



Research Article

**APPLICATION OF EXPERIMENTAL METHODS
TO TEACH SCIENCE SUBJECT FOR PRIMARY STUDENTS
IN HO CHI MINH CITY**

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ABSTRACT

The research has built a process of applying experimental methods in teaching Science composed of four stages. The design of appropriate teaching activities and the preparation of experimental means for teaching are important. Students participate in four types of activities including warm-up, inquiry, and discovery to find out how to perform experiments, report, and application activities. Students' activities start from asking questions or identifying problem situations related to the lesson requiring to be demonstrated using experimental methods. At the end of experimental activities, students must find examples of applying learned knowledge and explaining phenomena that occur in life from simple to advanced levels. The lesson plan "What properties does water have?" is designed according to the proposed teaching process. Through the experiment, the lesson plan was found to be effective in developing the natural science competencies for students according to the requirements of the 2018 Science Curriculum.

Keywords: competence; experimental method; primary; students; science subject; science research

1. Introduction

Science subject in primary school is built on the basic and original foundation of natural science and research fields in health education and environmental education. The subject plays an important role in helping students learn Natural Science at the middle school level and Physics, Chemistry, and Biology at the high school level. The subject focuses on arousing scientific curiosity, allowing students to learn and explore nature, applying knowledge and skills into practice, staying healthy, and behaving appropriately with the surrounding living environment. Students learn science through inquiry, discovery, observation, experiment, practice, and teamwork. Since then, natural science competencies have been formed and developed in students (Ministry of Education and Training, 2018).

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In science teaching, students should be offered opportunities to explore possibilities to resolve differences between current views on a topic and new information or to resolve conflicts like a scientist (National Research Council, 1997). Therefore, research-oriented teaching is the choice for modern education. Elken and Wollscheid analyzed and claimed that the effectiveness of research-oriented teaching depends on the subject, ability, and level of learners in the study (Elken & Wollscheid, 2016). Research-oriented teaching can use a combination of teaching methods such as project-based teaching, inquiry-based teaching, and problem-solving teaching to develop the qualities and competences of students (Nguyen & Nguyen, 2018). In Vietnam, research-oriented teaching has been applied to teach natural science subjects in high schools. For example, Pham and Nguyen applied this method to teaching physics to high school. In particular, the role of general research is an emphasis on the process of teaching physics knowledge or the process of applying physical knowledge in solving practical problems (Pham & Nguyen, 2016). The scientific research orientation has also been implemented in teaching biology through learning projects (Nguyen & Nguyen, 2019).

In Vietnam, research-oriented education has been applied to teach natural science subjects in high schools. For example, Pham and Nguyen applied this method to teaching physical subjects in high school. In particular, the role of general research is the emphasis on the process of teaching physical knowledge or the process of applying physical knowledge to solving practical problems (Pham & Nguyen, 2016). The scientific research orientation has also been implemented in the teaching of biology through learning projects (Nguyen & Nguyen, 2019).

The teaching of Science in primary schools is implemented according to the orientation of the 2018 Science Curriculum. The goal is forming and developing natural science competences for students such as cognise natural science, explore the natural environment, and apply knowledge and skills (Ministry of Education and Training, 2018). Research-oriented teaching will meet the objectives and requirements of the subject curriculum. However, this teaching orientation only applies to high school students, not with primary level students. It is not too difficult for teachers to use familiar teaching methods such as experimental methods to follow this teaching orientation. Using the natural science teaching experiment helps students to test ideas and find relationships between concepts, or to verify initial hypotheses. The students' retention (memorization) level by an experimental method is higher than that of the demonstration or the explanation. At the same time, the experimental method helps students to discover knowledge and experience better practical experiences (Veselinovska et al., 2011). Students develop the ability to do research, being able to ask many appropriate questions when studying chemistry through experiments (Hofstein et al., 2005).

2. Research Methods

2.1. Theoretical foundation

We searched documents and theories of science-oriented teaching (books, internet, scientific journals, research works of domestic and foreign authors), psychophysiological characteristics, content, and teaching natural science by experimental methods for primary students to clarify concepts related to the topic.

