Connecting between culture of learning in Thai contexts and developing students’ science learning in the formal setting

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Abstract

This study aimed to explore people perception about science concepts related to their culture, the way of life and living styles to connect between culture of learning in Thai contexts and developing students’ science learning in the formal setting. Target group was students, science teachers, and people from three district of Khon Kaen, Nongbualumphu, and Kalasin province in Northeastern of Thailand. Data collection was carried out both in school and communities that students living in. Data in communities was collected by assistant researchers who are local people and someone lived in those communities more than 2 years. Research instruments included participant observation, informal interview, and questionnaires. Findings revealed that a number of students held understanding of science related to their event, activities, and the way of life but most of them could not give verbal concepts of science. However, it seemed that science teaching and learning in schools did not provide students to link science concepts for applying to their event or activities in their communities. The paper will discuss scientific concepts related to event or activities to develop connection between culture and science learning in schools, and the implications of these results for better understanding socio-cultural views of learning, especially in relation to science teaching and learning in Thailand.

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1. Introduction

With the educational reform, the National Education Act (1999) was launched to introduce effective education. The new standards are to be achieved in the year 2007. The curriculum construction changed to become decentralized (ONEC, 2000a; Pitiyanuwat and Anantrasirichai, 2002). The curriculum changed to be school-based. The schools have flexibility to produce a local curriculum but it must be based on the content standards that are prescribed by the Institution for Promoting Science and Technology (IPST) for science content (ONEC, 1999; ONEC, 2000b). One concern of the teaching reform is changing the pedagogic philosophy from teacher-centred to student-centred (ONEC, 1999). The learning emphasis is on a learner-centred approach and life-long learning, so that learning can take place anywhere, at all times, and at all levels within learners themselves and outside the classroom (ONEC, 2000a). Students should have chance to be in touch and interact with everything around them such as other people, nature and technology; and to apply learning methods to their real life (ONEC, 2002a: 26 - 27).

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The goal of Thai science education is to assist students to develop thinking skills by considering the relationship between science, technology and society. This goal requires that people have a multidimensional scientific and technological literacy in order to make decisions about issues of science technology and society that affect living across the world (IPST, 2002). To attain the goal of science education, Thai science teachers in general agreed with the need for making science teaching more meaningful by emphasizing student-centred learning and a concern for life-long learning that should play on the relationship between science, technology and society. The goal of Thai science education was addressed along with these crucial aspects of educational reform. With the attempts for obtaining education reform, one of them involved science teaching and learning that emphasized knowledge rather than a chance for practice in analytical thinking, self-expression and acquiring knowledge by themselves.

With the important view of socio-cultural, we need to consider influenced different culture toward science learning in Thailand. For carrying out science education research, the concept of culture is limited in smaller. Thus, the values, norms, and beliefs of larger society; the culture of scientific community; culture of learners; and school contexts will influence the Thai learning and teaching science processes. The socio-cultural view suggests that science teaching and learning should be concerned with the influence of society and culture on thinking in the classroom. Scientific knowledge as western culture is a particularly alien culture for Thailand. Therefore, the gap of different cultures should be taken into account for teaching and learning in Thailand. For the classroom, the culture is a small copy of society. In this section, the values, norms, and beliefs of the larger society; the culture of scientific community; the culture of learners; and the culture of school science in Thailand will be discussed.

Culture of Science or Scientific Community

Science is a social enterprise. A characteristic of scientific community involves working as research groups, each linking into a larger network sharing a common interest in an area of enquiry. Scientists can share scientific information through the process of conferences, journals, and peers. This mechanism helps the findings of individuals become transformed into public knowledge (Driver et al, 1996). Thus, the scientific community, alternative point, acts as on behalf of all citizens in the creation and criticism of the public knowledge. Scientists have to assess the reliability of the science produced. With the working of the scientific community, scientific knowledge is generated and validated (Ziman, 1978).

