Difficulties in implementing STEAM education model at the Northern mountainous preschool in Vietnam

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Abstract: STEM education – an educational model of 4.0 era, is an educational trend considered an effective educational model recognized by developed countries in the world. However, to apply this model to Vietnam, it is necessary to pay attention to regional factors to choose which education model is appropriate for children, with the actual level of teachers and facilities condition. Localization is a very important thing before implementing a new spear model. In this report, the author wants to mention the difficulties encountered when implementing STEAM education model at preschool in mountainous areas of Northwest Vietnam with the characteristics of mainly ethnic minorities. We conducted a survey of 32 managers and 460 preschool teachers from 3 provinces of Son La, Dien Bien and Lai Chau to explore these difficulties. Thence, proposing to orient solutions to be able to deploy this educational model effectively.

1. Introduction

1.1. Currently, the new education program in Vietnam with an educational perspective towards creativity and high humanity aims to help children comprehensively develop from their early lives, there have been many advanced educational models that have been implemented in Vietnam that also have brought certain benefits. However, the STEAM educational model - an educational program derived from the idea of teaching in five foundational areas: Science, Technology, Engineering, Math and Art – helps children understand the operating laws of the physical world, promote the ability to categorize world-around problems by critical thinking, stimulate children’s creativity based on the cooperation and positive communication. This model has been recognized in the world, especially in developed countries, which have been successfully and effectively implemented [1], [2], [3], [14].

1.2. Along with the trend of international integration, to apply advanced education models and create opportunities for human resources development in the future, Vietnam has also initially welcomed this model. In fact, this model has only experimentally experienced and applied in some bilingual preschools in the center of big cities. Meanwhile, the more education towards creativity is introduced from the younger age, the more effectively they will achieve. Therefore, in the spirit of creativity and humanity in the modern education, every child must be concerned and enjoy advanced education for integration and development. However, STEAM is still a "strange" term for preschool teachers and children, especially in mountainous areas where mainly ethnic minorities live. It is effective to implement this model in Vietnam or not? What advantages and disadvantages will be encountered when there is a significant difference between teachers’ awareness and facilities of schools/classes in difficult areas and ethnic minority areas (see photo illustration) [5], [6], [7], [9], [10], [11], [12], [13], [15].
1.3. As an ethnic lecturer living in disadvantageous mountainous areas, I myself wish to contribute to give pre-school children in difficult mountainous areas and ethnic minority-inhabited areas in 3 provinces Son La, Dien Bien and Lai Chau the opportunity to enjoy an advanced education model like STEAM. In order to effectively implement a new educational model in difficult mountainous areas such as Northwest of Vietnam, it is essential to understand the factual local conditions. Therefore, in this article, we present the difficulties in preschools in the three mountainous provinces in the Northwest (Son La, Dien Bien and Lai Chau) in terms of human resources (managers and preschool teachers), facilities (teaching and learning aids, toys, equipment, classrooms) and financial issues.

2. Method of investigation and research
- Investigation method: the author uses questionnaires, in-depth interviews and observation methods.
- Research content: Find out and present the difficulties of human resources like managers and preschool teachers who will participate in the implementation of the STEAM educational model and the facility of these schools.
- When implementing the STEAM education model in difficult areas like the northwest region, many difficulties will be encountered, especially in terms of human resources. However, if organizations pay enough attention to the facility improvement and to directly support in disadvantaged areas and preschool managers and teachers are trained, and fostered knowledge and skills of STEAM, the access to this educational model has the best effect. This helps children in the disadvantaged areas have opportunities for integration and development along with the general trend of the world.

3. Participants
The research object is 460 preschool teachers and 32 managers in 3 northern mountainous provinces in Vietnam: Son La, Dien Bien and Lai Chau.

4. Finding and discussion
In this study, we understand the difficulties that are obstacles to the development of awareness, attitudes and individual behaviors of preschool pre-school managers and teachers involved in educational tasks. These difficulties are expressed in the conditions of facilities, social environment (the support of stakeholders) [7].

4.1. Difficulties in human resources
To meet the requirements of modern education in the industrial revolution 4.0, managers need to have some modern qualities and competencies such as cooperation skills, critical thinking, problem solving skills, and know how to compare Vietnamese education with other advanced educations in the world. Preschool teachers, not only have the duty to care for and educate children, but they must also be the enlightened founders, discover the inherent potential in each child to nurture and build a good future for him.

Nevertheless, both managers and teachers especially need to have the open attitude, to embrace the new to build an advanced education for integration and development. In what way are preschool teachers and managers aware of an advanced education model like STEAM? How much do they meet the requirements of this educational model? Are they willing to receive it?