2.2. Experimental method

To confirm the feasibility and effectiveness of the science teaching plan, the research has experimentalized with lesson plan "Nature of Water" at two classes of Grade 4 of Vinschool Primary School, Ho Chi Minh City. The 4A class is the experimental class and the 4B class is the control class. Each class has 30 students. Students of both classes will be evaluated before the experimental teaching. The lesson plans using scientific research-oriented experimental methods were taught for 4A students, while students of 4B class were taught according to lesson plans using conventional experimental methods. Then, both experimental and control classes did the same exercise to compare the results. The experimental period is from March 2, 2021, to March 14, 2021.

2.3. Data analysis

Data before and after the experiment were processed by Oneway ANOVA tool on SPSS 25.0 software. The conclusions were made based on the following criteria:

Hypothesis H_0 : there is no significant difference between the two assessment groups.

If $.sig < 5\%$, hypothesis H_0 can be rejected.

If $.sig \geq 5\%$, hypothesis H_0 cannot be rejected.

3. Research results

3.1. Developing a process for applying experimental methods in teaching science subject

Based on a four step scientific research process: (1) Problem statement; (2) Research design; (3) Collect, organize and process relevant data and knowledge; (4) Present research results, and combined with the teaching process by experimental method to develop the components of natural science competencies for students, including: cognise natural science, explore the natural environment, and apply knowledge and skills, we design a teaching process with four steps:

Step 1. Determine the objectives of the topic/lesson including specific competencies, general competencies, and qualities.

Step 2. Select the appropriate content and form to use the experimental method in the lesson.

Step 3. Design appropriate teaching activities that combine with the preparation of experimental means. In which, students participate in activities starting from warm-up to active application.

Step 4. Check and evaluate by comparing activities with lesson objectives.

In the above steps, we focused on step 3 which is the selection of content and organizational form suitable for experimental methods. We designed a lesson plan which starts from a question or a problem situation related to the lesson that needs to use experimental methods to demonstrate. This question/situation is done by the students themselves to develop scientific cognitive competence and explore the natural environment (The teacher only suggested if that was necessary). Subsequent teaching activities helped students to answer questions actively. Students have to find out examples of applying their learned knowledge or explaining phenomena that occur in life from a simple to an advanced level in the last activities. Specifically, the activities of experimental methods teach Science in research orientation as follows:

3.2. Build teaching activities in the lesson plan (step 3)

- **Activity 1. Warm – up**

The warm-up activity in teaching Science by the experimental method starts by putting students in a situation (in the form of a question, a new situation for students' perception) so that students need to conduct experiments to solve the problems. Students think for themselves about how to find answers through individual activities.

- **Activity 2. Inquiry and discovery activities through learning how to conduct experiments.**

- + Students discuss in groups to choose how to experiment. The members of the team change with the learning content so every student has the opportunity to express themselves.

- + Teachers introduce many different tools and materials to perform experiments. In which there are disturbing materials for students to think about and choose the right way.

- + The group of students select equipment and chemicals for the experiment and send someone to pick up the means to experiment.

- + Students perform experiments themselves, observe the experimental process and record predictions, and discuss the experimental results. Besides, when the students observe and discover strange things, they need to answer the "why" question. After experimenting successfully, students write down the process in their lesson notebooks. Teachers pay attention to reminding students to ensure safety.

- **Activity 3. Report on activity results**

- + Firstly, each group presents its experimental ideas. After that, the teacher chooses the wrong group to present and do it. The group that does the right thing (good) will present and do it later.

- + The groups explain the results, answer your questions.

- **Activity 4. Summarize and consolidate (practice, apply).**

- + Students comment on the experimental results of the groups.

- + Teacher summarizes and consolidates students' knowledge through a game (teacher gives, asks students to say how to do).

+ Students apply learned knowledge through experiments to explain problems that relate to life.

3.3. Design the illustrative lesson plan

Topic: Substance, SCIENCE 4

Lesson: What properties does water have?

