

PRACTICAL INVESTIGATION OF SECONDARY STUDENTS' NATURAL SCIENCE SELF-STUDY COMPETENCY IN SOME URBAN DISTRICTS OF HANOI

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Abstract. According to the Vietnamese latest general education program, one of the core competencies that need to be developed for students is self-study competency. This competency can be promoted by applying appropriate teaching methods which are based on the assessment of the current situation. This article investigates the current situation of secondary students' natural science self-study competency in some urban districts of Hanoi. The research uses the survey method by handling out the questionnaire, and online collecting information. A survey tool has been designed based on the theory of self-study competency, then standardized through a pilot survey on 148 students. The official survey was conducted on 1210 students to assess self-study competency and find out some forms of support that students need. From there, there is a basis to propose some measures to develop self-study competency for secondary school students in subsequent studies.

Keywords: self-study competency, natural science, practical investigation, secondary school.

1. Introduction

The era of knowledge explosion thanks to the emergence and popularity of the internet, search engines, and artificial intelligence, has had a lot of influence on education. One of them is that schools are no longer the sole source of knowledge for learners. Therefore, the development of self-study competency is essential before these changes, to create the best conditions for students on the path of lifelong knowledge discovery. Stemming from the 2018 general education program, self-study is identified as one of the common competencies necessary to develop students [1]. Thus, the study of ways to develop self-study competency for students is meaningful and necessary work, especially in the context of reforming the general education program.

There has been a lot of research in English and Vietnamese on self-study competency. The educational movement's direction focuses on significant changes in the educational process, shifting from knowledge acquisition to the development of learners' comprehensive qualities and competency, one of which is self-study competency [2]. Trinh Quoc Lap (2008) has given the concept of self-study, the reasons for self-study, ways to develop self-study competency, and the viability of developing self-study in Asian countries and Vietnam [3]. According to Bacolod-Iglesia, self-study takes the form of actively completing learning objectives and tasks on one's own, with a unique engraving [4].

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In Vietnam, Dao Thi Kim Nhung (2018) has analyzed the procedure for building materials to guide students in the self-study process [5]. Kieu Phuong Thuy (2021) has proposed several factors affecting self-study competency and some measures to develop self-study competency for students such as creating motivation and learning needs; promoting cognitive skills and metacognitive skills; development must be in line with the trend of the times, etc. [6]. For the theoretical basis of self-study and self-study competency including concept, structure, expression, importance, etc., many authors have also presented in papers [7-13]. The above research papers have detailed the theoretical basis for self-study and self-study competency and suggested some specific measures to encourage this competence for students. However, the subjects of the above studies are mainly high school students or university students, who have higher self-awareness and self-study competency, while the research and development of self-study competency for students at secondary school are still quite limited. On the other hand, at the middle school stage, self-study also plays a big role in helping students acquire knowledge, creating the basis for this competency to be developed in the next stages.

The location of the survey is in Hanoi, which is the authors' working area, so it is convenient to conduct a situation investigation in this region. Besides that, students in the urban districts of Hanoi almost have enough technological means, internet, etc. for self-study, therefore it is favourable to investigate what prevents students from developing self-study competency apart from physical facilities. Since then, it has shown the urgency to study the needs of secondary school students in self-study, especially students in some urban districts of Hanoi, creating the most favorable conditions for students to develop self-study competency.

Therefore, this study aims to investigate the status of self-study competency of secondary school students in science subjects and find out the needs of students in self-study, as a premise for proposing appropriate measures to develop self-study competency for secondary school students in the future. The research questions are: 1. What is the perception of secondary school students about self-study and the current level of their self-study competency? 2. What difficulties do secondary students often have in self-study of science subjects? 3. How do the students want to support themselves in self-study?

2. Content

2.1. Research purpose

The purpose of the research is to assess the current situation of secondary students' self-study competency in science subjects and; the difficulties and desires of students in self-study, thereby serving as the basis for proposing measures to develop this competency for students.