We conducted a survey of 460 preschool teachers with inquiries about qualifications, working experience and ethnicity. Education is always associated with the level of awareness, working experience and regional culture. Therefore, the results shown in the table below are also the basis for implementing a new education model.
Table 1. Qualifications, seniority and ethnicity of preschool teachers

| Ethnic | Quantity | %  | Level               | Quantity | %  | seniority      | Quantity | %  |
|--------|----------|----|---------------------|----------|----|----------------|----------|----|
| Thai   | 295      | 64 | Master's degree     | 0        | 0  | Under 5 years  | 216      | 47 |
| Kinh   | 97       | 21 | University degree   | 97       | 21 | Over 5 years   | 173      | 37.6|
| Mong   | 55       | 12 | Degree Of Associate | 267      | 58 | Over 10 years  | 46       | 10 |
| Muong  | 9        | 2  | Vocational school degree | 96       | 21 | Over 15 years  | 25       | 5.4|
| Dao    | 5        | 1  |                      |          |    |                |          |    |

Figure 1. Perceptions and attitudes of managers and preschool teachers about the superiority of STEAM model

The results of chart 1 show that the percentage of preschool teachers who know about STEAM education model is very small, only accounts for 8% and their answers are almost general. They do not fully understand the education model. The majority responded, "STEAM is a method of learning based on practice and creative experience activities" or "STEAM education is a way based on the integration of science, technology, arts, and math to give students knowledge and to encourage them to be creative." When asking about the answers, they said that they read it on the internet but they were not very clear about that. 92% of teachers have not heard about this education model. When asking about this model, the number of young teachers who mainly have been working for under 5
years were very interested in this model. It can be seen that STEAM education, though it is not new in the world, is a "strange" term for teachers in difficult areas like the northwest region.

Meanwhile, 62.5% of the managers know this model, while the preschool teachers only account for 8%. Thus, the term "STEAM" is not "strange" to the majority of managers but still 37.5% of managers do not know about this model: they are managers in areas where mainly ethnic minorities live, and in villages which is very far away from the center. However, some of pre-school teachers and managers in further interview said that they only read and found an article about STEAM on the internet (Table 2) and doubtfully understood that STEAM is the teaching integrated 5 areas such as Science, Technology, Engineering, Mathematics and Art, but they do not know how to teach, what the program is like, What content is. Teaching facilities, facilities like? I still don't get it. The result shows that the awareness of preschool teachers and managers about STEAM is not officially and systematically equipped; they themselves look for on the internet, so some information is sometimes inaccuracy.

### Table 2: Sources of information that managers and preschool teachers know about STEAM education model

| INFORMATION SOURCES                                | Managers | Preschool teachers |
|---------------------------------------------------|----------|--------------------|
| Quantity  | %        | Quantity  | %                  |
| Performance of the Ministry of Education and Training | 0        | 0                  | 0                   |
| Workshops and conferences                        | 0        | 0                  | 0                   |
| Professional training and retraining             | 0        | 0                  | 0                   |
| Internet                                         | 20       | 62.5               | 37                  |
| Books, notebooks and other documents             | 0        | 0                  | 0                   |

### Table 3: Opinions of preschool managers and teachers on the requirements when implementing STEAM education model

| No | REQUIREMENTS FOR TEACHERS                                                                 | OPINIONS OF TEACHERS | OPINIONS OF MANAGERS |
|----|------------------------------------------------------------------------------------------|----------------------|----------------------|
|    |                                                                                         | Have met | %     | Not have met | %     | No ideas | %     | Have met | %     | Not have met | %     | No ideas | %     |
| 1  | Applying and combining new teaching methods to make the lesson more interesting and interesting for students | 89       | 11    | 0            | 88    | 12       | 0     |
| 2  | Being aware of how to guide, inspire, motivate children to explore, learn and enhance their experiences in activities | 88       | 12    | 0            | 78    | 22       | 0     |
| 3  | Applying new methods to comment and assess children comprehensively                      | 75       | 25    | 0            | 68    | 32       | 0     |
| 4  | Understanding and applying “guiding” children to achieve better performance, instead of merely “teaching” | 88       | 12    | 0            | 80    | 20       | 0     |
| 5  | Creating close coordination in teaching among teachers of different fields              | 10       | 77    | 13           | 8     | 92       | 0     |
| 6  | Applying effectively techniques and technologies in class activities                    | 47       | 48    | 5            | 7     | 93       | 0     |
| 7  | Fully-Understanding the STEM education and apply it to integrate subjects in term of topics | 7        | 83    | 10           | 0     | 89       | 11    |
Table 3 shows that the number of preschool teacher (in the opinion of the teacher) that has met the requirements from 1 to 4 is relatively high. These are the four most important requirements when implementing the STEAM educational model because these requirements also need to be met in the current program and teachers have performed relatively well. In addition, requirements 5 to 7 are not fulfilled. It is compulsory to teachers who meet these 3 requirements to have knowledge and skills about the STEAM program. In fact, this educational model has only been applied in some bilingual preschools at international schools in big cities.