As the product of scientific community, the scientific ideas are tentative at each stage in their development. Therefore, it might be said that “what is ‘obvious’ today was ‘ridiculous’ yesterday and will be ‘false’ tomorrow” (Claxton, 1991: 80). The nature of scientific knowledge involves ontological commitments associated with the practice of science. Driver et al. (1994a) stated that “scientific knowledge is symbolic in nature and socially negotiated. The objects of science are not the phenomena of nature but it is construction that is advanced by the scientific community to interpret nature” (p.5). Thus, the things of science are no longer entities that populate a real world but the inventions of a scientific discourse which are “imposed on the phenomena” (p.5). Hence it is not nature which limits the scientific imagination but simply human capabilities and their cultural and conceptual tools which “reflect the cumulative wisdom of the culture” (Driver et al., 1994a: 5).

Scientific knowledge changes gradually all the time. With the continual changing of scientific knowledge, the question of how scientists can understand the scientific knowledge should be taken into account when teaching and learning science. At the centre of science is the attempt to generate a comprehensive account of phenomena in the natural world. This comprehensive account would give rise to accurate predictions, and therefore to the possibility of greater control within particular domains. This attempt is embedded within a context of personal psychology and social influences. Therefore, an image of science is an image of reliable knowledge, obtained through standard methods of enquiry when faced with a dispute between scientists about some practical matter (Claxton, 1991; Driver et al, 1996). An understanding of scientific knowledge and the validity and interpretation of data are negotiated through social processes. Scientific disputes bring the relationship between science and society into sharp relief, and provide a useful context for enquiry. Issues about the role of evidence and of social factors shape the course of a dispute and influence the time and manner of its resolution (Driver et al, 1996).
The way of scientific community generated and understood scientific knowledge is the process involved in sharing a common interest in an area of enquiry and scientific information; negotiating and disputing scientific knowledge for shaping ideas and finding scientific solutions. This mechanism shows a view of scientific knowledge as tentative. The idea of how scientific community works, should be taken into account in teaching and learning science. If teaching science offers a way of generating scientific knowledge similar to that of the scientific community, it may create meaningful learning of science.

Culture of School Science in Non-western Societies

In the socio-cultural view, learning is always directly related to the situation and cultural activities (Kiraly, 2000: 43). Brown, Collins and Duguid (1989) describe the basic ideas of situation related to constructing knowledge as a term of "situated cognition". Situated cognition means that cognitive processes differ according to the domain of thinking and the specifications of the task context (Coll et al. 2005). Term of situated cognition raises the question of the cultural influence on conceptual knowledge.

According to Brown, Collins and Duguid (1989), conceptual knowledge is a function of culture and the activities of the community in which the concepts have been developed. Therefore, conceptual knowledge cannot be abstracted from the situations in which it is learned and used. It is partly a product of the activity, context and culture in which it is developed and used. Conceptual knowledge may be considered as a set of tools. Learning how to use these tools as practitioners use them requires learning, like an apprentice, to enter that community and its culture. At school, students learn science that is shown the tools by practitioners (e.g. scientists). The school culture observes these tools to be different from the practitioners’ culture. Therefore, teachers need to be aware of these differences.

However, science teachers were often showing a false image of science (Claxton, 1991). Science teachers themselves have little knowledge of the culture of science. Traditional school science developed incorrect beliefs about the culture of science. These beliefs were reflected by that science develops in a linear like the table content in a book; advances in science are the result of the periodic efforts of men, acknowledged to be in the genius category; the scientists are motivated essentially by the ideal associated with the development of knowledge; science evolves independently of the socioeconomic and the cultural context of the time (Nadeau & Desautels, 1984).

To change the almost idolatrous attitude toward science of students, teaching science should include the history of science. The history of science considered socio-political and cultural contexts of some major scientific achievements and inculcate in students a critical approach to scientific activity (Nadeau and Desautels, 1984). Bridging the gap between scientists’ science and the way it is represented in schools should be considered.

Besides the difference between culture of scientific community and school science, the science in non-western country is one of factors that obstacle learning. Western style science education is seen as a stepping-stone (Tan, 1988). With western science being projected as a western construct the concept of ethno science often referred to as indigenous science (Linden, 1991), is appearing in modern epistemology. The non-western country adapted the western science curricula to provide personnel in the area of science and technology required for national development (Ingle and Turner, 1981). There are research and articles conducted in non-western country such as Samoa (Moli, 1991), Bostswana (Praphat, 1990), Nigeria (Okebukola and Jegede, 1990), Japan (Aikenhead and Otsuji, 2000) and Thailand (Pitiyanuwat and Sujiva, 2000) that indicated how beliefs, norms, and values of students from non-western cultures are in conflict with the beliefs.