2.2. Research methodology and tools

The research uses the survey method by handling out the questionnaire, and online collecting information. Based on the concept, forms of self-study, and expression of self-study competency, we have built a survey questionnaire about the current situation of self-study competency of secondary school students in science subjects. In the questionnaire, a combination of closed and open-ended questions was used to collect complete and objective information. Closed questions for basic investigation are designed in the form of multiple-choice questions with the requirement to choose one or more options, and some questions are designed as a Likert scale. Open-ended questions are to collect respondents' opinions.

After the questionnaire was built, an exploratory survey was carried out on 148 6th-graders in the secondary school system of Hanoi - Amsterdam High School for the Gifted. The probe results are used to standardize the assessment tool. Specifically, in the section "conditions for

students' facilities on self-study", we have added the answer "Have a computer/phone/tablet but do not have an internet connection" to classify these subjects. To the question about self-study time in Science, we added the answers "from 3-4 hours" and "over 4 hours". When asking about the desired length of video lectures to use for self-study of a new lesson at home, we omitted the option to write another answer because, in the probe survey results, many students wrote answers that matched the previous one. We repositioned the questions and, at the end of the survey, we added an open-ended question with short answers about the students' needs for self-study.

The official assessment tool was applied to conduct a mass survey for secondary students in some urban districts of Hanoi, including two parts as follows:

- Part 1: Collecting some personal information including Full name (optional), Grade, School, District, and Science grade point average (GPA).

- Part 2: Questions about the current situation of self-study skills in science subject, including:

- + Students' awareness of the importance of self-study in science.
- + Students' facilities to study on the Internet.
- + The level of self-study based on different expressions, assessing self-study competency in general.
- + Method and frequency of self-study, the average time of self-study in science per week.
- + Desire for self-study form when learning a new lesson, choosing the length of video lectures to use in self-study at home.
- + The causes leading to difficulties in self-study and the desire to support self-study.

2.3. Survey participants and period

The subjects of the investigation are students studying science at secondary schools in some urban districts of Hanoi. Students being sent questionnaires are in grades 6 and 7 these students are studying science subjects according to the 2018 general education program in Vietnam), with Science GPA in a wide range. The participants include both public and private school students to collect comprehensive and objective information. The survey period was from March 20, 2023, to April 7, 2023.

2.4. Research results

2.4.1. Personal information data of students participating in the survey

The research team has sent and collected 1210 valid questionnaires of 1210 students from 12 secondary schools in 7 districts of Hanoi. The districts include Cau Giay, Ba Dinh, Ha Dong, Tay Ho, Bac Tu Liem, Hai Ba Trung, and Hoan Kiem. The schools surveyed are both public and private school systems (8 public schools and 4 private schools). This information is shown in Table 1.

Regarding grades, 654 students in 6th grade (54%) and 556 students in 7th grade (46%) participated in the survey. For the GPA of science subject in the first semester of the school year 2022 - 2023, 36.9% of students had a GPA over or equal to 9.0; 32.2% of students from 8.0 - below 9.0; 23.3% of surveyed students have a GPA from 6.5 - below 8.0; the number of students with less than 6.5 Science GPA subject accounted for 7.6%. The parameters of the students participating in the survey as above show that the information was collected on a large scale, with students with a wide range of GPAs. All of them belong to two grades studying science in Vietnam's 2018 general education program, which is suitable for analysis of student's self-study competency in science.

Table 1. Locations of schools with students participating in the survey

District	Name of school	Type of school	Number of students
Ba Dinh	Mac Dinh Chi Secondary School	Public	141
	Giang Vo Secondary School	Public	135
Bac Tu Liem	Newton Grammar School	Private	85
Cau Giay	Hanoi – Amsterdam High School for the Gifted	Public	190
	Cau Giay Junior High School	Public	67
	Archimedes School	Private	53
Ha Dong	Marie Curie Hanoi School	Private	119
	Le Quy Don Secondary School	Public	156
Hai Ba Trung	Ta Quang Buu Middle & High School	Private	66
Hoan Kiem	Trung Vuong Secondary School	Public	16
	Ngo Si Lien Secondary School	Public	12
Tay Ho	Nhat Tan Secondary School	Public	170

Table 2. Percentage of students in two grades

Grade	Number of students (%)
6	654 (54%)
7	556 (46%)

Table 3. Science GPA in the 1st Semester of the school year 2022 – 2023

Science GPA	Number of students (%)
≥ 9.0	446 (36.9%)
From 8.0 - 9.0	390 (32.2%)
From 6.5 - 8.0	282 (23.3%)
≤ 6.5	92 (7.6%)

2.4.2. Results

** The awareness of the importance of self-study*

Figure 1 shows that 91.8% (about 1110 students) have chosen the option “very important” or “important” in terms of self-study, which illustrates that almost all students have an awareness of the importance of self-study. This is a good sign for developing students’ self-study competency.