However, the opinions of preschool teachers and managers are much different in requirement of 5, 6 and especially in requirement 7. Therefore, it also means that teachers are still not well-aware of the new education model. On the other hand, managers may have a higher demand for preschool teachers in requirements 5, 6 and 7. However, it is necessary to consider the problem because if there is no agreement between the manager and the teachers, any educational model will face certain difficulties. For the results on facilities, there is no difference between teachers and managers.

Table 4. The ability to fulfill the requirements of a STEAM educational model of preschool education managers

| No | Requirements                                              | Fulfilled Quantity | Fulfilled % | Unfulfilled Quantity | Unfulfilled % |
|----|----------------------------------------------------------|-------------------|-------------|----------------------|--------------|
| 1  | Ability to prepare and manage the facilities of the STEAM model | 32                | 100         | 0                    | 0            |
| 2  | Developing documents related to STEAM implementation     | 27                | 84,3        | 5                    | 15,7         |
| 3  | Training teachers STEAM educational model                | 25                | 78,2        | 7                    | 21,8         |
| 4  | Developing criteria for evaluating teaching and educational results according to STEAM model | 22 | 68,8 | 10 | 31,2 |
| 5  | Participating in training programs about STEAM or self-study / self-training | 32 | 100 | 0 | 0 |
| 6  | Developing a propaganda plan about the STEAM model to relevant partners (teachers, students' parents, local leaders) | 32 | 100 | 0 | 0 |

It can be seen in Table 4 that the majority of managers meet the requirements of a STEAM educational model (including requirements 1, 5 and 6), while about 15% - 32% of managers has not met the requirements 2, 3 and 4. All of unresponsive managers work in remote villages. However, the requirements of 2, 3 and 4 are also the necessary skills for managers to ensure the effective implementation of the STEAM education model or the current model.

Survey results of needs for supporting preschool managers and teachers when implementing STEAM education model:
- On the side of managers
  + Fostering professional knowledge about human resources management, facility management, asset management.
  + Fostering educational management skills in accordance with the new educational environment.
  + Participating in seminars and workshops to get the most accurate knowledge and skills before guiding schools.
  + Participating in seminars on new management skills that are suitable to modern and advanced educational methods and models such as STEAM.
- On the side of preschool teachers
  + Desire to be trained and fostered knowledge and skills about STEAM education model
  + Desire to be supported on facilities of technology and technique and STEAM education program
+ Other suggestions and desires such as: financial support, training experts, policies for teachers and support for ethnic minority children on communication in Vietnamese.

4.2. Difficulties in facility

Table 5: Situation of facilities meeting STEAM education model

| ASPECTS     | FACILITIES REQUIRED IN A THE STEAM CLASS | AT SCHOOL / CLASS |
|-------------|------------------------------------------|-------------------|
|             |                                          | Yes              |
|             |                                          | Quantity | % |
|             |                                          |           |   |
| SCIENCE     | Object / Toy                             | Geoscience game set | 82 | 18 |
|             |                                          | Set of biological science toys | 14 | 3  |
|             |                                          | Set of physical science toys   | 9  | 2  |
|             | Device                                   | Magnifying glass        | 356 | 78 |
|             |                                          | Microscope             | 9  | 2  |
|             |                                          | Laboratory             | 0  | 0  |
| TECHNOLOGY  | Toys, equipment                          | Computer room          | 312 | 68 |
|             |                                          | Speaker                | 460 | 100|
|             |                                          | Telephone              | 225 | 49 |
|             |                                          | I-pad                  | 124 | 27 |
| ENGINEERING | Object / Toy                             | Set of assembled toys  | 382 | 83 |
|             |                                          | Sewing and cutting stitch kits | 244 | 53 |
|             |                                          | Technical drawing ruler| 225 | 49 |
|             |                                          | Scissors, hammer, knife, pliers | 166 | 36 |
|             |                                          | Decoration kit         | 239 | 52 |
|             |                                          | Technical repair kit   | 382 | 83 |
| MATHEMATICS | Object / Toys/S/Toys                     | Clock                  | 414 | 90 |
|             |                                          | Rulers                 | 409 | 89 |
|             |                                          | Shape                  | 331 | 72 |
|             |                                          | Dice                   | 331 | 72 |
|             |                                          | Seeds                  | 460 | 100|
|             |                                          | Grain calculator       | 230 | 50 |
|             |                                          | Calculator stick       | 460 | 100|
|             |                                          | Number card            | 446 | 97 |
| ARTS        | Toys, equipment                          | Color paper            | 322 | 70 |
|             |                                          | Drawing paper          | 460 | 100|
|             |                                          | Easel                  | 262 | 57 |
|             |                                          | Crayon                 | 382 | 83 |
|             |                                          | Waste                  | 409 | 89 |
|             |                                          | Types of leaves, dried fruits, fresh fruits | 460 | 100|
|             |                                          | Clay                   | 414 | 90 |
|             |                                          | Pebbles, stones, sand  | 460 | 100|
|             |                                          | Dried leaves, fruits   | 460 | 100|
|             |                                          | Painting color         | 460 | 100|
|             |                                          | Paint                  | 428 | 93 |

