Chi Minh City
Total		11	189	200	

To evaluate the necessity and feasibility of the solutions, the survey was conducted simultaneously on 200 managerial staff and preschool teachers, with 3 rating scales equivalent to 3 points: Very necessary/ very feasible (3 points), Necessary/ feasible (2 points), Not necessary/ not feasible (1 point).

The final result will be converted to the mean \bar{X} with the following levels:

Mean \bar{X} = From 2.5 points to 3 points: Very necessary/ very feasible.

Mean \bar{X} = From 2.0 points to < 2.5 points: Necessary/ feasible.

Mean \bar{X} = From 1.0 points to < 2.0 points: Not necessary/ not feasible.

Through the results, the author assessed the current state of awareness about the necessity and feasibility of measures to train teachers to meet the requirements of STEAM educational activities at preschools. Specifically as follows:

Table 3. Results of assessing the necessity and feasibility of measures to cultivate teachers to meet the requirements of STEAM educational activities at preschools.

Level	Rating scale	Scale	Value	% ratio	Value of conversion points	Mean
Level of necessity	Very necessary	3	120	60%	360	2.5
	Necessary	2	60	30%	120	
	Not necessary	1	20	10%	20	
Level of feasibility	Very feasible	3	116	58%	348	2.52
	Feasible	2	72	36%	144	
	Not feasible	1	12	6%	12	

Table 3. shows the results of assessing the necessity and feasibility of measures to cultivate teachers to meet the requirements of STEAM educational activities at preschools. Of these, the majority believed that the measures were very necessary and very feasible with a rate of 60% and 58% of the total evaluation results, respectively. Up to 90% and 94% of the surveyed managerial staff and preschool teachers rated the solutions as necessary and feasible or higher. Only 10% of the surveyed managerial staff and teachers thought the solutions were not necessary, and 6% supposed the solutions were not feasible, indicating that applying the solutions would gain great consensus from the preschools' implementation team.

After converting to the total score, the mean of the necessity level for the solutions was \bar{X} = 2.5, and the mean of the feasibility level was \bar{X} = 2.52, reaching the mean of "very necessary" and "very feasible." It can be said that managerial staff and preschool teachers highly appreciate the urgency of the solutions to bring about the effectiveness of implementing a STEAM education program and the feasibility of applying the solutions in practice.

4. Developing a scale to measure the effectiveness of implementing measures to cultivate the teaching staff to meet the requirements of STEAM educational activities at preschools

To evaluate the effectiveness of applying measures to train teachers to meet the requirements of STEAM educational activities at preschools, the author constructed criteria and measurement scales to evaluate the output competencies of preschool teachers after completing the steps in the solution implementation process. These criteria were established based on the general job requirements of preschool teachers and incorporated new content related to skills, knowledge, and the implementation of the STEAM education program for preschool children.

Criteria were divided into 5 groups with 4 levels equivalent to conversion points as follows: Very Good (4 points), Good (3 points), Average (2 points), and Weak (1 point), in which:

Group 1: Ability to understand and encourage children to participate in activities with interest (9 criteria).

Group 2: STEAM knowledge and teaching methods for preschool children (9 criteria).

Group 3: Attitude in the process of organizing STEAM teaching for preschool children (5 criteria).

Group 4: Skills to create a STEAM learning environment for preschool children (7 criteria).

Table 4. Ability to understand and encourage children to participate in activities with interest.

No.	Assessment criteria	Level				Total score	Average score
		Weak	Average	Good	Very good		
		1	2	3	4		
1	Developing the content of STEAM lessons suitable for each age group.						
2	Deploying the content of the lessons through situations.						
3	Testing and assessing students with scores and comments.						
4	Responding to children's questions accurately and respectfully.						
5	Creating an open and happy atmosphere in the classroom.						
6	Encouraging learners to discuss and draw their conclusions.						

7	Creating an environment to help children work in groups effectively.						
8	Understanding children's difficulties and intervening promptly and appropriately.						
9	Understanding each student's strengths and weaknesses and responding positively.						

Table 5. STEAM knowledge and teaching methods for preschool children.

No.	Assessment criteria	Level				Total score	Average score
		Weak	Average	Good	Very good		
	1	2	3	4			
1	Selectively integrating the content of many subjects in STEAM education for preschool children.						
2	Analyzing and arranging the STEAM program suitable for preschool children.						
3	Understanding knowledge in the field of STEAM for preschool children.						
4	Designing, developing models, and optimizing the use of technology in STEAM education for preschool children.						
5	Using teaching methods flexibly to make lessons attractive to children.						
6	Developing STEAM lessons through projects in an effective and insightful way.						
7	Deploying STEAM learning for preschool children through experience and daily life.						
8	Encouraging students to use their own experiences to solve relevant problems.						
9	Creating learning tasks suitable for each topic.						

Table 6. Attitude in the process of organizing STEAM teaching.

No.	Assessment criteria	Level				Total score	Average score
		Weak	Average	Good	Very good		
	1	2	3	4			
1	Willing to receive feedback to improve skills.						
2	Realizing the role of connecting STEAM topics with the life of preschool children.						
3	Exploring and creating new knowledge so preschool children have an educational foundation before entering Grade 1 and can better connect with the future.						
4	Sharing experiences with colleagues and parents to jointly enhance the capacity to organize STEAM activities at preschools.						
5	Understanding the importance of developing preschool children's critical thinking and creative capacity in STEAM education.						

Table 7. Skills to create a STEAM learning environment for preschool children.

No.	Assessment criteria	Level				Total score	Average score
		Weak	Average	Good	Very good		
	1	2	3	4			
1	Arranging appropriate space to organize STEAM activities inside and outside the classroom.						
2	Preparing adequate tools and learning materials for						

	children's STEAM activities.						
3	Arranging learning materials conveniently so teachers and children can use them flexibly.						
4	Ensuring the safety, modernity, and nature-friendliness of materials used for STEAM activities.						
5	Selecting and appropriately using teaching aids in STEAM education to suit each age group.						
6	Allocating time appropriately and managing STEAM activities effectively.						
7	Handling situations during the process of organizing STEAM teaching for preschool children.						

After evaluating and synthesizing, the average score of each index will be compared with the following 4 score ranges:

Very good: $\bar{X} = 3.25$ to 4.0

Good: $\bar{X} = 2.50$ to < 3.25

Average: $\bar{X} = 1.75$ to < 2.50

Weak: $\bar{X} = 1.00$ to < 1.75

5. Conclusion

To boost the quality of managing STEAM education, it is significant to invest in developing a team of teaching staff. Training a qualified teacher to implement a STEAM education program takes a long time and requires much effort and finance. Hence, schools should have good policies to keep teachers engaged and motivate them to love their jobs and be interested in the new program.

The research results provide theoretical and practical tools and criteria for evaluating teachers' output standards. That process requires managers to be far-sighted and understand the school's goals, requirements, and expectations. Only when we have a scientific and methodical training plan and implement it consistently, continuously, and thoughtfully can we create effectiveness. Moreover, it is critical to apply theoretical and practical elements flexibly, and the implementation process needs to be closely followed by professional managers who will evaluate and give comments. From there, a continuous cycle with inheritance will be formed so that each teacher can enhance his or her competence, share experiences with new teachers, and evolve into a future training expert.

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