

Developing Grade 5 Students' Scientific Habits of Mind Through Community-based Science Learning

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Abstract

Students are future citizens who will be able to make more informed decisions on social movements. Reasoning, inherent skepticism, the ability to situate things in bigger settings and discern connections are all part of scientific habits of mind. This action research aimed to develop grade 5 students' scientific habits of mind through community-based science learning to meet the requirement of passing criteria 70% of mean score. Target group were 12 of grade 5 students from one primary school, located in Mahasarakham province, Thailand. The research tools were 2 spirals of lesson plan and community-based science learning organization, observational tools were 2 sets of 30-multiple choice test of scientific habits of mind, 10 items of 5-rating scale of scientific habits of mind questionnaire, and students' interview form towards community-based learning. Mean, standard deviation, and percentage were employed for data analysis. The findings pointed that first spiral of learning organization, students had 82.92% of mean score. The second spiral of learning organization, students had 90.83% of mean score. It can be concluded that community-based learning help students to gain their scientific habits of mind.

Keywords: Community-based Learning, Habits of Mind, Scientifically, Science Education,

INTRODUCTION

The pace of technology has made the world interconnected in various areas, resulting in rapidly moved an economic and is dynamically changed in social development. There are characteristics of a world where the knowledge is more bordered and more easily interconnected to anytime and anywhere. Youth who will survive and succeed in this era require different cognitive skills and flexible attributes (Prachagool & Nuangchalerm, 2021). This allows us to live peacefully with people of different cultures or multiculturalism as well (Walter, 2018; Kymlicka, 2019).

Educational management is at the heart of human resource development. Therefore, science and technology must be leveraged to manage learning properly. Creative thinking and effective science education encourage learners to develop their systematic thinking skills (Setiawan et al., 2018). Also, science communication and network cooperation focus on lifelong education with flexible approach (Sosutha et al., 2021). It motivates learners to practice various kinds of thinking, self-directed learning, and researching for themselves. Teachers need to be alert and prepared to manage learning so that students have the skills to go out and

live in the world in the 21st century (Nuangchalerm, 2017).

The Ministry of Education has set a target for the management of science courses in educational institutions, with the important goal in article 7: to provide people with psychics, morality, ethics and values in the creative use of science and technology, to manage science learning in the classroom. If it is to encourage students to be passionate, interested in or have a good sense of science. These processes encourage learners to have scientific knowledge, to develop the characteristics of psychiatry, result in the students having a good mind for learning science, value learning science. They can create the power of learning to be knowledgeable in science for the rest of their lives, and having knowledge to be properly utilized.

The goal of teaching science courses in educational institutions is to see that in addition to learning about the use of science knowledge in the process of researching knowledge and solving problems, students are also asked to learn about science. Learners must also have habit of mind in sciences, which will result in students feeling good about studying science, value of learning (Kelly et al., 2012; Krist et al., 2019; Green et al., 2020). It motivates learners aspire to study science, to apply their knowledge in everyday life correctly.

Learning through suitable way of habit of mind in science is useful for human life today, something that should be instilled in a person.

Those with habits of mind in science, it will be known to use natural resources and new technologies wisely and efficiently. Learners be able to work and live in a democratic society. According to educational standards, aims to promote students in aptitude, attention, interest, and full potential in each area. The basic skills and attributes of citizens and the necessary characteristic skills in the 21st century (Janpleng & Ruangmontri, 2021). One of the characteristics of students can be seen that they do not have sufficient knowledge or do not know the correct way to assess the reliability of what they read (El Islami et al., 2018; Nuangchalerm & El Islami, 2018a). These are skills that are much needed to live in today's world. Students need to improve their reading skills on their own. The ability to investigate and review comments, be distinguishing between facts and opinions, considering information through the basics of digital literacy (Suarez-Alvarez, 2021).

The researchers then studied learning activity patterns suitable for the development of habit of mind in science. It was found that community-based learning management is an integrated

learning management model that connects curriculum-based content. Students can learn summary of science and their community environments, then allowing students learn from action from everyday situations in the community (Prasertsang et al., 2013; Thamwipat et al., 2018). Teachers design learning activities, motivate motivation, curiosity, and engage sociocultural movements. Students recognize responsibility as part of the community, create social change in a constructive way that strengthens communities sustainably.

