Challenges and Needs for Primary Rural Schools to Develop
Computing Science Teaching in Thailand

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Abstract
The teaching of computing science in a rural area is challenged by various limited resources and supports. This study aims to explore challenges and needs in computing science teaching in primary rural school, Thailand. Qualitative data were collected through interviews with six participants who teach computing science in a primary rural district. The findings show that there are teachers from diverse backgrounds, including education, social sciences, science, and computer. They teach computing science based on their own experiences using different approaches in classes. Most teachers suggest the requirement for training to gain more teaching experience, especially those who background not in the computer field. Furthermore, more learning tools should be provided in this area, as only a few schools have accessed to standard learning equipment. Activities such as games and active constructions are integrated into their classes to promote an understanding of computational thinking among students. However, teachers required intense supervision from the regional education office to ensure effective implementation and improvement.

Keywords: Teaching, Computing Science, Primary School

Introduction

The Institute for the Promotion of Teaching Science and Technology in collaboration with the Ministry of Education (MOE) has improved learning standards and indicators for science learning subjects in the core curriculum (revised edition 2018) and added technology content which includes Technology and Computing Science (CS) for schools to provide basic education that is consistent with economic and social changes according to the government's national development policy. The basic education curriculum in Thailand is a 12-year core curriculum including a 9-year compulsory curriculum. Core content and indicators of CS for each grade level were provided to help develop students to have knowledge, understanding and skills in logical thinking, analytical thinking, and problem solving were recognized as a key stimulus in the development of a country's human resources. To drive the implementation of CS in the classroom, the first academic semester started from 2017 to this date the CS is in science and technology content (IPST & MOE, 2018).

In the context of primary rural school districts, Ratchaburi, Thailand, primary teachers encounter specific obstacles, notably a substantial presence of students from low socioeconomic backgrounds inhabiting small, often isolated communities. Moreover, resource allocation is limited. There are more than 200 primary schools across Ratchaburi Province, and they are unique depending on each educational area. In rural schools, it's common to find smaller class sizes and multi-grade classrooms. Teacher is a key driver of the rural area's development. A comprehensive understanding of the strengths, challenges, and opportunities associated with primary education in rural areas is significant for policy decisions and interventions aimed at improving educational outcomes for rural students to drive Thailand into a digital economy and a tech-rich society (OECD, 2019). The research designed as a case study in which schools are in a context of high marginality and diversity. The study aims to explore teachers' challenges and needs in teaching computing science in primary schools near the western border of Ratchaburi, Thailand.

Methodology

A Qualitative method was used as the main objective of the study was to explore the challenges teachers faced in teaching computing science and what could be done to improve this situation. It was considered important to reflect and interpret the reality to reach the understanding of teaching computing science in rural primary school districts. Six participants were asked about teaching computing science they were currently doing and their background and the following questions: 1) "What challenges, if any, have you encountered teaching computing Science"; 2) "What suggestions do you think work well for helping students understand computing Science?" The length of each interview ranged from one to two hours. Since each participant works as a teacher from a different school in a primary school near the western border of Ratchaburi, Thailand, the location of the interview varied. The recording of the data was done through Zoom VDO recording, face-to-face interviews, and taking notes, always with the consent of the participants of this study, their rights not to participate, and the commitment to protect confidentiality and anonymity. The analysis of results was carried out via content analysis to determine the challenges and needs of primary school teachers.

No.	Name	Gender	Teaching Experience in CS (years)	Background	No. of Students in CS class	Class level Responsibility (k)
1	A	F	0.5-1	Science	~75	1-3
2	B	F	2-2.5	Business	~90	1-3
3	C	F	2-3	Computer	~200	1-6
4	D	M	4-5	Computer	~150	4-6
5	E	M	5-6	Computer	~300	1-6
6	F	F	6-6.5	Biology	~100	1-6

Table 1: Characteristics of Study Participants

Findings

The General Data of Participants

Three males and four females were interviewed. Most participants have a 1-5 years difference in teaching experience computing science of primary school. Participants 's backgrounds are in computer, followed by science and business. In terms of class size, most of them teach computing science in medium-large classes from the k1-6 class level.

Participant Experiences in Computing Science Teaching

The challenges identified by the participants refer to student, teacher, and resource. Below are some quotes as evidence of such experiences.

Student Challenges

Large number of students in the class:

> "… due to the large number of students. If you have enough teaching materials, you can manage it - there is not enough for unplugged media, leading to competition among students. Sometimes we evaluate students in pairs and don't know who they are. For younger students, we prepare more. As for the plug-game materials for 24 students, I allocate materials initially and then rotate them around …" (C, 3 Y, Computer).

Different levels of basic knowledge:

> "… content for prathom 1 should focus on systematic practices like brushing teeth and washing clothes. Reading is still difficult for many, and some children begin to tell the process in the middle of washing. When asked how they wash, some simply respond by using just water not adding detergent. For dental hygiene, they tend to forget about to gargle with water after brushing their tongues …" (A, 1 Y, Science Teaching).