The issue of language is crucial factor for learning in science as it relates to non-western language learners. For this issue, Vygotsky provided a useful theoretical basis for understanding the connections (Rollnick, 1998). Learning science for learner, perceive western language as foreign language, is translated from western language that the gap between languages should take into account for understanding science. Japanese, for example, translate science as ‘kagakugijutsu’ but translation back into English come out as ‘techno-science’ (Aikenhead and Otsuji, 2000). According to meaning of science as techno-science in Japanese, it represents “how Japanese people have traditionally dealt with western science by treating it as a materialistic benefit rather than a way of knowing nature” (Aikenhead and Otsuji, 2000: 287). It might be say that the culture of science is alien culture for Thai teaching and learning because there is difference of culture, cognition and educational background. In western societies, science
educators understand the fundamental, culturally based beliefs about the world that students and teachers bring to classroom (Cobern, 1998).

Culture of Learners

Before modern Thai education, public education only took place in Buddhist temples, therefore, part of the value of education stemmed from Buddhist teaching (Pittiytanuwat & Sujiva, 2000; Fry, 2002; MOE, 2004). In period of the modern Thai education, public schools and universities were established. To attend those educational institutes, students need to take entrance examination. Unfortunately, there are different qualities among those schools. Therefore, most students want to attend in the most well-known schools. It can be said that the characteristics of most Thai learners have evolved from Buddhism philosophy (Pittiytanuwat & Sujiva, 2000), and driven by the gap in educational opportunities (Kaewdaeng, 2003).

Thai learners value education as memorised knowledge for taking examinations, rather than as a basis for lifelong learning (Kaewdaeng, 2003). Students have to take an entrance examination to study in Grades 1, 7, 10 and in universities. The entrance examination is a real goal of education for students and their parents. In order to achieve high scores, to apply for the well-known schools and universities, students have to memorise knowledge for taking the examination. This need means that students must take supplementary study in a tutor school outside their normal school time. This tuition in tutor schools expands the gap of students’ opportunity of education between students in city and country; between poor and rich students. This culture of learning raises the competition of studying, but memorising knowledge does not correspond with learning science.

The learners who emerge with a Buddhist view might appreciate the scientific method because the Four Noble Truths of Buddhism have the ideas which are quite similar to the scientific method. The Four Noble Truths of Buddhism consist of ‘Tukh’, ‘Samutai’, ‘Niroth’, and ‘Mahk’. Pittiytanuwat and Sujiva (2000) clarified these terms as below:

‘Tukh’: perceiving the state of suffers as their real condition (Tukhata). This process of clarification and identification of suffers must be understood and its limitations defined. (2) ‘Samutai’: realizing what causes suffering and learning how to eliminate it. This process involves the investigation, analysis and diagnosis of the causes of suffering. (3) ‘Niroth’: realizing the state of the elimination of suffering and clarifying it. This process involves realizing what the destination of suffers is, and understanding the possibility of attaining that destination. (4) ‘Mahk’: refers to the conductions for attaining the elimination of suffering that must be practised. This process involves taking steps to eliminate suffering and then conducting them oneself (Pittiytanuwat and Sujiva, 2000: 84).

Therefore, the scientific ideas from a western perspective might be not totally alien for mainstream Thai teaching and learning science. However, the Thai identity is rooted in Buddhist view of the middle way and a simple style for living (Wisdavet, 1996). This identity is integrated and has become the characteristic of the Thai learner. This identity might be an obstacle to learn extreme scientific and technological knowledge. As the view of middle way, Thai have inspiration for creative thinking in science and technology at the moderation level rather than at the extreme level (Wisdavet, 1996). An obstacle of developing extreme scientific and technological knowledge can be insight by considering developmental working of Thai farmer. Thailand is an agricultural society. Most of Thai are farmer who grow rice (ONCC, 2004). Thai traditional farmer did not develop gradually science and technology for their product. With living style as middle way, it might be assumed that Thai farmer have no inspiration to apply technology because there is no serious agriculture problem. The weather usually does not change seriously and, therefore, farmer can grow naturally rice that mean it depend on weather.

