



**MANAGEMENT OF TEACHING ACTIVITIES IN NATURAL SCIENCES
UNDER STEM EDUCATION ORIENTATION IN SECONDARY SCHOOLS
IN TUA CHUA DISTRICT, DIEN BIEN PROVINCE**

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Abstract

The STEM education-oriented Natural Science subject in the 2018 high school curriculum is characterized by an integrative, interdisciplinary educational method: The knowledge in the subject is an interdisciplinary, interdisciplinary integration of subjects such as physics, chemistry, biology, and other subjects. The amount of knowledge in these subjects is abstract and difficult to understand. The traditional method of imparting knowledge can cause dryness and boredom for students. Especially for middle school students when they enter puberty, with many complex physiological and psychological changes. The article presents the results of research on the content management of teaching activities in Natural Sciences according to STEM education orientation in secondary schools in Tua Chua district, Dien Bien province.



QUẢN LÝ HOẠT ĐỘNG DẠY HỌC MÔN KHOA HỌC TỰ NHIÊN THEO ĐỊNH HƯỚNG GIÁO DỤC STEM Ở CÁC TRƯỜNG TRUNG HỌC CƠ SỞ HUYỆN TỬA CHÙA, TỈNH ĐIỆN BIÊN

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Từ khóa

Quản lý dạy học, giáo dục STEM,
trung học cơ sở, Tủa Chùa -
Điện Biên.

Tóm tắt

Môn Khoa học tự nhiên theo định hướng giáo dục STEM trong chương trình phổ thông 2018 với đặc thù là một phương thức giáo dục mang tính tích hợp, liên môn: Các kiến thức trong môn học là sự tích hợp, liên môn từ của các môn học như vật lý, hóa học, sinh học và các môn học khác. Khối lượng kiến thức của các môn học này mang tính trừu tượng, khó hiểu, phương thức truyền thụ kiến thức truyền thống có thể gây ra sự khô khan, nhàm chán đối với học sinh. Đặc biệt, đối với lứa tuổi học sinh Trung học cơ sở khi các em bước vào tuổi dậy thì, với nhiều biến đổi phức tạp về tâm sinh lý. Bài viết trình bày kết quả nghiên cứu nội dung quản lý hoạt động dạy học môn Khoa học tự nhiên theo định hướng giáo dục STEM ở các trường trung học cơ sở huyện Tủa Chùa, tỉnh Điện Biên.

1. Introduction

Implementing the resolutions of the Party and the National Assembly and the Prime Minister's decision, on December 26, 2018, the Ministry of Education and Training announced a new general education program with Circular No. 32/2018/TT - Ministry of Education and Training of the Minister of Education and Training. In the 2018 General Education Program, STEM education has the role of promoting education in the fields of science, technology, engineering, and mathematics implemented in an interdisciplinary approach, focusing on the development of science, technology, engineering, and mathematics. Developing students' qualities and abilities, creating an experiential space that connects theory with real life.

Currently, STEM education has been initially implemented and included as an official educational activity in high schools. However, how to specifically manage and implement this activity for each lesson and subject still leaves many administrators in middle schools confused, requiring further research. practice as a basis for replicating and developing this form of education.

2. Research methods

The research uses a combination of research methods: synthesis, systematization, document analysis, and historical methods. Use the above methods to research history, identify concepts, and build a theoretical basis for managing natural science

teaching activities with STEM education orientation in Tua district secondary schools. Pagoda, Dien Bien province.

3. Research results and discussion

3.1. Teaching activities of natural sciences according to STEM education orientation in middle schools

3.1.1. The goal of teaching natural sciences according to STEM education orientation in middle schools

From the connotation of the STEM concept and the scientific basis of teaching natural sciences oriented towards STEM education, it can be seen that the goal of teaching natural sciences oriented towards STEM education is to: Create opportunities for students. Students connect the knowledge learned in Technology with the basic knowledge of STEM subjects with real-life problems. Help students proactively, actively, and voluntarily acquire natural science knowledge to form and develop practical skills; Form basic skills for students such as observation skills, asking and answering questions; Skills in reasoning, predicting, proving, criticizing, and refuting inappropriate issues; know how to explain and apply natural science knowledge learned to solve problems that arise in life. Helps students apply the knowledge they have learned, helping them think more broadly about certain situations or problems. Help students form and develop critical thinking; Develop communication skills, teamwork ability, and collaborative work. Create an environment that encourages discovery, creativity, and practical problem-solving.

