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Teaching Science in Primary Schools: A Study on the Current Situation in Ho Chi Minh City – Vietnam

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The renovation of the Vietnamese general education system has been implemented at all levels since 2018. This reform was put into practice due to the growing demands for social developments and the remaining inadequacies in the current general education system. Such inadequacies in education levels and school subjects are being investigated extensively by local educators. This article explores the current situation of science teaching and learning in primary schools in Ho Chi Minh City, Vietnam. On that basis, it is possible to propose a model for organising experiential activities in science teaching with an orientation toward the development of students' competencies. This is expected to enhance the quality of education, meeting the demands for a reformed general education system in the present and the foreseeable future.

Keywords: *Science Subject, Primary Schools, Educational Renovation, Field Survey Results*

Introduction

Renovating the general education system is considered one of the most important goals of the Vietnamese educational renovation in order to enhance education quality, satisfy social needs, and expand into international markets. Therefore, the general education program (the primary education level) was launched under Circular No. 32/2018/TT-BGDDT issued by the Minister of Education and Training on December 26th, 2019 to meet the demands for new teaching materials and methodologies in the new era. Particularly, the emphasis is placed on reforming the teaching and learning of science, as this subject is one of the subjects that "help students learn about the natural world, sciences, and humans, equipping students with the foundational knowledge and skills as well as helping them develop the appreciation for nature, the scientific creativity and interest for discovering their surroundings. It raises their awareness for protecting

their physical and mental wellness as well as that of their family and communities. Students learn to protect natural resources and be responsible for their environment. Besides, studying science also lays the foundation for other subjects such as Natural Science in lower secondary schools and Physics, Chemistry, and Biology in upper secondary schools. One of the requirements put forth by the program is that students must be immersed in experiences" (Vietnam's Ministry of Education and Training, 2018, p.2).

In reality, the teaching and learning of science subject in primary schools, at the moment, demonstrates certain inadequacies. *From the practices mentioned above, it is clear that the current situation of science teaching and learning should be investigated thoroughly with integrity and objectivity.* On that basis, theoretical grounds and valid practices can be provided to develop a model for teaching science through experiential activities with an orientation toward the development of students' competencies.

Literature Review

In "Scientific inquiry and nature of science", Flick and Lederman (2004) cited Miller's perspective, stating that science is the result of human activities to discover and explain our observations of the natural world around us. The effectiveness of science teaching depends on the creativity, reflection, and personal experiences of learners (Government of Ireland, 1999). Science provides individuals with factual and useful knowledge about the surrounding world (Tseitlin & Galili, 2006). As a result, to improve and enhance the quality of science teaching, many studies have been conducted to investigate the teaching of science, including its nature as well as the contents and curricula used. The goals of teaching science are to provide students with scientific knowledge to foster their interest in becoming scientists in the future (Settlage & Southerland, 2007; The Ontario Public Service, 2016), improving their responsibility toward their society, communities, and surrounding environment (Eurydice, 2006). Science plays a vital role in the development of students as it gives them the opportunities to enrich their knowledge and build their own way to discover the world with proper attitudes and positive contributions to society, among other benefits (The Government of Ireland, 1999). This is in line with the goals of science teaching in the Vietnamese General Education Curriculum issued in 2018: "Contributing to the formation and development of an appreciation for mankind and nature in students, the scientific creativity and interest in discovering the natural world; contributing to the formation and development of scientific competencies, the ability to use knowledge to explain events, phenomena, and relationships in nature, as well as resolve basic problems in daily life" (Vietnam's Ministry of Education and Training, 2018).

Several studies have offered recommendations to improve the teaching of science. For example, the teaching should ensure the following three criteria (Settlage & Southerland, 2007):

- The legality of science in the curriculum.
- The role and the position of science in comparison with other subjects in the curriculum.
- The impact of science on the development of intelligence and skills in students.

Recently, in large-scale assessment frameworks such as PISA, the learning quality of students in science and mathematics is strongly emphasised. Moreover, knowledge of science and mathematics is essential for a modern citizen (Bybee, 1997; OECD, 2003). Science literacy is multifaceted, including the descriptions, explanations, and predictions about scientific phenomena as well as an understanding of scientific research, explanations of evidence, and scientific conclusion (OECD, 2003).