Duration: 1 period

1. Objectives

Competences and qualities	Target	Encode
Scientific competences	State the properties of water.	(1)
	Presentations are predictions about the properties of water.	(2)
	The proof is predicted by experimenting.	(3)
	Apply the properties of water to life.	(4)
General competences	Problem solving and creativity: practice creative experiments in different ways.	(5)
Main qualities	Honesty: When reporting experiments.	(6)
	Hardworking: Enthusiastic to participate in individual and class activities.	(7)
	Responsibilities: Together with class members to complete the learning task.	(8)

2. Preparation of teachers and students

Work	Teacher's preparation	Students' preparation
Activity 1	01 bottle of water, 04 bottles of water of the same type	
Activity 2		- Group table
Activity 3	<ul style="list-style-type: none"> - Experiment 1: water, strawberry milk, orange juice, tea, milk coffee. - Experiment 2: Container (vase, bowl, cup, box), water, oil. - Experiment 3: water, sugar, salt, sand, cooking oil, spoon. - Experiment 4: mica sheet, plastic, wood, (40cmx50cm), 01 pieces of foam, aluminum tray (50cmx60cm). - Experiment 5: Plastic tray, tissue paper, cloth, cotton, sand. 	<ul style="list-style-type: none"> - Experiments 1, 3: 05 sets of transparent plastic cups with the same shape and size, 02 cups with different shapes and sizes. - Experiment 2: absorbent paper, 01 plastic bottle. - Experiment 4: 01 plastic sheet (40cmx50cm), A4 paper. - Experiment 5: aluminum tray, nylon bag.

3. Teaching activities

3.1. Warm-up activity

a) *Objectives:* 1, 7

b) *Method:* Questions and answers

c) *Organizational process:*

- Teacher asks students to present their knowledge about the water.

- The teacher prepares 5 bottles that are the same and transparent: Bottle number 1 contains water and the remaining 4 bottles have no water, the observation distance is 2m enough for students to identify difficulty.

+ Students observe and determine: (1) Which bottles have /do not contain water; (2)

Why are there different results?

+ The teacher leads the lesson: What are the properties of water and how are the properties of water applied in life?

d) *Expected product:*

- Students' answers about some properties and roles of water.

- (1) Students find the bottle with water by guessing.

- (2) Because all 5 bottles are colorless and transparent; Bottle 1 contains water and transparency is a property of water.

3.2. Activity 2: Proposing questions and ways to find answers

a) *Objectives:* 2, 7, 8

b) *Teaching methods and techniques:* cooperative teaching, tablecloth techniques.

c) *Organizational process:*

- Students work in groups of five members according to the tablecloth technique, record their initial understanding of the properties of water on the group board. At the same time, each group mentioned at least three questions to find out about the properties of water.

- Students present group work products.

- The teacher synthesizes the questions of the groups (editing and grouping the questions under the content of learning about the properties of water, including: (1) What is the color, smell, and taste of water?; (2) What is the shape of water?; (3) What substances can/cannot dissolve?; (4) How does water flow?; (5) Does water can be permeable through some objects?

+ The teacher requests students to give answers to the above questions and answer the question: Is there a way to prove that feature (property) of water?

d) *Expected product:* Students can present some characteristics of water and ask questions to find out the properties of water. Proposing a way to prove the properties of water by experiment.

3.3. Activity 3: Make predictions, propose experimental options and draw conclusions

a) Objectives: 2, 3, 6, 7, 8

b) Teaching methods and techniques: experiments, cooperative teaching

c) Organizational process:

- Divide students in class into five groups;
- The teacher introduces five experimental kits prepared for studying the properties of water. For each set of tools, the teacher prepares one to two extra tools/materials for interference so that students in the group have to discuss and choose the right equipment and experimental materials.

- Each group draws lots and chooses kits and materials suitable for the assigned task of the group.

Group	Guess
first	What is the color, smell, and taste of water?
2	What is the shape of water?
3	Water dissolves/insoluble some substances
4	How does the water flow?
5	Water does/doesn't seep through some objects

- Students experiment, record the experiment progress and results.
- Students: Compare the experimental results with the original prediction and draw conclusions about the properties of water.
- The representative student of each group present the results and conclude.

d) Expected product

Group	Expected product
1	<ul style="list-style-type: none"> - Students choose tools and materials to experiment, including five same cups, water, strawberry milk, tea, orange juice, coffee milk, spoon: Cup 1 is water, cup 2 is strawberry milk, cup 3 is orange juice, cup 4 is tea, cup 5 is milk coffee. Students use eyes, tongue, and nose to identify properties. - Students explain the predicted results: Because water is colorless, odorless, tasteless. Orange juice, strawberry milk, coffee with color, smell, and taste. - Students conclude: Water is a clear, colorless, odorless, and tasteless liquid.
2	<ul style="list-style-type: none"> - Students choose experimental tools including four containers (jar, bowl, cup, box) and water; - Students experiment to observe the shape of water. - The water will have the same shape as the container. - Students conclude: Water does not have a definite shape but has the shape of a container.