3.1.2 Characteristics of natural sciences oriented towards STEM education

Natural science oriented towards STEM education is an integrative, interdisciplinary educational method: The knowledge in the subject is an interdisciplinary, interdisciplinary integration of subjects such as physics, chemistry, and biology. studies and other subjects. At the middle school level, the natural science subject integrates knowledge and skills along the content lines: matter and changes in matter, living things, energy and changes, earth and sky. The content is arranged according to linear logic, combining several concentric contents for students to become familiar with and have practical applications.

Natural science oriented towards STEM education is a subject that combines theory with practice and experience: With the 5E teaching model: Engage, Explore, Explain, Consolidate (Elaborate), Evaluate (Evaluate), students gradually discover new knowledge based on previously known knowledge through practice and experience activities. Through practice and experience activities, Natural Science helps students master theoretical knowledge and at the same time have the ability to apply Natural Science knowledge and skills to life. By organizing STEM education topics at school, students can experience and gain interdisciplinary knowledge and skills to face different problems in life [3], [4].

Natural science oriented towards STEM education is a subject always associated with the development of the scientific and technical revolution. The subject content refers to relevant modern scientific knowledge. Therefore, the subject content must continuously update new scientific achievements, reflecting advances in science, technology, and engineering. Teaching according to the scientific and technological design process not only helps students practice skills like real scientists in research and product development departments, but more importantly, helps students feel more confident in themselves when they can solve problems on their own [3].

Natural science subjects oriented towards STEM education connect science learning with life. STEM lessons are always based on stories or real-life problems. Thanks to that, students feel the lessons become more vivid and close, enhancing the application of scientific knowledge in real-life situations. Through that, students see that science is very interesting, close, and practical to human life. The program contributes to developing students' adaptive capacity in a constantly changing society, contributing to sustainable social development [4].

3.1.3. Teaching content of natural sciences according to STEM education orientation in secondary schools

In the 2018 high school curriculum, the Natural Science subject at the Middle School level is developed from the Science subject in grades 4 and 5 of elementary school. At the junior high school level, this subject is a compulsory subject, taught in grades 6, 7, 8, and 9, for 35 weeks/school year, a total of 140

periods/school year, 4 periods/week. Natural science is an integrated subject, belonging to the basic education stage. The Natural Science curriculum for grades 6, 7, 8, and 9 has 3 parts corresponding to knowledge in the fields of Physics, Biology, and Chemistry, arranged in chronological order as follows [5]:

Grade 6: Chemistry (20%) - Physics (32%) - Biology (38%)

Grade 7: Chemistry (24%) - Physics (28%) - Biology (38%)

Grade 8: Chemistry (31%) - Physics (28%) - Biology (31%)

Grade 9: Chemistry (31%) - Physics (30%) - Biology (29%)

Researching the overview of the Natural Science program at the secondary school level, we can see that the program is built on three axes: Scientific topics; General principles and concepts; and Forming and developing capacity. Therefore, the teaching content of Natural Sciences according to STEM education orientation includes:

* Teaching content of Natural Sciences:

- Main scientific topics of the program:

+ *Substance and changes of matter*: substances around us, structure of substances, chemical transformation of substances.

+ *Living things*: Diversity in the organization and structure of living things; living activities; people and health; organisms and environment; heredity, variation, and evolution.

+ *Energy and change*: energy, physical processes, force, and movement.

+ *Earth and sky*: movement in the sky, the Moon, the solar system, the Milky Way, the chemistry of the Earth's crust, some bio-geo-chemical cycles, and the Biosphere.

Topics are arranged mainly according to linear logic, combined to a certain extent with concentric structure, and there are also several interdisciplinary and integrated topics to form principles and rules. of the natural world” [4].