Sometimes Buddhist beliefs did not encourage the learner to consider creating new innovations in science and technology because the Buddhist perspective does not encourage the production of material wealth. This opposes the dominant materialist world-view which regards science and technology as the solution of all problems. Western views of science and technology aim to develop a materialist and mechanistic world-view. The Buddhist position is self-development that involves cultivating a person’s own mind. “The aim of Buddhism is not to shape life in the world, but to teach liberation, release from the world. The Buddhist attempt to attain inner peace (Nibbana) through self-development is understood as an absolutely personal performance of the single individual”
(Premasiri, 1996). This perspective shows why Thai traditional educators or literates, educated in the Buddhist temple, had never been interested in studying science and technology. The history of studying science in Thailand is not deep rooted as in the western countries but origin of science can be traced back to the middle nineteenth century. The history of studying science began with King Mongkut (Rama IV), the Father of Science in Thailand. This king was keenly interested in astronomy and accurately predicted the occurrence of a total eclipse over Wa Ko, a subdistrict in Prachuab Khiri Khan, on 18 August 1868.

Culture of Thai Community

There are number of cultural perspectives in Thai community that influence Thailand values education. The values education in Thailand is based on religion, mainly Buddhism; Thai identity and tradition (Wisadavet, 1996) and the economic development (Pittiyatanuwat & Sujiva, 2000). Some of these perspectives can be supportive of teaching and learning science but some of them can be obstructive.

The Thai living style is to live peacefully together. The Thai norm is to respect seniority; therefore the Thai attitude is one of humility. Children are taught that good children must obey parents, teachers and adults (Titthummo, 2004). The view of seniority can be shown in the proverb about obeying adults, ‘Phu yai arb nam ron ma kon’ or ‘dem tam phu yai ma mai kad’ (Adults see the world before children, so children should obey them). It might be said that this view holds the Thai worker to the work place. Thai workers follow what their head orders without disputing or negotiating the best way for their organization. In the classroom, learning science tend to lack discussion because students might believe that good students usually do not say anything that might oppose what the teacher is teaching.

Thai identity stems from the Buddhist view. The Buddhist principle of no-self (anatta) teaches Thai that should not be strongly attached to things. Everything is changing. This is the reason why Thai are quite flexible and pragmatic (Wisadavet, 1996) and Thai society can accept easily foreign culture. In modern times, Thailand received scientific and technological perspectives and things from the western countries. Thai regards science and technology as helping to develop the nation. This Buddhist principle of ‘anatta’ might support Thai students, to be able to more easily understand the nature of science.

The teaching and learning science is influenced by the socio-cultural perspective. There are several culture influences in teaching and learning science. In order to find the baseline for developing science teaching regarding socio-cultural perspective, this study aimed to explore people perception about science concepts related to their culture, the way of life and living styles to connect between culture of learning in Thai contexts and developing students’ science learning in the formal setting.

2. Methodology

This research is conducted regarding the interpretive paradigm. Interpretive research seeks to describe and interpret human behaviour based on their natural setting rather than form laws about it (Marriam, 1998; Cohen et al., 2000). Concerning the issue of dependability, therefore, a clear description of how data was obtained and open acknowledge of context should be taken into account. The study aimed to explore people perception about science concepts related to their culture, the way of life and living styles to connect between culture of learning in Thai contexts and developing students’ science learning in the formal setting. As the process of interpretation, people perception was interpreted by assistant researchers who are local people and someone lived in those communities more than 2 years. The interpretation of data is based on fields work.

2.1. Target group

Target group was people from three districts of Khon Kaen, Nongbualumphu, and Kalasin province in Northeastern of Thailand.
2.2. Methods of Inquiry

People science learning from three districts in Khon Kaen, Nongbualumphu, and Kalasin were explored. Data collection was carried out both in school and communities that students living in. Data in communities was collected by assistant researchers who are local people and someone lived in those communities more than 2 years. Research instruments included participant observation, informal interview, and questionnaires. The informal interview was carried out when target group did some activities or raise culture issues that could represent scientific concepts behind.