Students can learn through holistic approach and knowledge can be emerged by community engagement. They gain academic knowledge and professional competency by democratic environments, be live happily with others based on individual differences (Muhlisin et al., 2019). In addition, they will be encouraged in participatory learning. The new direction of education tends to raise awareness, cultivate attitudes, social values, morality, ethics, self-esteem, and social responsibility (Raab & Bogner, 2021). According to sustainable development goals for enhancing environmentally friendly, quality of life, and living happily. They are able to develop knowledge that surround them through community-based learning, that is a tactic used to

strengthen work skills (Beakley et al., 2003; Eli et al., 2020).

Students have the opportunity to do important and essential work for their livelihoods. They increase civic skills and leadership to prepare for careers or continuing education. Students have a greater learning responsibility that will help them learn how to get the job done, and to study the impact on problems in the community and the needs of the community (Steinke & Fitch, 2007), community-based learning is beneficial to the development of educational management to conform to the context, problematic conditions and needs of learners and communities. This study employed action research, aims to develop grade 5 students' scientific habits of mind through community-based learning. The result can gain their habit of mind and respect to the way of community learning and role of science education.

METHOD

This study used action research to develop scientific habits of mind in grade 5 students through community-

Table 1. Spiral of community-based learning

Step	First spiral	Second spiral
Planning	Students engage their content about world's water, the amount of fresh and marine waters on Earth, types of natural water, utilization of natural water, and water resource problems in the community. Each group of students studied information from textbooks or learning resources such as the Internet. They have cooperative working through	Students participate in the lesson and the content of water resources issues in the community. Water saving and water conservation are major contents that students have learn together. Water resources in the community, water savings, and water conservation in the community are major concept, then students make

based learning. Approach details might be supplied in terms of a systematic investigation method that teachers use as researchers. The beginning of the process is usually an issue of scientific habit of mind, and researchers demand that students improve it, as well as a national science education standard that has been established.

Target group were 12 of grade 5 students from one primary school, located in Mahasarakham province, Thailand. The research tools were 2 spirals of science lesson plan, observational tools were 2 sets of 30-multiple choice test of scientific habits of mind, 10 items of 5-rating scale of scientific habits of mind questionnaire, and students' interview form towards community-based science learning. Procedure for action research is manipulated into 2 spirals can be shown in Table 1.

This research employed basic statistics: mean, standard deviation, and percentage for data analysis. The qualitative data were presented in descriptive analysis.

	work sheets. Students and teachers plan to study, conduct activities to investigate water resources in community.	work sheets on the value of water.
Acting	Students are divided into 2 groups, conducting community activities with teachers. Each group of students collects information about the characteristics of important natural waters in the community. They interviewed community members and recorded the information which obtained from community experiences. Students take an action to explore water resources issues in the community, interviewed community leaders and community representatives.	Students take the issues they have analyzed. They learn to do with community members and their peers through community-based learning activities. They are actively designed the plan to solve the problem about water resources in the community. Collecting necessary information from interviewing with people in the community about troubleshooting outcomes.
Observing	Each group of students presented their ideas through mind mapping. Teachers raise questions to stimulate students' thoughts by having each group of students share their opinions on the major causes of water resources problems in the community. Maintaining water resources in the community as students are part of the community is recorded.	Students debate arguments about community water resources issues. There is an exchange of learning with classmates. Teacher participates in the sharing process of suitable solution. The conservation of water resources in the community is included in the argumentation.
Reflecting	Students and teachers are jointly summarized the knowledge, gained experiences from the community-based activity. By presenting the results of the activities in front of the class and teacher measures the habit of mind in science in the first spiral.	Each group of students came together to summarize the results of the activity. They present results on solving water resources in the community. Then teacher measures the habit of mind in science in the second spiral.

RESULTS AND DISCUSSION

The first spiral showed students' scientific habit of mind is at high level (Table 2). Therefore, 12 students can analyze into individual report, 3 students are at highest level while 1 student is at moderate level. They learned science through community as it related to their

local environments. The learning process allowed them to plan, do think, reflect, and collaborate about local science and community resources.