Regarding the reform of the science curriculum, researchers have pointed out that the reform of curriculum content must be carried out in conjunction with the reform of teaching methodologies and assessment with an orientation toward the development of competencies (Eurydice, 2006). The knowledge to be included in the science curriculum should be designed into topics about life, humans, plants, animals, environment, sounds, and lights, among others (Gillespie & Gillespie, 2007). The curriculum should be updated to include more diverse content, especially for higher grades in primary education so that students get to learn about the life around them, plants, animals, bacteria, materials, and environment, among others (Inspectorate Department of Education and Skills, 2012). The reform should include all the content, the curriculum, and methodologies with an emphasis on constructive and experiential learning (Jenkins, 2013). The curriculum should be designed to maintain the harmony between the theories and practice of different topics, building theories on reality to encourage students to experience for themselves (Government of Ireland, 1999).

Regarding the science teaching methodologies, at the end of the 19th century, the British chemist Henry Edward Armstrong (1948-1937) introduced the heuristic method of teaching centred around the notion of investigation and discovery. Sixty years later, his method is known as learning through investigating, which is closely connected with the concept of discovery learning. These days, it has been widely implemented in the European Union and is known as the “Inquiry-Based Science Education” (Koutsoukos, Fragoulis, & Valkanos, 2015).

Gagné (America) proposed a teaching model consisting of observations, question raising, discussions, practice, and experiments among which observations are most frequently conducted by teachers (Chapter 6, page 43). Besides, other studies recommend that teachers should employ constructive and experiential learning frequently (Jenkins, 2013). Outdoor activities should be organised to discover natural, scientific, and social phenomena with field investigation being the focus of scientific activities (The Government of Ireland, 1999). Using a combination of methods such as group work, individual work, and discovery learning to give students the opportunities to experience for themselves (The Government of Ireland, 1999). Sitting at their desk listening to lectures is not an interesting experience for learners – students should be able to work things out, practice, observe, cooperate with each other and share their

ideas (Walma van der Molen, Aalderen-Smeets, & Asma, 2010). Science should be considered as a verb, meaning students should be able to think and act as they learn through practice (Settlage & Southerland, 2007). The most commonly used teaching methods include observation, investigation, experience, experiment, debate, role-playing, task-based learning, practice, encouraging students to raise questions and speak up, and using the internet, among others. Parents' involvement in their children's learning process as they join scientific experiential activities with their children at night also contributes to enhancing their children's learning quality (Peacock, 2006).

To teach science effectively, some education researchers around the world have designed several teaching models (see Table 1). The most prominent models for teaching science include the three-phase cycle of Robert Karplus and Their (Eurydice, 2006; Settlage & Southerland, 2007); the four stages of Wynne Harlen and Anne Qualter (Eurydice, 2006; Harlen & Qualter, 2018; Settlage & Southerland, 2007); the five stages of Bybee (Bybee, 1997); Settlage and Southerland (Settlage & Southerland, 2007); the seven steps of Eisenkraft; and the ten steps of Yvette F.Greenspan (Greenspan, 2016).

Table 1: Summary of the science teaching models in primary schools (Settlage & Southerland, 2007)

Model	***Karplus and Thier***	***Education Development Center***	***Bybee***	***Settlage and Southerland***	***Eisenkraft***
Step 1	/	/	/	/	Elicit
Step 2	/	Getting started	Engage	Engage	Engage
Step 3	Exploration	Exploring and discovering	Explore	Explore	Explore
Step 4	Concept introduction	Processing for meaning	Explain	Explain	Explain
Step 5	Concept application	Extending the learning experience	Elaborate	Extend	Elaborate
Step 6	/	/	Evaluate	Evaluate	Evaluate
Step 7	/	/	/	/	Extend

Several studies also show that science teaching will be more effective with experiential activities. Particularly, eight of the most prominent studies include:

- "Science in the primary school 2008" states that experiments "would have been much better if they were not so teacher directed and if the children had an opportunity to conduct the experiments themselves. The children spent a lot of time sitting and listening during this lesson. The lesson is wholly controlled and led by the teacher. She

gives clear explicit instructions but there is no fostering of the pupils' independent skills or the development of higher-order thinking skills. The teacher uses a didactic approach and there are no opportunities for the pupils to discuss, ask questions or to explore their own questions. The teacher presented the lesson well and has a secure knowledge of the topic she was teaching but there was no effort to include scientific enquiry in the lesson" (Inspectorate Department of Education and Skills, 2012, p.27). This is in line with the perspectives of many educators around the world (Harlen & Qualter, 2018; Lilly, n.d.; McCloughlin & Murphy, 2003; Settlage & Southerland, 2007).