3. Research Findings

People perception about science concepts related to their culture, the way of life and living styles was interpreted to finding connection between culture of learning in Thai contexts and developing students’ science learning in the formal setting. The findings will be discussed in two aspects including (1) the sociocultural activities or situations that could connect to science learning in schools, and (2) people pathway of constructing scientific concepts related to those sociocultural activities or situations.

3.1. Sociocultural activities or situations connecting to science learning in school

Relation between sociocultural activities and people’s learning science and mathematics concepts. Interpretation indicated sociocultural activities situated people learning science and mathematics. Science learning could be assessed from those activities. These include constructing floating restaurant, BBQ fish, “Kao-tom-mud” cooking, sticky rice cooking, streaming refresh “Poun” (food), “Bunglan” fishing trap, plastics tube for level measuring, yellow light for protect buffalo from mosquito, cultivating, fertilizing, “Pla-ra” preserving fish, rock salt farming, decreasing golden apple snail from rice farm, rice farming, collect the mushroom from the community forest, fishing, frog hunting, chemical use, batik, silk and cotton textile, heating activities after childbirth, silkworm farming, and ghost scarecrow.

People explanation about their culture, the way of life and living styles can be interpreted what they held scientific concepts. Those activities and situation can be classified into concepts about physics, chemistry, and biology.

Activities and situation representing physics

There are many activities and situation that could be interpreted for people holding physics concepts; for example, the floating restaurant, fish BBQ.

Constructing the floating restaurant

People constructed the floating restaurant in the dam. This floating restaurant was pulled away and came back by wheel and axle that adapted from the motorcycle wheels. This activity reflected how people held their scientific concept about wheel and axle as their dialogue.

“… Interviewer: how can you construct this floating restaurant?
Mongkol (the owner of floating restaurant): the motorcycle wheel was used for pulling the floating restaurant to go straight away and come back. Our customers have to roll this wheel and then the floating restaurant will move as they need to go. …”

Fish BBQ

At the small restaurant in small village of Nong Bualumphu province, Daeng showed how to cook fish BBQ faster. The secret of cooking faster is the big piece of zinc cover during cooking. This activity could be connected to concept of insulator and conductor. Daeng thought that the zinc cover allow the cooked faster because the heat go all around in the zinc cover. His dialogue also reflected how he constructed his concept of conduction.

“… interviewer: why do you use the zinc cover like this?
Daeng: I got the idea from my mother used the a ‘tong’ leaf for fish BBQ cooking. So, I used the big piece of zinc cover because I have to cook many of fish BBQ for my restaurant. …”

*Activities and situation representing biology*

There are many activities and situation that could be interpreted for people holding physics concepts; for example, the floating restaurant, fish BBQ.

*Activities and situation representing chemistry*

There are many activities and situation that could be interpreted for people holding physics concepts; for example, the floating restaurant, fish BBQ.

3.2. *Pathway of people’s constructing knowledge about science through sociocultural activities.*

Pathway of people’s constructing knowledge could be classified into 5 pathways. These include:

- Pathway 1 Constructing scientific knowledge through local wisdom and peer validation
- Pathway 2 Constructing scientific knowledge from their observation in their everyday life activities
- Pathway 3 Constructing scientific knowledge from their try and error
- Pathway 4 Constructing scientific knowledge from generating innovation
- Pathway 5 Constructing scientific knowledge from solving problem in their farm

4. Conclusion

With the important view of socio-cultural, the gap of different cultures should be taken into account for teaching and learning in Thailand. Exploring people perception about science concepts related to their culture, the way of life and living styles reflected connection between culture of learning in Thai contexts and developing students’ science learning in the formal setting. There are several culture influences in teaching and learning science. People explanation about their culture, the way of life and living styles can be interpreted what they held scientific concepts. Those activities and situation can be should be applying for students learning of concepts about physics, chemistry, and biology. Sociocultural activities or situations that could connect to science learning in school, and people pathway of constructing scientific concepts related to those sociocultural activities or situations could be developed the baseline for science teaching regarding socio-cultural perspective.

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