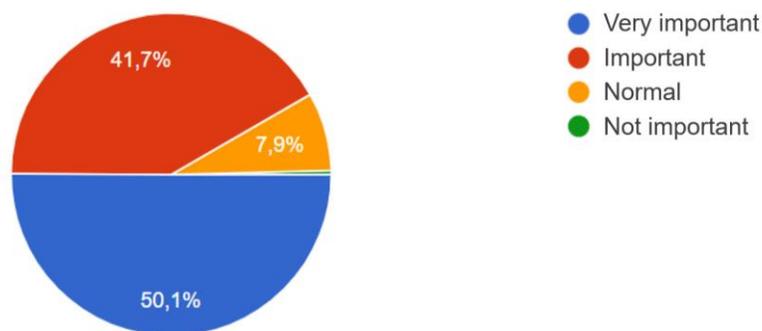


Figure 1. Assessing the awareness of the importance of self-study

*** The technological means to support students in self-study**

This question aims to investigate the technological means to support students in self-study. The results from Figure 2 show that up to 1147 students (accounting for 94.8%) have a computer/smartphone/tablet with an internet connection. This indicates the advantage of implementing some popular forms to support self-study such as interaction, task-taking, or supplying online references for students in some urban districts of Hanoi.

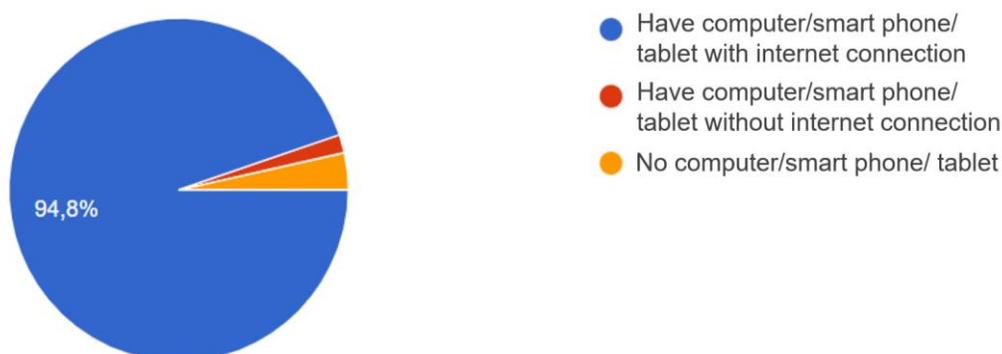


Figure 2. Current situation of technological means to support students in self-study

*** Student's self-study competency**

Results from Table 4 show that students' ability to determine study plans (methods, means, and time) and students' ability to evaluate the self-study process are relatively low (Mean = 2.15 ~ 2.17). Students quite highly appreciate taking notes, organizing knowledge (Mean = 2.4), collecting, searching, analyzing, processing, comparing information sources, and applying knowledge and skills in problem-solving/learning tasks (Mean = 2.32). Thus, the skills that students often acquire from traditional teaching methods such as taking notes, and applying knowledge to solve the problem, are quite good. In addition, students in 6th and 7th grades also know how to collect data, search, and compare information (which is considered too much at that age), possibly because they are exposed to technology and the internet from a young age, gradually forming this skill early. However, determining the study plan and evaluating the process of self-study is not an appreciated aspect. Students need instructors and need to practice more of these skills.