- Students will become more active in learning when they are offered opportunities for self-discovery than passively receiving knowledge from their teachers or textbooks (Fitzgerald, 2012). Generally, scientific knowledge is formed by teaching methods: Specific experiences + practice = scientific concepts

- Students start with their own ideas about how everything works and discover new knowledge through experiential activities. During scientific activities, students should be offered opportunities to try to exchange or challenge ideas. Observation is considered a basic skill in teaching science (The Government of Ireland, 1999).

- A successful learner is someone who has learned the learning method and the learning method can be gained from experiential learning (Scherer & Beckmann, 2014).

In the same vein, many studies have revealed the limitations of the science curriculum, including the lack of teaching materials, textbooks on environments, and the shortage of competent science teachers (Koutsoukos et al., 2015). The curriculum does not emphasise the learning outcomes, lacks content diversity, and only focuses on three main topics, namely, organisms, energy, and environments (Inspectorate Department of Education and Skills, 2012). The rigid topic-based curriculum limits children's awareness and interest (Jenkins, 2013). The curriculum is outdated, heavy on content and lacks practice (The Government of Ireland, 1999). As a result, researchers suggest that the curriculum should be designed to maintain harmony between theories and practice, providing students with opportunities to experience for themselves (The Government of Ireland, 1999). Fundamental changes to the time allocation and content are necessary to develop a curriculum with an orientation toward competency development (Eurydice, 2006).

Research Methodology

To investigate the current situation of teaching science, direct interviews were conducted to collect extensive data from school administrators, teachers, and students for analysis, discussion, and evaluation of results. Pedagogical observations were also carried out in teachers' lessons and students' learning activities. In addition, indirect interviews were conducted in the form of questionnaires. A combination of closed-ended questions and open

questions was developed based on the results of the field survey to collect information and figures about the current situation of science teaching in primary schools. Data collected from the field survey played an essential role in the analysis and evaluation of the current situation of science teaching in Ho Chi Minh City, Vietnam.

The questionnaire for administrators and teachers includes eight questions focusing on:

- The current situation of teaching science in primary schools, including the actual teaching methods (item 1), lesson planning (item 2), teaching facilities (item 3), the actual experiential activities in teaching science (items 4, 5, and 6).

- Difficulties teachers face when organising experiential activities when teaching science with an orientation toward developing students' competencies (item 7) and recommendations to improve the quality of teaching and learning science (item 8).

There were two more questions for administrators to evaluate teachers' attitudes toward teaching science (item 9) and the effectiveness of science teaching in the school (item 10).
The questionnaire for students includes four questions focusing on:

- How teachers actually teach science (item 1), teachers' use of teaching facilities (item 2), students' preferences for learning science (item 3), and students' interest in this subject (item 4).

Both closed-ended and open questions were used and the three-point Likert scale was employed for measurements.

*** Statistical analysis:** For the three-point Likert scale:

The scores were assigned for each point as follows:

The first point: 1 score; The second point: 2 scores; The third point: 3 scores

After the questionnaires were collected, the data was analysed using Excel and SPSS 20.0 (Statistical Package For The Social Sciences). The statistical analysis was as follows:

Descriptive statistics	Abbreviation
Mean	M
Rank	T.h

The meaning of each mean score in the interval scale

Range = (Maximum – Minimum)/n = (3 – 1)/3 = 0.67

Mean Score	Frequency
1,00 – 1,67	Never
1,68 – 2,35	Sometimes
2,36 – 3,00	Often

Results and Discussion

Using the random sampling method, the participants were chosen from the three target groups in 27 primary schools in 18/24 districts, including:

- 45 Principals and Vice Principals (Administrators)
- 354 teachers in charge of grades four and five
- 1880 students in grades four and five

The survey results are as follows:

Results

The lesson content

Based on the lesson plans of 27 primary schools surveyed and the observations of 47 periods, certain comments on the actual science content can be made:

- 100% of the schools have their lesson plans in accordance with the curriculum issued under Circular No. 16/2006. There are two periods for science each week. The total number of science periods in an academic year is 70 periods, covering 70 lessons. There are three topics for grade 4 (Humans and Health, Matters and Energy, Animals and Plants) and four topics for grade 5 (Humans and Health, Matters and Energy, Animals and Plants, Environment and Natural Resources).