Table 2. Students' scientific habit of mind (Spiral 1)

No.	Value of science		Value enrichment of society		Social values regarding science		Attitude towards science learning		Full score (60)	%	Level of scientific habit of mind	
	Full score (15)	%	Full score (15)	%	Full score (15)	%	Full score (15)	%			Mean	Interpret
1	12.00	80.00	10.00	66.67	9.00	60.00	13.00	86.67	44.00	73.33	3.67	High
2	13.00	86.67	11.00	73.33	12.00	80.00	14.00	93.33	50.00	83.33	4.17	High
3	12.00	80.00	10.00	66.67	10.00	66.67	11.00	73.33	43.00	76.67	3.83	High
4	10.00	66.67	13.00	86.67	12.00	80.00	12.00	80.00	47.00	78.33	3.92	High
5	9.00	60.00	14.00	93.33	12.00	80.00	8.00	53.33	43.00	76.67	3.83	High
6	14.00	93.33	13.00	86.67	11.00	73.33	12.00	80.00	54.00	90.00	4.50	High
7	12.00	80.00	14.00	93.33	14.00	93.33	15.00	100.00	55.00	91.67	4.59	Highest
8	12.00	80.00	15.00	100.00	13.00	86.67	15.00	100.00	55.00	91.67	4.59	Highest
9	13.00	86.67	14.00	93.33	15.00	100.00	15.00	100.00	57.00	95.00	4.75	Highest
10	8.00	53.33	10.00	66.67	9.00	60.00	11.00	73.33	38.00	63.33	3.17	Moderate
11	12.00	80.00	14.00	93.33	11.00	73.33	14.00	93.33	51.00	85.00	4.25	High
12	11.00	73.33	15.00	100.00	14.00	93.33	14.00	93.33	54.00	90.00	4.50	High
Mean	11.50	76.67	12.75	85.00	11.83	78.87	12.83	85.53	49.25	82.92	4.15	High
SD	1.73		1.96		1.95		2.12		6.12			

Table 2 shows the results of students' scientific habit of mind, Spiral 1, there is an overall average score is 82.92%. The test score can be calculated in 76.67% of the value of science, 85.00% of the value enrichment of society, 78.87% of the social values regarding science, and 85.53% of attitudes towards science learning. When considering individual students who have failed to meet at least 70 percent of the scientific habit of mind development criteria by 3 of 12 students. Then the second spiral is reflected and studied in the next action plan.

Students able to search information on their own and gained a greater understanding of the content. They can learn behavior during the course of the activity showed that the students had habit of mind as well. In terms of having a good attitude towards learning science. Students loved and are enthusiastic about exploring the community, acting willingly and

enjoyably because they are doing activities with members of the group. Students talk to community representatives to collect information about important natural waters in the community, and to utilize natural water sources in the community. They are dare to question the social issue about water management in community.

In terms of the value of science, students have developed a rational way of thinking, analyzing the causes of problems, thinking about ways to prevent problems and solving problems creatively. It has the ability to solve problems systematically and criticize using data obtained from research studies and from action activities. It found that students were assertive, open-minded to listening to opinions on proposals within their own groups and offerings in front of classes. It has engaged in controversial discussions on water source issues in the community of

students interested in students (Figure 1).



Figure 1. Students learn to plan learning experiences by collaborating in water topic

In the social aspect of science, which is the result of the scientific learning process that students apply in the course of activities. On the issues that students should know and believe about promoting social values by using critical thinking. There is a view on the value of science based on reason and

authenticity. And it reviewed the learning results from the practice of activities. The first spiral showed students' scientific habit of mind is at highest level (Table 3). Therefore, 12 students can analyze into individual report, 7 students are at highest level while 5 students are at high level.

Table 3. Students' scientific habit of mind (Spiral 2)

