

## Integration of Agricultural Knowledge with the Thai Language, Mathematics, and Science Subjects for First-year Elementary School of Thailand

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### Abstract

The research is aimed at studying academic achievement and the effects of attitudes towards agriculture from teaching and learning through the integration of agricultural knowledge with the Thai language, mathematics, and science subjects of the first grade of elementary school in Thailand. This study was a true experimental design, which employed only the post-test control group design. Results of the study were as follows: 1) Teaching/learning which employed agricultural knowledge to integrate subjects could enhance the students' knowledge of agriculture; and 2) Teaching and learning through integrated subjects made the students have increased attitudes towards agriculture.

*Keywords: attitudes, integration, agricultural knowledge, Thai language subject, mathematics subject, science subject*

### Introduction

The Ministry of Education determined strategies and guidelines for the acceleration of quality and standard development of students in the 2012-2016 educational development plan. It focuses on curricular program improvement, teaching/learning process, measurement and assessment. In other words, it focuses on the development of the learning facilitation process and the provision of activities that supplement learners' skills. This was aimed at making the learner

have systematic analytical thinking, as well as skills in science, mathematics, technology and foreign languages. It also promotes media production and learning materials both in normal and electronic forms, including learning content that improves consistency with current conditions. In other words, learners can learn by themselves through these learning materials (Ministry of Education, 2012).

In addition, this educational development plan promotes codes of conduct and good Thai citizenship in the education system. This could be classified into 4 aspects as follows: 1) promoting the construction of the learning process, instilling awareness of virtues, ethics, values of pride to be Thai, and the public in accordance with the philosophy of economy sufficiency; 2) promoting diverse learning integration on the basis of academics, life skills, arts, music, culture, religion, and being Thai; 3) promoting learning process development, practical activities for the development of citizens, disciplines, unity, democracy, and royalty to the King; and 4) promoting coordination networking among families, religions, and educational institutions for the development of codes of conduct for students (Ministry of Education, 2012).

Regarding strategies and guidelines for accelerating the development of the quality and standard of learning, at present the subject of Agriculture is a subject under the core curriculum of basic education, 2008, which is included in the learning content group on learning of occupations and technology (Ministry of Education, 2008). Apparently, agricultural teaching/learning hours at the elementary school level are very few. That is, the teacher cannot teach all agricultural contents as established. It is the basic knowledge and skills having an effect on the lack of good attitudes towards agriculture or the need for agricultural occupations of students in the future. Therefore, the integration in accordance with the educational development plan is an alternative to solving problems in facilitating agricultural teaching and learning activities. This idea is consistent with the opinions of guardians of the first grade elementary school pupils in Sangkaprachanusorn School (98.68%). They agreed that agriculture was essential for daily living, so they wanted their children to have agricultural knowledge about plants and animals. Besides, they wanted agricultural knowledge to be integrated with the Thai language, mathematics, and science subjects at a high level (Satiansiriwiwat et al., 2016a).

In addition, the school committee of Sangkaprachanusorn agreed that the integration of agricultural knowledge with the Thai language, mathematics and science subjects for the first grade of elementary school is a good matter because it instills agricultural knowledge into the students and they will realize the importance of agriculture (Satiansiriwiwat et al., 2016B). Accordingly, the agricultural

teachers and the concerned personnel, i.e., guardians and the school committee, have consistent opinions on the integration of agricultural knowledge into the Thai language, mathematics, and science subjects. Therefore, the team of researchers aimed at the facilitation of teaching/learning in the first grade of elementary school (Sangkaprachanusorn School). This would help solve the problem in inadequate agricultural teaching hours. Also, it was responsive to the needs of guardians, practices in accordance with the school committee and the policy of the Ministry of Education. Moreover, this was integrated to truly build the students' good attitude towards agriculture. This can be a model for the management of education in the first grades of elementary schools throughout the country. This conformed to the goal of education in agriculture at the elementary school level, which focuses on building a good attitude and instilling the love of agriculture into students (Intorrathed, 2013).

### **Research Problem**

Nowadays, there are very few teaching/learning hours devoted to agriculture at the elementary school level, i.e., the teacher cannot teach all agricultural learning contents as established. It is the basic knowledge and skills that have an effect on the lack of good attitudes towards agriculture or the need for agricultural occupations in the future.

### **Research Focus**

1. Study the academic achievement results of teaching and learning through the integration of agricultural knowledge with the Thai language, mathematics, and science subjects of the first grade of elementary school in Thailand.
2. Study the attitudes towards agriculture resulting from teaching and learning through the integration of agricultural knowledge with the Thai language, mathematics, and science subjects of the first grade of elementary school in Thailand.