- The weekly lesson plans include details on the lesson titles, which are followed accurately by teachers. Teachers deliver properly the content, knowledge, and skills as well as helping students adopt the right attitudes in each lesson.

- The 47 observation periods consisted of 24 periods of grade four (topics include Matters and Energy, and Animals and Plants) and 23 periods of grade 5 (topics include Animals and Plants, and Environment and Natural Resources). It is observed that 35/47 periods (74.5%) were conducted close to the content and guidelines provided in the teacher's books when it came to organising learning activities for students. There were 25/47 periods (51.1%) where the teachers failed to expand the lesson content and

neither gave creative examples nor designed activities suitable for the cognitive characteristics, levels, and competencies of their students. From their perspectives, they were afraid that if they taught content outside of the textbook and teacher's book, their teaching would be deemed as inaccurate and non-compliant with policies. There were only five periods from grade four and six periods from grade five where the teachers gave examples outside of the textbook and related to real-life for students to work on forming new knowledge.

Besides, although the teachers did organise experiential activities to teach science, those activities were not appropriate or well designed. As the teachers did not want to fall behind on their lesson plans, they were prone to taking over students' work. Because the lessons were tightly based on the textbooks and teacher's books, some of the content was not suitable for students' cognitive characteristics, thus, failing to engage and capture their interest. The students themselves lacked autonomy, resulting in passive classroom atmospheres. Most of the periods focused on delivering knowledge and did not provide many activities for students.

Teaching methods

Based on the questionnaires delivered to 45 administrators and 354 teachers, observations, and interviews, the results are demonstrated as follows (see Table 2):

Table 2. Results of the teacher survey on the frequency of teaching methods used

No.	**Methods**	Never		Sometimes		Often		**M**	**T.h**
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
1	Q&A	/	/	11	3.1	343	96.9	2.97	1
2	Observation	/	/	28	2.9	326	92.1	2.92	2
3	Visual aids	/	/	36	10.2	318	89.8	2.90	3
4	Instruction	1	0.3	46	12.9	307	86.7	2.86	4
5	Discussion	/	/	94	26.6	260	73.4	2.73	5
6	Practice	1	0.3	122	34.5	231	65.2	2.65	6
7	Problem raising and solving	17	4.8	203	57.3	134	37.9	2.33	7
8	Brainstorm	22	6.2	195	55.1	137	38.7	2.32	8
9	Story-telling	19	5.4	206	58.2	129	36.4	2.31	9
10	Presentation	24	6.8	211	59.6	119	33.6	2.27	10
11	Investigate - Discover	29	8.2	229	64.7	96	27.1	2.19	11
12	Debate	27	7.6	232	65.5	95	26.9	2.19	12

13	Experiment	3	0.8	286	80.8	65	18.4	2.18	13
14	Role-play	78	22.1	213	60.1	63	17.8	1.96	14

The results of the teacher survey show that in order to deliver lessons, teachers often used 6/14 teaching methods, including Q&A, observation, visual aids, instruction, discussion, and practice ($M \geq 2.65$). The remaining eight teaching methods (problem raising and solving, brainstorming, story-telling, presentation, investigation-discovery, debate, experiment, and role-play) were used occasionally to teach science ($1.96 \leq M \leq 2.33$).