-
- Students' choice of instrument testing: four same cups, sugar, salt, sand, cooking oil, spoon.
- 3
- Students make predictions about water solubility.
 - Experiment: put half a teaspoon of substances in 4 cups with the same amount of water, stir with a spoon to know if the substance is soluble in water or not.
 - Students conclude: Water can dissolve sugar, salt; Insoluble sand; Cooking oil.
-
- Students choose experimental tools: meca plate or 01 plastic sheet (40cmx50cm), water.
 - Students can perform experiments:
 - Students can answer some information for the question: How will the water flow?
 - * Water flows straight down.
- 4
- * Water flows from top to bottom.
 - * Water flows in many streams from top to bottom.
 - * Water flows to the tray, then spreads to all sides.
 - * Water flows from above, spreading to all directions.
 - * Water flows from high to low, to the tray the water spreads to all sides.
 - Students conclude: **Water flows from low pipes, spreading to all sides.**
-
- Students' choice of instrument testing: four same cups, sugar, salt, sand, oil, spoon.
 - Students make predictions about water solubility with materials.
- 5
- Experiment: put half a teaspoon of substances in four cups with the same amount of water inturn, stir with a spoon to know if the substance is soluble in water or not.
 - Students conclude: **Water can dissolve sugar, sal, and insoluble sand, cooking oil.**
-

3.4. Contact with practice

a) Objectives: 4, 8.

b) Method: Game-based learning.

c) Organizational process:

+ In 3 minutes: Students in groups record the applications of water properties in human life and explain?

+ The group students will win if they score the most correct answers and explain the properties of water in three minutes.

d) Expected product

+ **Water is a clear, colorless, odorless, tasteless liquid:** Use water to cook rice, ...

+ **Water has no definite shape:** Humans create aquariums of many shapes, ...

+ **Water dissolves certain substances:** Humans make many attractive and healthy drinks such as lemonade, orange juice, ...

+ **Water flows from high to low, spreading in all directions:** People make waterfalls, artificial springs, sprinklers, water plants, make sloping roofs, make hats...

+ **Water can be permeable/can not permeable some objects:** People wear raincoats, shoes, plastic slippers to not get wet, produce water containers such as aluminum kettles,

buckets, pots, towels to dry people after bathing, making many types of paper, specialized wipes to help clean, clean the house...

*** Expected assessment: Checklist for the lesson**

Criteria	Yes	No
Select specimens and instruments that meet the requirements of the test.		
State the experimental questions.		
State the experimental hypothesis.		
Design experimental steps.		
Perform experimental operations competently.		
Complete experimental record.		
Explain experimental results clearly.		
Draw correct conclusions.		
Contact and apply the properties of water in practice		

3.3. Pedagogical experiment

Before experimental teaching, two groups of experimental and control students in grades 4A and 4B took the test in Appendix 1 (skip question number 6). In the questionnaire, we divided it into three levels corresponding to the three components of natural science competences: cognise natural science (questions 1, 2, 3), explore the natural environment (questions 4), and apply knowledge and skills (questions 5). A Post-experiment test was performed on both groups (experimental group, control group) to determine the level and effectiveness of using experimental methods. Table 3.1 shows the results of students' tests.

Table 3.1. Student's test results after the experiment

Competences	Question	Scores	Experimental group	Control group
Cognise natural science	1	3	26	16
		2	2	8
		1	2	4
		0	0	2
	2	1	25	22
		0	5	8
Explore the natural environment	3	1	27	22
		0	3	8
	4	3	22	18
		2	5	10
Apply knowledge and skills	5	1	2	2
		0	1	0
	0	2	24	16
		1	5	7
		0	1	7

The Oneway-ANOVA test shows that there is a significant difference between the experimental and control groups (Table 3.2).