## **Research Methodology**

### **Research General Background**

This study was a true experimental design that employed only the post-test control group design having 3 steps as follows:

1. Developing the curricular program on the integration of agricultural knowledge with the Thai language, mathematics, and science subjects

2. Preparing an integrated learning plan on agricultural knowledge with the Thai language, mathematics and science subjects
3. Trying-out the teaching of knowledge integration on agricultural knowledge with the Thai language, mathematics and science subjects

### **Research Sample**

1. The population consisted of the pupils of the first grade of elementary school in the 2016 school year.
2. The sample consisted of the first year elementary school pupils of Sangkaprachanusorn School.
  - 2.1. The first grade class 1/3 as the experimental group (24 students)
  - 2.2. The first grade class 1/2 as the control group (24 students)

### **Instrument and Procedures**

1. Developing the curricular program on the integration of agricultural knowledge with the Thai language, mathematics, and science subjects

The first step was to develop the curricular program by investigating the indicators and contents of the core learning content on the Thai language, mathematics and science subjects of the first grade of elementary school in accordance with the core curriculum of basic education, 2008. Also, it investigated the consistency of the indicator. Appropriate content and learning standards of the learning content of the Thai language, mathematics and science subjects, which could be integrated into agricultural knowledge, were selected. Agricultural knowledge was established and would be integrated with guardians and the school committee (Satiansiriwiwat et al., 2016A, B). Three scholars assessed the curricular program using the curricular program assessment form. The results of the assessment were analysed using mean, standard deviation and interpretation criteria on opinions according to Best (1981). The results of the assessment on quality of the integrated curricular program by the scholars were found to be at a very high level ( $\bar{x}= 4.55$ )

2. Preparing the integrated learning plan on agricultural knowledge with the Thai language, mathematics and science subjects

The second step was to write the plan to facilitate learning in the Thai language, mathematics and science subjects for the first grade of elementary school based on the developed curricular program and the determination of teaching hours. The developed curricular program was analysed based on the principles, aims, and content of learning standards, learning time

structure, course structure preparation, determination of content and learning time, investigation of learning facilitation plan writing, as well as review of literature on measurement and assessment in accordance with the form as set by the school. Then, the learning facilitation plan was proposed to the assistant principal of the school. This aimed to check, give suggestions on objectives, facilitate teaching/learning activities, teaching media, correct content having consistency with the measurement and assessment using the learning facilitation plan assessment form. The results of the assessment were analysed using mean, standard deviation and interpretation criteria according to Best (1981). The results of the assessment of the quality of the learning facilitation plan were at a very high level ( $\bar{x}= 4.50$ ).

3. Trying-out the teaching of knowledge integration on agricultural knowledge with the Thai language, mathematics and science subjects
  - 3.1. Trying-out teaching to measure academic achievement: it was conducted with the first grade pupils of elementary school for 30 h. The experimental group was divided into two groups: those who did not learn through the integration of agricultural knowledge (Control group) and those who learned through the integration of agricultural knowledge (Experimental group).
  - 3.2. Trying-out teaching to measure the attitudes towards agriculture: The trying-out integrated teaching based on the lesson facilitation plan constructed in the second step lasted 30 h. This was conducted with the control group and the experimental group.

## Data Analysis

1. Trying-out teaching to measure academic achievement:
  - 1.1. The testing of the difficulty value of the testing form to approve academic achievement was inspected based on the KR20 formula.
  - 1.2. The testing of differences in the scores of academic achievement between that of the control group and the experimental group was compared using the t-test (independent sample).
2. Trying-out teaching to measure attitudes towards agriculture:
  - 2.1. The testing of the objectivity of the measuring form was checked and improved by three scholars using the Index of Item-objective congruence (IOC)
  - 2.2. The testing of differences in an average mean score of the attitude towards agriculture of the control group and the experimental group was analysed using the t-test (independent sample).

**Research Results**

1. Developing the integrated curricular program on agricultural knowledge with the Thai language, mathematics and science subjects

The results show that the integrated curricular program consists of learning units, contents and some specimens of the integrated curricular program (Table 1).