In comparison, the results from the administrator survey regarding the teaching methods used by most teachers are illustrated below (see Table 3):

Table 3: Results of the administrator survey on the frequency of teaching methods used by most teachers

No.	**Methods**	Never		Sometimes		Often		**M**	**T.h**
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
1	Q&A	/	/	3	6.7	42	93.3	2.93	3
2	Observation	/	/	3	6.7	42	93.3	2.93	4
3	Visual aids	/	/	2	4.4	43	95.6	2.96	2
4	Instruction	/	/	7	15.6	38	84.4	2.84	5
5	Discussion	/	/	1	2.2	44	97.8	2.98	1
6	Practice	/	/	19	42.2	26	57.8	2.58	6
7	Problem raising and solving	/	/	30	66.7	15	33.3	2.33	9
8	Brainstorm	/	/	30	66.7	15	33.3	2.33	10
9	Storytelling	/	/	28	62.2	17	37.8	2.38	7
10	Presentation	/	/	31	68.9	14	31.1	2.31	11
11	Investigate - Discover	1	2.2	39	86.7	5	11.1	2.09	14
12	Debate	1	2.2	30	66.7	14	31.1	2.29	12
13	Experiment	/	/	35	77.8	10	22.2	2.22	13
14	Role-play	/	/	29	64.4	16	35.6	2.36	8

According to the administrators, among the 14 methods commonly used to teach the science subject in primary schools, teachers often used eight methods, including discussion, visual aids, Q&A, observation, instructions, practice, storytelling, and role-play ($M \geq 2.36$). Six of those are in line with the teachers' perspectives, namely, discussion, visual aids, Q&A, observation,

instruction, and practice. Two methods considered commonly used by teachers were storytelling and role-play. The six remaining methods considered as sometimes used by teachers were problem raising and solving, brainstorming, presentation, debate, experiment, and investigation-discovery. The administrators made these evaluations based on their observations of science classes and unscheduled inspections of teachers' expertise. Therefore, although the administrators and teachers ranked teaching methods differently, all of them were in agreement that none of the 14 methods commonly used in teaching science was left out.

To investigate the reason why the administrators believed more teaching methods were used than numbers provided by the teachers, classroom observations, and interviews with administrators and students were conducted. Based on the classroom observations and interviews with administrators, it appears that the survey results are consistent with the actual science teaching practices of teachers. In the classrooms, teachers made good use of and combined effectively many methods, mainly the eight methods mentioned above. However, during the interviews with five fourth-grade students and nine fifth-grade students, the students stated that their teachers organised more activities, designed more games, and used more attractive realia when there were classroom observations. They were allowed more opportunities to work things out using realia related to the lesson content. The students greatly enjoyed those opportunities. The classrooms were more interesting and active, which perfectly captured their interest. The teachers were gentle and helpful. As a result, the students loved those classes and would love to have more classroom observations.

To gain more insights into the teaching methods used by teachers, 1,880 students from 27 primary schools were surveyed about the learning activities commonly used by their teachers to teach science. The results are as follows (see Table 4):

Table 4: Results of the student survey on student participation in science learning activities

No.	**Activities**	Never		Sometimes		Often		**M**	**T.h**
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
1	Answer questions raised by teacher or questions in textbooks	12	0.6	288	15.3	1580	84.1	2.83	1
2	Listen to teacher's instruction and memorise the lesson conclusion	11	0.6	332	17.7	1537	81.8	2.81	2
3	Work in groups, discuss to learn more about the lesson	123	6.5	1138	60.6	619	32.9	2.26	3
4	Observe photos or realia	94	5.00	1208	64.3	578	30.7	2.26	4
5	Read books, discuss with friends	105	5.6	1318	70.1	457	24.3	2.19	5
6	Play learning games, answer riddles, etc.	94	5.00	1396	74.3	390	20.7	2.16	6

7	Read the textbook, then memorise the lesson conclusion	301	16.1	1114	59.2	465	24.7	2.09	7
8	Debate, present the lesson content	264	14.1	1322	70.3	294	15.6	2.02	8
9	Investigate, role-play to discover the lesson content	396	21.1	1359	72.3	125	6.6	1.86	9
10	Practice and experiment	1169	62.2	669	35.6	42	2.2	*1.40*	10

Based on the results in Table 4, the learning activities commonly used by teachers were letting students learn by "Answer questions raised by teacher or questions in textbooks" (M = 2.83) and "Listen to teacher's instruction and memorise the lesson conclusion" (M = 2.81). This means that the most commonly used teaching methods were Q&A and instruction. In addition, experiments were not used (M = 1.40).