- General principles of natural science in the program:

+ “General principles: Structure; Diversity; Interaction; Systematicity, Movement and Change

+ General and generalized principles of Natural Science are the core content of Natural Science. The contents of physics, chemistry, biology, Earth, and the sky are integrated throughout those principles. The knowledge of physics, chemistry, biology, the Earth, and the sky are data that both clarify natural principles and are integrated according to different logics in natural exploration activities and in solving problems. solve technological problems and issues affecting the lives of individuals and society. Understanding the principles of nature, along with activities to explore nature and apply natural science knowledge to solve practical problems is a requirement to form and develop scientific capacity. natural learning in students. The relevance of each topic of physics, chemistry, biology, Earth, and sky to the general principles of science is selected at different levels. Some principles need to be expressed at a high level of relevance, but some principles only need to be expressed at a low level” [4].

3.1.4. *Teaching methods for natural sciences according to STEM education orientation in middle schools*

Teaching natural sciences mainly uses active teaching methods, in which teachers play the role of organizing and guiding activities for students. Students' learning activities are mainly active learning, actively acquiring knowledge under the guidance of teachers.

natural science teaching methods according to STEM education in middle schools are as follows: The teaching method is learner-centered, helping students to be active and proactive in class, avoiding passive, one-way learning. Form in students the skills to apply knowledge to solve practical problems; Bringing students into a learning environment that always involves discovery and exploration; Students can experience, practice, and be creative when participating in learning, turning students into subjects of cognitive activities.

When applying innovative directions for teaching natural sciences in the direction of STEM education, teachers need to be flexible and creative based on the goals, subject content, and characteristics of students. and specific local conditions. Teachers need to have a diverse combination of teaching methods for each topic. Traditional teaching methods (presentations...) teachers use innovatively to promote students' positivity. Enhance coordination with modern teaching methods.

3.1.5. Forms of organizing natural science teaching according to STEM education orientation in middle schools

The organization of teaching natural science subjects oriented towards STEM education in middle schools is implemented diversely and flexibly. Teachers can use the following forms of teaching organization [6]:

Individual teaching: This is a form of individualized teaching for learners. Teachers organize students to work independently for each student, tutoring each student so that weak students can keep up with their level. general of the class, on the other hand, students who study well can develop their own abilities to a higher level than their current level.

Teaching in groups: Collaborative learning in groups will help groups of students take advantage of collective intelligence according to the motto: “Light your candle with my fire, your candle lights up with my fire.” nor darken.” Studying in groups will help each student actively and voluntarily work according to the group’s assignment, thereby mastering the knowledge and skills of each lesson.

Sightseeing, experience: This is an indispensable educational activity when teaching natural sciences according to STEM education orientation. Through this form of learning, students can access vivid practical knowledge that is not as dry and academic as theoretical knowledge in class. From there, students can connect knowledge with reality, learning along with practice according to educational principles.

natural science teaching forms in the 2018 general education program require attention: Combining a variety of different teaching forms to suit each lesson content; Strongly apply information technology to natural science teaching activities to exploit the strengths of this activity. Especially focusing on exploiting virtual experiments, simulation experiments... used in teaching activities.

3.1.6. Evaluating the results of teaching natural sciences according to STEM education orientation in middle schools

Evaluating results is a regular and indispensable activity in activities. The same goes for teaching natural sciences. Through evaluating results, administrators and teachers accurately grasp the current status of the

school’s teaching and learning activities and promptly adjust the limitations of the activities. this move. At the same time, results assessment activities also help parents and students know the true quality of student learning, and correct and adjust student learning activities in the right direction.

To achieve the effectiveness of natural science learning outcomes assessment activities, when evaluating teachers, attention should be paid to using assessment methods that are reliable and objective; and combine diverse forms of assessment; Assessment also needs to take into account the psychological characteristics of students in the region and corresponding learning conditions...