Table 4. Results of student’s self-assessments in self-study
(3 = “Good”, 2 = “Normal”, 1 = “Weak”)

Criteria of self-study competency	Mean		
	General	6 th Grade	7 th Grade
Determine goals and content to self-study	2.28	2.25	2.31
Determine the self-study plan (methods, means, time)	2.15	2.14	2.15
Collect/search, analyze, process, and compare sources of information for accuracy	2.32	2.29	2.35
Apply knowledge and skills to solve learning problems/tasks.	2.32	2.29	2.36
Know how to take notes, organize the knowledge, adjust, and supplement.	2.40	2.37	2.44
Evaluate the self-study process according to the self-study ability assessment scale and the requirements to be achieved.	2.17	2.15	2.19
Adjust and learn for the next self-study task.	2.33	2.31	2.36
<i>The average value of all self-study competency criteria</i>	2.27	2.24	2.30

Regarding the average value of all self-study criteria of 6th and 7th grades separated, in general, grade 7 students self-assessed at a higher level. This can be explained by the fact that 7th-grade students have been familiar with the secondary school program for over a year, gradually forming and self-directing the necessary skills for self-study. Students in grade 6, have just transitioned from primary school, and are not familiar with the curriculum of secondary schools, so they still face many difficulties in self-study. Therefore, the application of teaching methods to encourage the development of self-study competency between the two grades needs to be adjusted to suit the grade.

*** The frequency of using methods for self-study Science**

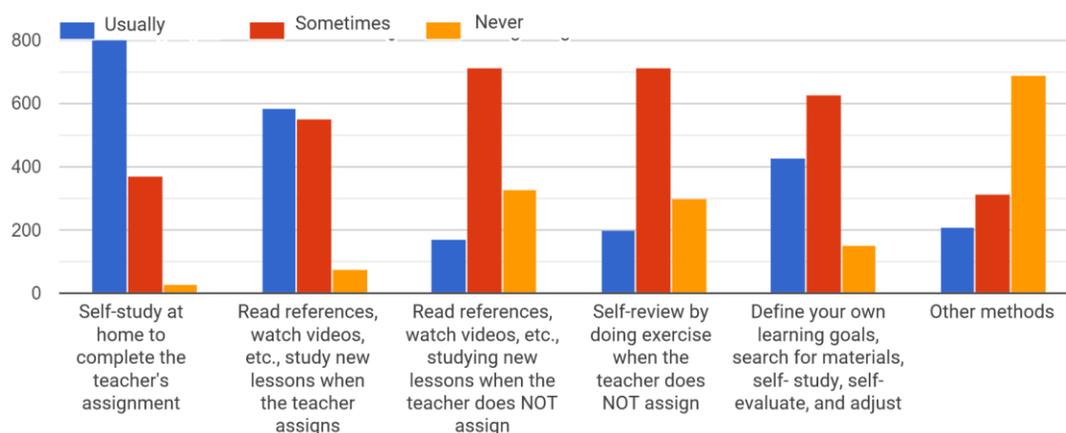


Figure 3. The frequency of using methods for self-study of Science

Figure 3 illustrates that students mainly engage in self-study by completing homework assigned by teachers (usually and sometimes levels are 66.8% and 30.7% of students, respectively); Self-determination further learning goals, searching for learning materials, self-assessing, and adjusting of self-study process are also quite frequent activities carried out by students (with the number of 1057 students, accounting for 87.4% at regular and occasional levels). It proves that students have a sense of self-study when given assignments and can determine learning goals, which is the foundation for self-study. This is a favorable point to encourage self-study competency for students through applying some methodologies.

However, regarding the fact that students read books or references, or watch videos before learning new lessons if the teacher does not assign them: the frequency of 'sometimes' or 'never' takes up a lot (625 students as 51.7%), 'usually' makes up a lesser part (585 students as 48.3%). Thus, most students still lack self-discipline with these activities, which can originate from many reasons: teachers do not ask them to do it, self-study tools such as supporting documents or videos are not attractive enough, and there is a lack of detailed instruction of self-study. Therefore, there are still no means to stimulate students to engage in self-study regularly. Thus, it is necessary to develop learning resources to support teaching models that encourage students' self-study activity, such as flipped classrooms, combined teaching models, etc.