6
The above table shows that the toys and equipment needed for a STEAM class in schools in three provinces are relatively responsive in three subjects like math, science and art, but technology and technique are still poor.

We interviewed some more teachers and it is known that the facility for three subjects containing math, science and art are relatively well-equipped because there are these subjects in the current education program. However, the two aspects of technology and technique which are not in the current program have not been concerned and invested. Almost preschools in this area have relatively equipped for STEAM, like natural materials and toys, but they are mainly lack of modern equipment like technology and technique.

The same question was surveyed on 32 preschool managers, the results matched and they also said that teacher these areas are not well-equipped about technique and technology because of cultural and economic conditions. Therefore, preschool teachers have not applied technique and technology in teaching activities for preschool children. Thus, to ensure a new educational model is effectively implemented, it is significant to have enough necessary facility to support training and retraining of teachers and other factors such as programs, content, methods, environment, experts and facilities.

5. Conclusion
The above research results have shown that most of preschool managers and teachers still do not fully understand the STEAM education model. The number of managers and teachers who are willing to receive this model is small because they are afraid of not being able to implement such a new model, especially teachers with seniority over 15 years and ethnic minority teachers. There is a lack of facilities, especially technology and technique in some schools in remote communes. The results of this study will be the basis for the effective implementation of the STEAM education model.

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References
[1]. Nguyen Minh Anh, Truong Thi Kim Oanh (2019), STEAM: Combination of science and art to comprehensively develop preschool children. National Workshop, University of Education, Hue University.
[2]. Zelasko, N, & Antunez, B. (2000), If your child learns in two languages. National Clearinghouse for Bilingual Education.
[3]. Kelly.C Margot and Todd Kettler (2019), Teachers’ perception of STEM integration and education: a systematic literature review. International Journal of STEM Education
[4]. Ministry of Education and Training (2017), Preschool Education Program.
[5]. Quigley, C.F., & Herro, D. (2016) “Finding the joy in the unknown”: Implementation of STEM teaching practices in middle school science and math classrooms. Journal of Science and Technology, 1 -17
[6]. Chesloff,J.D.(2013). STEM Education Must Start in Early Childhood. Education Week, 32- 37
[7]. Lowrie, T., Downes, N., & Leonard, S. (2018). STEM Education for all young Australians. A Bright Spots STEM Learning Hub Foundation Paper for SVA, in partnership with Samsung. University of Canberra STEM Education Research Centre.
[8]. Hoang Phe (chief editor) (1998), Vietnamese dictionary, Da Nang Publishing House, p 484.
[9]. Bunprom S, Tupsai J, and Yuenyong C (2019). Learning Activities to Promote the Concept of Engineering Design Process for Grade 10 Students’ Ideas about Force and Motion through Predict-Observe-Explain (POE). Journal of Physics: Conference Series, 1340 (1), 012081
[10] Chomphuphra P, Chaipidech P, Yuenyong C (2019). Trends and Research Issues of STEM Education: A Review of Academic Publications from 2007 to 2017. Journal of Physics: Conference Series, 1340 (1), 012069
[11] Duc NM, Linh NQ, and Yuenyong C (2019). Implement of STEM education in Vietnamese high school: unit of acid-base reagent from purple cabbage. *Journal of Physics: Conference Series, 1340* (1), 012029

[12] Duc NM, Ninh TT, Toan NT, Hai KT, and Yuenyong C (2019). STEM education program: manufacturing mixture of phosphate and potash fertilizer straws and waste of animal bones. *Journal of Physics: Conference Series, 1340* (1), 012050

[13] Linh NQ, Duc NM, and Yuenyong C (2019). Developing critical thinking of students through STEM educational orientation program in Vietnam. *Journal of Physics: Conference Series, 1340* (1), 012025

[14] Pagsangkanae P and Yuenyong C (2019). Applying the philosophy of sufficiency economy and STEAM knowledge of Grade 11 Students in the STS biodiversity Unit. *Journal of Physics: Conference Series, 1340* (1), 012075

[15] Sutaphan, S. Yuenyong, C. (2019). STEM Education Teaching approach: Inquiry from the Context Based. *Journal of Physics: Conference Series, 1340* (1), 012003