Therefore, based on the results from surveying the current use of methods to teach science, there were both consistency and inconsistency. Administrators, teachers, and students were consistent in choosing the Q&A and instruction methods. However, there was inconsistency in the numbers and content of the methods that were commonly used and never used. According to the teachers, they used four more methods than the number provided by the students, which are observation, visual aids, discussion, and practice. According to the administrators, the teachers used two more methods (storytelling and role-play) than the number provided by the teachers themselves and six more methods (observation, visual aids, discussion, practice, storytelling, and role-play) than the number provided by students. What could be the reason behind such inconsistency? Classroom observations and interviews with administrators, teachers, and students reveal a major cause: When there were classroom observations, the teachers were more invested and used more teaching methods to help students learn and receive knowledge. Consequently, learning activities were more diverse, the students were more interested and participated in the lessons to build up more knowledge for themselves. In contrast, when there were no classroom observations, most teachers often used two methods, namely Q&A and instruction to save time and ensure that they could deliver the basic knowledge to students. Unfortunately, the students felt that the lessons were boring because they received knowledge passively. Besides, in the 47 periods observed in this study, no teacher used experiments. This situation provides essential grounds for proposing models, methods, and techniques to organise experiential activities with an orientation toward the development of students' competencies.

Teaching facilities

Results from the teacher survey show that among the seven teaching facilities commonly used to teach science in primary schools, the two most commonly used were textbooks (M = 2.98) and projectors and TVs (M = 2.77). The remaining five types of facilities (pictures and

diagrams, real objects and realia, models, picture books and reference books, experiment tools) were used occasionally by teachers ($2.04 \leq M \leq 2.32$). No facilities weren't used (See Table 5).

Table 5: Results from the teacher survey about the frequency of teaching facilities used

No	Teaching facilities	Never		Sometimes		Often		M	T.h
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
1	Textbooks	1	0.3	5	1.4	348	98.3	2.98	1
2	Projectors and TVs	/	/	80	22.6	274	77.4	2.77	2
3	Pictures and diagrams	6	1.7	228	64.4	120	33.9	2.32	3
4	Real objects and realia	2	0.5	240	67.8	112	31.6	2.31	4
5	Models	2	0.5	287	81.1	65	18.4	2.18	5
6	Picture books and reference books	14	3.9	296	83.7	44	12.4	2.08	*6*
7	Experiment tools	67	18.9	205	57.9	82	23.2	2.04	7

Based on the results of the teacher interviews, classroom observations, and field surveys, it seems that most of the type-one schools (schools with over 28 classrooms) were already equipped with TVs for every classroom. Therefore, during science periods, teachers often used textbooks, projectors and TVs to present pictures in order to let students observe and figure out the lessons. The lesson plans and pictures are widely available on the internet. Teachers only have to download them and adapt them to suit their students' cognitive characteristics.
These results are similar to the results from the administrator survey (see Table 6):

Table 6: Results from the administrator survey about the frequency of teaching facilities used by teachers

No.	Teaching facilities	Never		Sometimes		Often		M	T.h
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
1	Textbooks	/	/	1	2.2	44	97.8	2.98	***1***
2	Projectors and TVs	/	/	3	6.7	42	93.3	2.93	***2***
3	Pictures and diagrams	/	/	10	22.2	35	77.8	2.78	***3***
4	Real objects and realia	/	/	30	66.7	15	33.3	2.33	5
5	Models	3	6.7	13	28.9	29	64.4	2.58	***4***
6	Picture books and reference books	4	8.9	39	86.7	2	4.4	1.96	*6*
7	Experiment tools	19	42.2	13	28.9	13	28.9	1.87	7

However, the administrators believed that the teachers also used two more types of facilities which were pictures and diagrams, and models. Besides the consistency in the administrators' and teachers' evaluations of the commonly used facilities (textbooks, projectors and TVs), what is the reason behind the inconsistent evaluation? Three administrators, two fourth-grade teachers, and three fifth-grade teachers were interviewed. During class, teachers often used textbooks, projectors and TVs. However, when there were classroom observations, teachers were more invested in their lessons and used more teaching methods and learning facilities. They used more teaching methods as well as lesson organisation types to enhance the effectiveness of their lessons, making them more attractive, which improved students' learning. According to the administrators, the teachers also used the other teaching facilities occasionally and no facilities were left unused.