No	Value of science		Value enrichment of society		Social values regarding science		Attitude towards science learning		Full score (60)	%	Level of scientific habit of mind	
	Full score (15)	%	Full score (15)	%	Full score (15)	%	Full score (15)	%			Mean	Interpret
1	13	86.67	15	100.00	11	73.33	14	93.33	53	88.33	4.42	High
2	14	93.33	15	100.00	13	86.67	13	86.67	55	91.67	4.58	Highest
3	11	73.33	14	93.33	13	86.67	11	73.33	49	81.67	4.08	High
4	15	100.00	12	80.00	14	93.33	13	86.67	54	90.00	4.50	High
5	13	86.67	11	73.33	14	93.33	12	80.00	50	83.33	4.17	High
6	14	93.33	15	100.00	13	86.67	15	100.00	57	95.00	4.75	Highest
7	13	86.67	15	100.00	15	100.00	15	100.00	58	96.67	4.83	Highest
8	15	100.00	15	100.00	15	100.00	15	100.00	60	100.00	5.00	Highest
9	15	100.00	14	93.33	15	100.00	15	100.00	59	98.33	4.92	Highest
10	12	80.00	12	80.00	13	86.67	11	73.33	48	80.00	4.00	High
11	14	93.33	11	73.33	15	100.00	15	100.00	55	91.67	4.58	Highest
12	12	80.00	15	100.00	15	100.00	14	93.33	56	93.33	4.67	Highest
Mean	13.42	89.44	13.67	91.11	13.83	92.22	13.58	90.56	54.50	90.83	4.54	Highest
SD	1.31		1.67		1.27		1.56		3.90			

Table 3 shows the results of students' scientific habit of mind, Spiral 2, there is an overall average score is 90.83%. The test score can be calculated in 89.44% of the value of science,

91.11% of the value enrichment of society, 92.22% of the social values regarding science, and 90.56% of attitudes towards science learning. When considering individual students

found that there are no students who have failed to meet at least 70 percent of

the scientific habit of mind (Figure 2.).



Figure 2. Students learn to investigate science in their community-based science learning

Well preparation in action learning, it be able to develop students' scientific habit of mind, also rational, creative, critical thinking, and criticism, leading to the systematic solution. It is based on the importance of data collected from surveys and interviews, which can be analyzed and verified. Members of the group share a work plan, and take responsibilities. Students apply basic everyday values to learn science systematically, such as honesty, diligence, fairness, curiosity. Embracing new ideas suspicion and imagination are the parts that make teaching science by organizing community-based learning as an effective base for green learning (Goldman et al., 2018; Sukma et al., 2020).

The result is to strengthen the positive attitude towards society and the desirable values of students. The researchers collected student data from student interviews using community-

based learning management interviews. It was found that students enjoyed acting on activities together and were curious about the results in solving water resources in their group. Students discover the knowledge and skills created by working together. It is also about developing students to be self-responsible (Fahrnisa et al., 2020). The working and learning are key adaption to allow students playing with their real-life experiences (Ngan et al., 2020).

Reflective stages develop students in terms of the value of science, students have developed a rational way of thinking, analytical thinking, which allowing them to prevent and solve water problems in creatively. It has the ability to solve problems systematically and criticize using data obtained from research and action activities, as well as students with the ability to use their skills in the process of researching knowledge. Students are proud as part of

a community that has used their knowledge from research to solve water resources in the community, including conserving, maintaining water resources in the community, and value using water more economically (Suryawati et al., 2020).

Community-based learning arrangements can develop students' scientific habit of mind (Bedri et al., 2017), students create a learning experience in which real learning begins when takes action that allows them to real life experiences. Students have the opportunity to do important and essential work for their livelihoods (Beakley et al., 2003). They have a greater learning responsibility that helps students learn how to get the job done, and to study the impact on community issues and community needs (Steinke & Fitch, 2007). Participatory learning and motivating students to have a positive attitude among students towards science classes, and strengthening the relationship between school and community (Melaville et al., 2006).

Students learn from real-life events, which leads to them learning on their own and strengthening their planning abilities. As a consequence, community-based learning management is defined as a strategy that links classroom work with meaningful communities (Nuangchalerm & El

Islami, 2018b; Charungkaittikul, 2019; Junkaew, et al., 2021). A learning through community and social problems are an approach that enables learners to acquire and develop necessary learning abilities in the form of learning partnerships and shared learning exchanges (Afzal & Hussain, 2020). However, for community-based learning management to be successful, students must have hands-on learning experiences in the community (Lee et al., 2019).

CONCLUSION

The findings pointed that students learn science, develop scientific habits of mind were at high and highest levels by the first spiral of community-based science learning organization, students had 82.92% of mean score. The second spiral of community-based learning organization, they had 90.83% of mean score. It can be concluded that community-based science learning helps students to gain their learning about science and also enhance scientific habits of mind.

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