*** The time for self-study of science each week and regular difficulties in self-study of science**

In terms of the time for self-study of science each week, on average, students' self-study in 1-2 hours accounted for the majority (501 students, approximately 41.4%). The remaining 25% of students have self-study time of 2 hours a week or more. This also shows that students have consciously spent time on self-study for this subject, which is an advantage to applying teaching methods to encourage self-study competency.

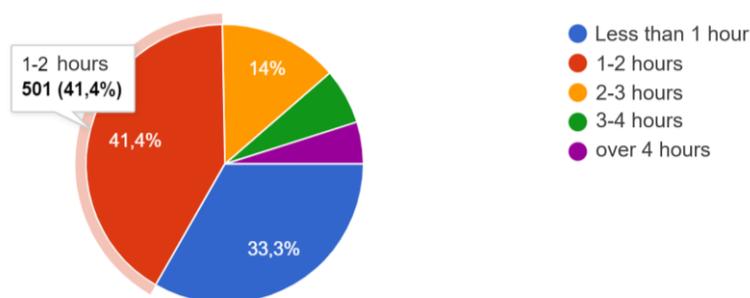


Figure 4. Time for self-study of science each week

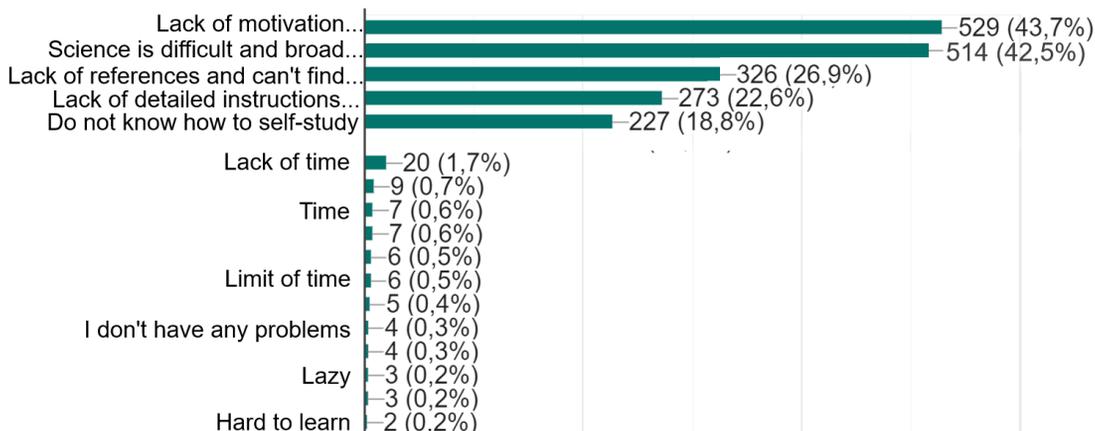


Figure 5. Regular difficulties in self-study of science

Among the regular difficulties in self-study of science, the most common difficulties are the lack of motivation and science knowledge is wide and difficult for self-study (529 students and 514 students, respectively, accounting for 43.7% and 42.5%). Lack of references, not knowing how to find materials for self-study and lack of detailed instructions from teachers are also two difficulties some students encounter (326 students and 273 students, accounting for 26.9% and 22.6%). Only about 227 students (accounting for 18.8%) have chosen the option of not knowing methods of self-study. Besides, quite a few students gave reasons for the limit of time/ lack of time, or no facilities, materials, or tools for self-study. Thus, it may be necessary to develop detailed, attractive, and concise references and tools to encourage and maintain students' self-study in the best way.

*** The students' desired form when assigned a new lesson for self-study, the duration of the video lesson used for self-stud of a new content**

The survey shows that when receiving the task of self-study of a new lesson, the most chosen form by students is interactive learning with video lectures (combining listening to the lecture and answering questions) (516 students accounting for 42.6%) and learning from the teacher's handout (495 students, which is 40.9%). In addition, reading books or references to answer questions has 482 students with it (taking up 39.8%), while watching video lectures and doing short exercises only accounts for 34.2%. After that, the article further surveyed the preferable duration of video lessons used for self-study of new content for students, receiving the most answers from 10 to 15 minutes (566 students 46.8%). Besides, students also stated some other desired forms for self-study. Many forms have been offered, but the article has selected some forms that most students have the same opinion such as playing games, doing entertaining quizzes related to the lessons' content, doing practical experiments, researching information on the internet, and studying in groups. These are some very valuable suggestions for teachers when planning lessons that implement methods to encourage students' self-study competency.