To gain insights into the teaching facilities commonly used by teachers, students were surveyed. The results were as follows (see Table 7):

Table 7. Results from the student survey about the frequency of teaching facilities used by teachers

No.	**Teaching facilities**	Never		Sometimes		Often		**M**	**T.h**
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage		
1	Textbooks	14	0.7	22	1.2	1844	98.1	2.97	1
2	Projectors and TVs	317	16.9	1220	64.9	343	18.2	2.01	2
3	Pictures and diagrams	302	16.1	1308	69.6	270	13.3	1.98	3
4	Real objects and realia	352	18.8	1366	72.6	162	8.6	1.90	5
5	Models	352	18.8	1259	66.9	269	14.3	1.96	4
6	Picture books and reference books	857	45.6	972	51.7	51	2.7	1.57	*6*
7	Experiment tools	1281	68.2	591	31.4	8	0.4	1.32	7

Based on the results from surveying 1,880 students from 27 primary schools in Ho Chi Minh city, only one type of teaching facility, which was textbooks, was commonly used by teachers (M = 2.97). Two of the types of teaching facilities never used were picture books and reference books (M = 1.57) and experiment tools (M = 1.32). The results from the student survey were significantly different from the results of the teacher and administrator surveys. In particular:

- The administrators and teachers stated that there were two to four types of teaching facilities commonly used and none was left unused.

- The students stated that only one type of teaching facility was used commonly, namely, textbooks. Two types of teaching facilities were never used (picture books and reference books, and experiment tools).

Based on the classroom observations and student interviews, it is safe to assume that the fundamental cause behind this issue stems from teachers' teaching habits and the shortage of experiment tools for certain lessons. In fact, each teacher was issued one toolkit which included all the necessary pictures, models, and experiment tools. However, due to the teachers' teaching habits (which is especially the case for older, more experienced teachers – according to the survey, 39.5% of the teachers have been teaching for more than 20 years), large class size, small classrooms (a common problem for schools in the city), teachers only used teaching facilities when absolutely necessary. Additionally, one toolkit for each class was not enough. Students could only watch their teachers' demonstrations and did not have the chance to practice with the toolkit themselves. This is why the students claimed they never got to use experiment tools.

In short, according to the students, their teachers often used Q&A and instruction as their main teaching methods. The types of lesson organisation commonly used were whole-class and individuals. The type of teaching facilities most commonly used was textbooks. Based on the student survey, it appears that when teaching science, teachers have not been able to organise truly exciting learning activities to capture students' interest. The teachers mostly rely on traditional teaching methods and the main type of teaching facility used is textbooks.

Discussion

Based on the results from the surveys on the actual teaching of science conducted on 45 administrators, 354 teachers, and 1,880 students in 18/24 districts in Ho Chi Minh City, it can be concluded that:

All teachers followed the curriculum, lesson plans, and time allocation (2 periods/week). The teachers were in control of the lesson content and knowledge as well as confident in their teaching. However, the lessons were still heavily centred around the textbooks and the suggestions provided in the teacher's books. Few teachers were creative in extending the lessons or made use of other contents suitable for the students' cognitive abilities to design appropriate learning activities and experiential activities. Therefore, the lessons remained rigid. Some of the content was not suitable for the students' mentality and psychology. The students were passive in learning and lacked autonomy.

When organising learning activities to help students gain new knowledge, all of the teachers used effective teaching methods (such as Q&A, discussion, visual aids, and observation) combined with visual objects, projectors, and lively images to encourage students to be proactive in learning, discussing, and discovering knowledge. The students participated in

group work and discussion to exchange ideas. They were confident when presenting the tasks assigned by their teachers. The classrooms were lively and active. Most students were proactive in learning. However, there were still many students "sitting back" from learning activities with a passive attitude. They were only looking and did not participate in discussions nor raise their voices in any activity. Most teachers could not stay on top of their whole class and were not able to keep an eye on each student. As the class sizes were rather large (over 40 students in each class), it was not feasible to ensure the total participation of every student. Sometimes, when the students raised questions in certain lessons, the teachers did not follow up. Some of the students were shy and could not present the topics clearly. They would hesitate and slow down the pace of the lesson. The teachers would take over and answer for the students instead of helping them finding the answers and solving learning tasks on their own. Students mostly observed pictures with their eyes. Other senses (for example, touch and smell) were not engaged because many students sitting at the back of the classroom could only look up to the board or the TV. Students who were more active received more learning opportunities from their teachers while others only listened passively. This results in uneven development and further enlarges the gaps in competencies among students.