Assessing learning outcomes in natural science subjects oriented towards STEM education can be done in many different forms as follows: Assessment by written test (essay); Use of objective tests; Evaluation through the results of practical exercises and experiments; Evaluation by essays and topics; Evaluate through the results of learning projects; Evaluation by teacher observation sheet; Evaluate by student’s learning records... In reality, students’ learning abilities expressed in different aspects of learning are different. When teachers use a variety of assessment forms, it will help evaluate students’ abilities in many aspects, thereby maximizing students’ strengths, and limiting and overcoming limitations and weaknesses. poor in learning for students to develop comprehensive personality for each student according to educational goals.

3.2. Content of managing natural science teaching activities oriented towards STEM education in middle schools

3.2.1. Planning natural science teaching activities according to STEM education orientation in middle schools

The school’s teaching and educational activity plan is approved by the Principal of a school, based on each teacher’s plan and the plan of the Professional Team. The Principal can assign the Vice Principal in charge of expertise to organize discussions with professional groups and comment on the draft plan; Complete the plan and submit it to the Principal for review and approval.

Planning for teaching natural sciences with a STEM education orientation for each semester and the entire

school year can include many different plans such as planning for organizing and implementing teaching activities for natural science subjects oriented to STEM education; Planning to innovate methods and forms of teaching natural sciences towards STEM education; Professional training plan for teacher of natural science subjects oriented towards STEM education; Plan to develop a STEM education-oriented subject in Natural Sciences; Plan to develop the natural science program according to STEM education orientation by school year and semester.

To develop a plan, the principal needs to disseminate basic information to all teachers right from the beginning of the school year (requirements of integrated teaching of natural sciences according to STEM education orientation, suggestions for planning models). planning, requirements for the quality of teaching and learning of teachers - students...) The principal directs professional groups to develop group plans according to the same process and presentation as the natural science teaching plan of the school. school, the STEM education-oriented natural science teaching plan of the professional team must be approved by the principal, and become a legal document for the principal to direct the activities of the professional team.

The content of planning to teach natural sciences according to STEM education orientation covers many different contents, but it is necessary to focus on the main topics: Topic of substance, change of substance; theme of living things; topic of energy and energy transformation; Earth and sky theme. These large topics include many sub-topics, so planning needs to follow the details of each topic and each grade level as prescribed in documents of the Ministry of Education and Training.

3.2.2. Organize and deploy natural science teaching activities oriented towards STEM education in middle schools

The principal established a steering committee to implement natural science teaching activities according to STEM education orientation. The steering committee needs to research and master the guiding documents, how to implement the new high school program in general, and teach natural sciences with a STEM education orientation in particular.

The principal coordinates with the research steering committee and promulgates documents guiding the

teaching of natural sciences according to STEM education orientation to the professional team and the entire teaching staff of natural sciences. Organize direct written instructions for professional teams and teachers on regulations on preparing lesson plans for each teacher's class plans and lesson plans.

The principal directs group discussions to agree on lesson preparation regulations and agree on goals, content, methods, and forms of teaching natural sciences according to STEM education orientation for each lesson and period. Discussions in groups must take place regularly in the form of observing lessons and studying lessons. Core teachers need to improve their sense of responsibility in supporting colleagues to fully and properly implement the requirements. , regulations for teaching natural sciences according to STEM education orientation.

natural science teaching topic that has been developed in the planning content such as:

“ Teaching plan: Topic of substances and changes of substances: substances around us, structure of substances, chemical transformation of substances;

Teaching plan: Living things topic: Diversity in organization and structure of living things; living activities; people and health; organisms and environment; heredity, variation and evolution;

Teaching plan: Topics of energy and change: energy, physical processes, force, and movement.

Teaching plan: Topics of the Earth and the sky: movement in the sky, the Moon, the solar system, the Milky Way, the chemistry of the Earth's crust, some bio-geo-chemical cycles, the Biosphere” [10],[11].

The principal directs the established steering committee to regularly inspect and supervise TCM in teaching natural sciences by the prescribed program. Timely measures to correct errors of the professional team in implementing teaching rules and regulations according to STEM education orientation.

The principal builds relationships with educational forces inside and outside the school to mobilize socialization resources to join hands with the school in organizing the teaching of natural sciences. When there is support from socialization resources, the Principal needs to focus on strengthening the facilities and teaching equipment for natural sciences that the school is weak or lacking; Necessary natural science

teaching equipment but not in the list of equipment provided by the Ministry of Education and Training; Associate with local businesses and production facilities to coordinate and conduct experiential and practical activities on the subject.