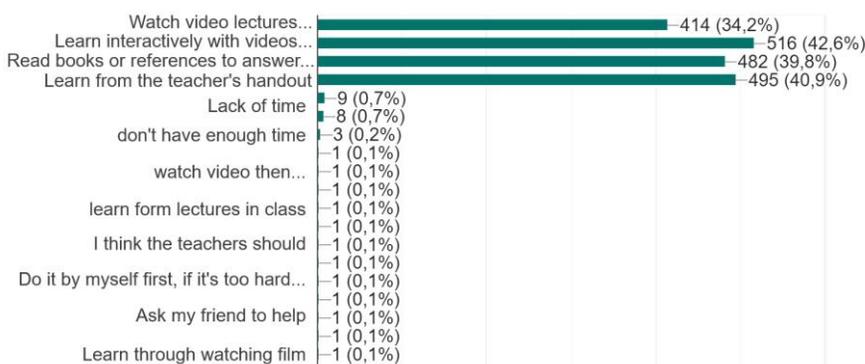


Figure 6. The students' desired form when assigned new lesson for self-study

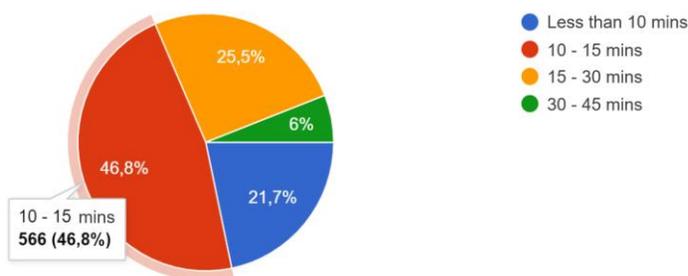


Figure 7. The duration of the video lesson used for self-study of new content

*** Student's desired forms of support during self-study**

We have received various answers to the last open-ended question about students' desired forms of support during self-study. The majority of students have raised the opinion that teachers should give them detailed instruction handouts, and instruct them how to look up information and materials on the internet for self-study at home. In addition, a large number of students want to have online lectures or interactive videos to support self-study. Some other students need to use many websites to do exercises or lesson reviews and have detailed answers after that. In addition, they also suggest other means, such as application software, and books for self-study. Some students with low self-study competency want to interact with teachers and friends on the Internet to ask questions outside of school hours. Thus, most students have a sense and orientation about self-study and need many different means and ways to support this process. Therefore, it is necessary to provide resources, learning materials, and means for students to make self-study effective at best.

3. Conclusions

Self-study competency is one of the common skills necessary to develop students. The development of this competence is important in the context of the new era, encouraging students to develop the habit of self-improvement and self-training, creating the best conditions for students to acquire knowledge on their own of long-term vision.

The article has identified the expressions of self-study competency, designed and standardized survey tools, conducted a pilot survey on 148 students, and officially surveyed 1210 students of secondary schools in some urban districts of Hanoi. The results show that the majority of students are aware of the importance of self-study, and have technological means to support students in self-study, but most of the students still follow the traditional way of self-study, such as doing exercises assigned by the teacher. Students usually do not actively engage in self-study by reading references or watching videos when doing new assignments, because they do not have enough materials, resources, and detailed instructions from teachers for self-study. Regarding the expressions of self-study, the ability to determine the learning plan and evaluate the students' self-study process is still not high. Therefore, the application of teaching methods to encourage self-study competency, and building tools and resources for self-study such as websites, application software, manuals, etc. is essential to form and develop self-study competency further. One of the appropriate measures that can be applied is the flipped classroom model, which is suitable for students who have full technological means to support. Due to the fact that the official time in class may not be enough to meet the whole content, instead of following the traditional teaching method (studying theory in class and doing homework at home), in the flipped classroom model, students read theory at home first, then exchange questions and apply the knowledge to solve problems and exercises in class. These results are a practical basis for future studies.

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