During the lessons, the teachers did try their best to provide students with learning activities. However, due to the large class size of over 40 students per classroom, not all students could participate in learning games. Only a few representatives from each group of students were allowed to participate in such games. This reality limits the effectiveness of organising active learning activities for students. Noticeably, there were no periods where the teachers used teaching facilities such as picture books, reference books, and experiment tools. Thus, experiments were not used as a teaching method in science classes. This provides essential grounds to design models, methods, and techniques to organise experiential activities that can be easily utilised in science classes to capture students' interest and develop their competencies.

Regarding the organisation of experiential activities to teach science in primary schools, 57.8% of the teachers stated they did organise experiential activities while the remaining 42.2% did not use experiential activities in their teaching. 80.3% of the administrators believed that the teachers used experiential activities to teach science. Many teachers did not organise experiential activities due to the large class size, shortage of facilities and funding to make teaching aids, students' attitudes toward learning, safety issues, parents' support and cooperation, and the lack of clear guidelines on how to organise experiential activities (for example, the steps to conduct the hands-on method). Such challenges in organising experiential activities combined with the fact that around 50% of the teachers do not use experiential activities to teach science have resulted in low effectiveness in science teaching (according to the 45 administrators surveyed, the current teaching of science is not highly effective).

Assessment of students' learning progress places the emphasis on retrieving knowledge, is traditional and heavy on theories. Assessment relies entirely on examination results, failing to provide an objective, holistic assessment of the learning progress.

During the lessons, students would like to participate in games and be allowed to view pictures and watch videos about the lessons. They would enjoy learning in nature, practicing experiments, role-playing, and discussing in groups. In fact, these are the main points of organising experiential activities to teach science with an orientation toward developing students' competencies. Therefore, they must be researched and incorporated into the models, methods, and techniques to organise experiential activities to teach science with an orientation toward developing students' competencies in order to meet students' needs to participate in learning activities and ensure the feasibility and effectiveness of the learning progress.

Conclusion

All in all, the teaching of science in primary schools in Ho Chi Minh city is receiving attention from most administrators and teachers. However, because the teaching methods, facilities, and lesson organisation still leans toward the conventional teacher-centred approach where the teachers provide students with knowledge from the textbooks, the effectiveness of science teaching remains relatively low. Although the teachers are invested in teaching science, many have not employed proactive learning activities (such as experiential activities) in their teaching due to different reasons, including non-optimal classroom spaces, large class sizes and shortage of facilities and teaching aids, among others.

When learning science, students would like to participate in experiential activities such as learning in nature, practicing, experimenting, and playing games. However, due to several limitations, including the lack of spaces and facilities, the main teaching equipment used are projectors and TVs. Schools located in the outskirt areas have very limited resources – students have access to only chalk, blackboards and textbooks. This places a serious constraint on the organisation of learning activities, specifically experiential activities, to help students acquire knowledge more effectively and foster an appreciation for the subject. Assessment of students' learning progress is not oriented toward their competency development. Students are tested on the ability to reproduce the lesson content and are not formatively assessed. The final examination results serve as the basis to measure students' academic achievements at the end of the semester and the academic year.

Being aware of the benefits of teaching via experiential activities with an orientation toward the development of students' competencies and the demands for this teaching approach, many administrators and teachers have been training themselves to make changes and enhance their teaching quality. Unfortunately, as they do not have full access to materials, models, methods, and techniques to organise experiential activities, the effectiveness of their teaching remains

unsatisfying. Therefore, models, methods, and techniques to organise experiential activities should be timely proposed.

On that basis, it is essential to propose a model to teach science using an experiential approach and design topics that are practical for the teaching of science subject. Thereby, teachers will not have to spend too much effort and yet still find joy in implementing experiential activities to teach science with an orientation toward developing students' competencies. As a result, the quality and effectiveness of teaching science will be improved, meeting the demands for a reform and high-quality education at the present and in the foreseeable future, particularly the demands of the 2018 General Education Curriculum.

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