> "… When playing games there's been confusion when a picture of a mouse appears. as some children incorrectly identify it as a keyboard. Additionally, the screen and computer still have incorrect answers ..." (A, 1 Y, Science Teaching).

Multi-grade classroom:

> "… in terms of reading and language comprehension, it's essential to make sure everyone's on the same page and understands each other well .…" (B, 2Y, Business).

> " … most of our students belong to the Karen ethnic group, accounting for about 90% of the total. Teaching Prathom 6 tends to focus on basic and easy, not detailed …" (C, 3 Y, Computer).

Teacher Challenges

Less confident in subject knowledge:

> "… my favorite learning media includes coding and building with Lego. There is a lot of equipment, some of which is necessary, and I'd like to try out and incorporate it. What do I want to develop further? As a beginner, I'm unsure about what's right or wrong, so I rely on those with expertise in the field …" (A, 1 Y, Science Teaching).

Self-doubt in using the program:

> "… I like keeping it simple with fewer gadgets, like non-computer devices such as cards. These items tend to only be used once a year, which means a lot of preparation time for minimal usage. Instead, it would be better to have stuff I can use all the time, like things that stay useful, or computer programs would be more practical ..." (E, 5 Y, Computer).

Resource Challenges

Technical problems in school:

> "… at present, students come to study in the science room. The science room does not have any technological equipment except the teacher's notebook …" (F, 6Y, Science and Technology).

> "… right now, we're facing a situation where three students are sharing one computer, or they're taking turns using the same machine. This makes it difficult for them to get practice …" (D, 4Y, Computer).

According to the previous challenges, the needs identified by the participants refer to student, teacher, and resource, respectively as in Table 2. Some quotes are described as follows:

Student Needs

Effective classroom management:

> "… students do not yet possess sequential thinking in computational science. It's essential to focus on teaching how to think systematically, and the technology foundational skills for them to build on …" (A, 1 Y, Science Teaching).

"… printing pictures and playing games with Post-it notes works well, especially for dealing with English consonants. Sometimes, certain letters don't quite fit. I've found that playing a game each evening, where kids take turns answering questions, is effective. Additionally, using identical plates to teach the ABCs has been a hit too …" (A, 1 Y, Science Teaching).

Teacher Needs

Reflect on performance, set personal goals & explore new techniques:

"… I'm eager to develop my proficiency in teaching Scratch and Python programming …" (B, 2Y, Business).

"… it would be great to receive a certificate of honor for attending training as recognition of self-improvement …" (A, 1 Y, Science Teaching).

Resource Needs

Onsite and online training:

"… I normally travel to training workshops using my car. If there are students along, they should be notified in advance so that the school can allocate a budget in case…" (A, 1 Y, Science Teaching).

"… when organizing training, it's important to consider the level of teaching, the specific aspects to cover, and the equipment used ..." (A, 1 Y, Science Teaching).

"… if it's a program teaching course, I want it to be on-site because training is all about practice. If it's online, sometimes we have questions. But the speaker is still not convenient to answer us. Like step 1, if you don't get the next step, you can't do it. So, we thought about what on-site was the most answerable. If training is required on using the program …" (F, 6 Y, Science and Technology).

Point	Challenges	Needs
Student	Large number	Effective classroom management
	Different levels of basic knowledge	
	Multi-grad classroom	
Teacher	Less confident in subject knowledge	Set personal goals & explore new techniques
		Reflect on performance
	Self-doubt in using the program	Onsite and online training
Resource	Technical problems in school	Future curriculum development
		Improving class hour

Table 2: Challenges and Needs

The findings indicate major challenges related to students, teachers, and material resources. In terms of students point, they have different basic knowledge and multi-grade students in the same class. Teachers want to have more time to understand core content, and strategies for their students to achieve learning outcomes of this subject and how to manage classroom

effectively. As to the point of teacher, they have less confidence in subject knowledge and self-doubt in using the program in teaching. Exploring new techniques, reflecting on performance, and training can be the direction for teachers to get more confident in their teaching. As for resources, some technical problems in local schools are the barriers to teaching computing science. This study illustrates the challenges faced by teachers in primary rural schools. There are previous studies that can give guidelines to build an environment for primary and secondary school students in the class and to embed computational thinking skill, logical thinking, and problem-solving skill (Surakiart Y. & Surachai S., 2020; Siririat W. & Wichai S., 2021), however, there is an obvious struggle in practice and continuous improvement in the condition of the rural area. The findings of this study can provide some useful implications. The management is demanding the training and necessary material and human resources that could allow the optimal operation of the school and overcome these challenges of schools are the teachers' initiative, the person in charge, and the teamwork with community authorities and stakeholders (Cristóbal C., Rubí S. & Edith C., 2019).

Conclusion

The exploration of challenges and needs can point out school issues in three levels: student, teacher, and resource in current situations and context conditions that schoolteachers need to be accompanied by necessary resources and the effectiveness in programs implementation derived from educational policies, linked to educational reforms.

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