Table 3.2. Post-experiment analysis results

The competences	Question	Experimental group		Control group		.Sig
		Medium score	Standard deviation	Medium score	Standard deviation	
Cognise natural science	1	2.8	0.56	2.27	0.95	0.001
	2	0.83	0.38	0.73	0.45	0.39
	3	0.9	0.31	0.73	0.45	0.36
Explore the natural environment	4	2.6	0.77	2.53	0.63	0.049
Apply knowledge and skills	5	1.77	0.50	1.3	0.84	0.002

- In the control group:

+ The scientific cognitive competences: students of the control group could only observe the teacher experimenting without directly being involved in the experiment, so only 16/30 students got the maximum score in questions 1, 22/30 students achieved the maximum score in questions 2 and 3. At the same time, students did not master the knowledge and fully state the properties of water and their applications.

+ The competences to explore the natural environment: The results show that 18/30 students had knowledge related to the experiment and 10/30 students can reach 2/3 of the maximum score. Thus, the fact that students can only observe teachers doing experiments, but not directly implementing them so they have been limited learning activities to inculcate knowledge for students.

+ The competences to apply knowledge and skills: In the process of participating in the lesson, students of the control class did not pay attention to the experiment process because they were still passive or the experiments were too abstract for their ability. This is reflected in the fact that 16/30 students applied the properties of water to explain phenomena and events in life.

- In the experimental group:

+ The scientific cognitive competences: The results show that 26/30 students achieved the maximum. Thus, the teacher used the experimental method according to the proposed process. This led to a clear difference in teaching effectiveness. Students participated in all steps in the learning process. This helped create interest in students and help them more learn more This is the basis for developing students' scientific cognitive competences.

+ The competences to explore the natural environment: The results show that 22/30 students achieved the maximum score. Most students were able to do experiments well, memorized knowledge, and analyzed experimental results.

+ The competences to apply knowledge and skills: The results show that 24/30 students in the experimental class got the maximum score on question 5. Thus, when students participated in different stages in the experiment process, which was just enough for themselves, stimulated them to find and explore. Especially, students can apply the results of the experiment in daily life.

At the same time, the results in Table 3.2 show that there is no medium score in any competences of the experimental group lower than that of the control group. The students of the experimental group have better scientific competences than students of the control group. This result shows that using experimental methods will be more effective and competencies are formed better than teaching without using experimental methods. The standard deviation of the scores in the experimental group is smaller than the standard deviation of the scores in the control group (in 4/5 questions, except for question 4). Mean that students in the experimental class have a more equal level of ability than the control group. Thus, using experimental methods not only improves students' competences but also helps to create a balanced and effective class.

On the other hand, through actual observation and testing, we find that the class uses lively experimental methods, students are interested and enthusiastic about activities, express their understanding and creativity, and they can believe in themselves. In contrast, the students in the control group were not promoted to be creative and positive in class. The experimental results show the effectiveness of experimental teaching to develop learners' competences. Thus, we can confirm the correctness and reality of our research topic.

4. Conclusion


Based on theoretical research on the use of experimental methods in teaching and theory on teaching Science subject to the orientation of competence development, the research has built a teaching process in four steps. The results of the pedagogical experiment shows that the teaching process and plan make a difference compared to traditional teaching methods to form and develop students' scientific competences.

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

REFERENCES

- Avi Hofstein, Oshrit Navon, Mira Kipnis, Rachel Mamlok-Naaman (2005). Developing students' ability to ask more and better questions resulting from inquiry-type chemistry laboratories. *Journal of Research in Science Teaching*, 42(7), 791-806. doi: 10.1002/tea.20072
- Mari Elken, & Sabine Wollscheid (2016). The relationship between research and education: typologies and indicators. A literature review. *Nordic Institute for Studies in Innovation, Research and Education (NIFU)*, (8), 1-68.
- Ministry of Education and Training (2018). *Overall general education program* (No. 32/2018/TT-BGDĐT dated December 26, 2018).
- National Research Council (1997). *Science Teaching Reconsidered: A Handbook*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/5287>
- Nguyen, T. T., & Nguyen, V. H. (2019). Learning project building process on development of scientific research competences for high school student. *Education Magazine*, (464) (Term 2 - 10/2019), 60-64.
- Nguyen, V. K., & Nguyen, V. N. (2018). Overview of teaching Physics in high school based on scientific research process. *Education Magazine*, (428) (Term 2-4/2018), 51-53.
- Nguyen, X. L., & Pham, H. H. (2015). Research-oriented teaching approach in technology teachers training. *Hnue Journal of Science, Educational Sci.*, 60(8D), 29-36. doi: 10.18173/2354-1075.2015-0252
- Snezana Stavrova Veselinovska (2011). The effect of teaching methods on cognitive achievement, retention and attitude among in biology studying. *Cypriot Journal of Educational Sciences*, (4), 175-185.