The principal agrees with the steering committee and professional team to develop tools and criteria to evaluate the results of natural science teaching activities. Evaluation criteria need to be developed, transparently, ensuring practicality and feasibility to help evaluate natural science teaching results by prescribed documents, to improve the quality of teaching natural sciences according to STEM education orientation.

3.2.3. Directing the implementation of natural science teaching activities oriented towards STEM education in middle schools

natural science teachers have developed from the beginning of the year, review and re-examine the plans, and approve them. Teaching plans and directing the implementation of approved teaching plans and content.

The principal directs the professional team to assign teaching assignments to teachers for each grade level. The teaching assignment for teachers must be consistent with the teaching capacity of each teacher and the characteristics of the students. Each teacher in the teaching process has different abilities and strengths. Assigning teaching that is appropriate and appropriate to the subject will help teachers develop their full potential.

The principal directs the professional team to regularly observe lessons and check teachers' expertise. Observing lessons is carried out in the spirit of current educational innovation. Observing lessons is not to criticize or criticize teachers, but observing lessons should focus on studying the teaching process, and evaluating results and attitudes. student learning through each lesson's content. Thereby, the professional group meets to give suggestions in the direction of lesson research, so that each teacher can see that this lesson can be done better if they actively innovate and be creative.

3.2.4. Inspect and evaluate natural science teaching activities oriented towards STEM education in middle schools

For this management activity to be effective, the Principal needs to carry out the following contents: The

Principal combines forms of inspection and evaluation, both irregular and periodic inspection of teachers' class records and attendance records. Hours of evaluation of teachers' natural science teaching activities. Through inspection, the Principal understands the current status of teachers' teaching results, builds emulation and reward criteria to encourage good teaching activities, and at the same time corrects and corrects problems. Limited issues arise in teachers' teaching activities.

Principals need to develop a plan to check lesson books, grade books, and books to monitor teachers' practice and experiments. The data of natural science teaching activities oriented towards STEM education is presented in many aspects and contents. Therefore, conducting tests will help raise teachers' sense of responsibility when implementing different forms of teaching.

The principal coordinates with the professional team to conduct tests and evaluate the effectiveness of using facilities and equipment in the process of teaching natural sciences according to STEM education orientation. For necessary items and equipment, resources need to be focused on investment or renovation. Ineffective facilities and equipment should be eliminated to propose new, more suitable equipment. The principal cooperates with the steering committee and professional team to check students' learning results after studying natural science subjects following STEM education orientation. If learning results do not meet expected requirements, we need to focus on building new, more appropriate management measures to improve the quality of teaching and learning natural sciences. If the learning results have met the requirements and expectations, then upgrade and develop to new, higher stages.

The principal directs activities to check teachers' learning results after attending training and fostering activities on teaching natural science subjects according to STEM education orientation. This activity helps each teacher participating in training not just for formality but also to consciously grasp the important content in each training session. The principal and the professional team examine the effectiveness of coordinating forces in teaching natural science subjects according to STEM education orientation. This form of testing helps to coordinate educational forces more unified and effective.

4. Conclusion

An overview of theoretical and practical issues shows that managing natural science teaching activities according to STEM education orientation for middle school teachers is a system of purposeful and planned impacts. from the Principal to teachers of professional groups (Mathematics, Natural Sciences, Technology, Informatics) to guide, organize, direct, inspect, and evaluate the teaching process according to STEM education orientation. , helps teachers organize the teaching process towards forming the ability to solve practical problems for students. Managing teaching activities of natural sciences oriented towards STEM education for teachers is carried out in many aspects: Managing the implementation of teaching goals of natural sciences oriented towards STEM education; Managing natural science teaching content according to STEM education orientation; Managing and implementing the natural science teaching process according to STEM education orientation; Manage methods and forms of teaching natural sciences according to STEM education orientation; Managing the exploitation and use of facilities in teaching natural sciences according to STEM education orientation.

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