APPENDIX 1. STUDENT SURVEY FORM WHEN EXPERIMENTING



Date:
Subject: Science, Grade: 4.....

Properties of water

Question 1: Put an X in the box with the correct answer:

What properties does water have?

<input type="checkbox"/> Colorless, odorless, tasteless	<input type="checkbox"/> Colorless, odorless, taste
<input type="checkbox"/> Can't be dissolved	<input type="checkbox"/> Can be dissolved in some substance
<input type="checkbox"/> Flowing from high to low	<input type="checkbox"/> Does not penetrate some objects


Circle the letter in front of the right answer

Question 2: Which of the following experiments uses the property that water can dissolve some substances?

A. Water is spilled on the table, use a paper towel to wipe it
B. Using water to make lemonade
C. Using water to cook rice
D. Catching rainwater under the roof




Question 3: What property of water does the experiment in the picture show?

A. Colorless
B. Water flows down from above
C. Water can seep through some object
D. Can be dissolved in some substance



Fill in your answer in the blank below.

Question 4: What properties of water do people use in each picture?


.....
.....

Question 5: Listing at least 03 household water containers made of different materials. Explain why such materials can be used to store water.

.....
.....

Question 6: Which activity/content do you like/dislike the most in the classes, and why?

.....



**VẬN DỤNG PHƯƠNG PHÁP THÍ NGHIỆM TRONG DẠY HỌC KHOA HỌC
THEO ĐỊNH HƯỚNG NGHIÊN CỨU TẠI THÀNH PHỐ HỒ CHÍ MINH****Nguyễn Minh Giang*, Nguyễn Trần Thanh Liêm***Trường Đại học Sư phạm Thành phố Hồ Chí Minh, Việt Nam***Tác giả liên hệ: Nguyễn Minh Giang – Email: giangnm@hcmue.edu.vn**Ngày nhận bài: 15-6-2021; ngày nhận bài sửa: 07-9-2021; ngày duyệt đăng: 02-10-2021***TÓM TẮT**

Nghiên cứu đã xây dựng được quy trình vận dụng phương pháp thí nghiệm trong dạy học Khoa học theo định hướng nghiên cứu khoa học theo 4 bước. Việc thiết kế các hoạt động dạy học phù hợp và chuẩn bị các phương tiện thí nghiệm cho dạy học là rất quan trọng. Học sinh được chủ động tham gia 04 loại hoạt động gồm: khởi động, tìm tòi và khám phá để tìm hiểu cách thức thực hiện thí nghiệm, báo cáo hoạt động và vận dụng. Hoạt động của học sinh bắt đầu từ việc tự đặt câu hỏi hoặc xác định tình huống có vấn đề liên quan đến bài học cần sử dụng phương pháp thí nghiệm để chứng minh, giáo viên chỉ gợi ý khi cần thiết. Kết thúc các hoạt động thực hiện thí nghiệm, Học sinh phải tìm ra được các ví dụ vận dụng kiến thức đã học, giải thích được các hiện tượng xảy ra vào trong cuộc sống từ mức độ đơn giản đến mức độ nâng cao. Kế hoạch bài dạy “Nước có tính chất gì” được thiết theo qui trình dạy học đã đề xuất. Thông qua việc thực nghiệm kế hoạch bài dạy đã chứng minh có hiệu quả tốt trong việc phát triển các thành phần năng lực khoa học tự nhiên cho học sinh theo yêu cầu của chương trình môn Khoa học 2018.

Từ khóa: năng lực; phương pháp thí nghiệm; học sinh; tiểu học; khoa học; nghiên cứu khoa học