**Table 1.** Some specimens of the integrated curricular program on agricultural knowledge with the Thai language, mathematics and science subjects

Learning unit	Content	Some specimens of the integrated curricular program		
		Thai language	Mathematics	Science
Interesting plants	Plants around us	<ul style="list-style-type: none"> <li>• Plant reading and writing</li> <li>• Writing plant names</li> <li>• Answering questions about what has been read</li> </ul>	<ul style="list-style-type: none"> <li>• A number and counting plants around us</li> </ul>	Living things and Processes of life (Compare differences between living things and non-living things)
	Growing plants in a container	<ul style="list-style-type: none"> <li>• Writing communications by using simple words and sentences</li> <li>• Describing steps of plant growing</li> </ul>	<ul style="list-style-type: none"> <li>• A number and Operation</li> <li>• Geometry (Distinguish triangles, quadrilaterals, circles and ellipses)</li> </ul>	Substances and Properties of Substances (type, properties of materials used for plant growing)
	Taking care of plants to be grown	<ul style="list-style-type: none"> <li>• Writing about taking care of plants</li> </ul>	Measurement (Comparison of height)	<ul style="list-style-type: none"> <li>• Change process of the Earth (Explore, experiment and explain components and physical properties of soil in the local area)</li> <li>• Astronomy and Space</li> </ul>
	Harvesting agricultural yields	<ul style="list-style-type: none"> <li>• Writing short stories about their experiences</li> </ul>	<ul style="list-style-type: none"> <li>• Weighing</li> <li>• Tell length and weight, by using non-standard units of measure</li> </ul>	Structure of plants (Observe and explain characteristics and functions of external structures of plants)

Learning unit	Content	Some specimens of the integrated curricular program		
		Thai language	Mathematics	Science
Interesting animals	Animals around us	<ul style="list-style-type: none"> <li>• Reading and writing animal names</li> <li>• Telling the meanings of words and texts read</li> </ul>	Add, Subtract and Mix addition and Subtraction of cardinal numbers	Living things and Processes of life (Specify characteristics of animals in the local area, and categorize them by using external characteristics as criteria)
	Structure of animals	<ul style="list-style-type: none"> <li>• Principles of Thai language Usage</li> <li>• Write spellings and tell meanings of words.</li> </ul>	–	Structure and function of animals (Observe and explain characteristics and functions of external structures of animals)
	Benefits of animals	<ul style="list-style-type: none"> <li>• Thai literature and Tales</li> <li>• Telling about insights obtained from reading or listening to literary works for children in prose and inverse</li> </ul>	Analyse and find answers to problems and mix problems of cardinal numbers	<ul style="list-style-type: none"> <li>• Benefits of animals</li> <li>• Verbally present their work for others to understand</li> </ul>
Importance of agriculture	Producing food	Writing a story	Computation of incomes and expenses	Nature of Science and Technology (Arrange data obtained from exploration and verification into groups and present results)
	Income generating	Listening, Viewing and Speaking	Incomes and expenses records	Nature of Science and Technology (Make a record and explain results of the exploration and verification by drawing pictures or writing short texts)
Processing of agricultural yields	Products from plants	Reading and writing names of plant products	Mathematical Skills and Processes	Substances and Properties of Substances (Observe and specify apparent characteristics or properties of materials)

Learning unit	Content	Some specimens of the integrated curricular program		
		Thai language	Mathematics	Science
Processing of agricultural yields	Products from animals	Reading and writing names of animal products	<ul style="list-style-type: none"> <li>• Plus and minus</li> <li>• Write and read Hindu-Arabic and Thai numerals</li> <li>• Showing quantity of objects or cardinal numbers</li> </ul>	-
			Goods exchange, selling, and buying	Reading sentences and passages

2. Writing the integrated learning facilitation plan of agricultural knowledge with the Thai language, mathematics and science subjects

Interesting details are presented in Table 2.

**Table 2.** Some specimens of the integrated learning facilitation plan of agricultural knowledge with the Thai language, mathematics and science subjects

Learning unit	Content	Thai language	Mathematics	Science
Interesting plants	Plants around us	Thai vowels and consonants (1 h)	Plus/minus (1 h)	<ul style="list-style-type: none"> <li>• Local plants</li> <li>• Classification of plant types (1 h)</li> </ul>
	Growing plants in a container	-	2D geometry (1 h)	Soil components (1 h)
	Taking care of plants grown	Writing a record (1 h)	Measurement of length and height (1 h)	The sun (1 h)
	Agricultural yield harvesting	-	Weight comparison (1 h)	Structure of plants (1 h)
Interesting animals	Animals around us	Spelling section (2 h)	Problem of positivity on plus and minus (1 h)	Local animals (1 h)
	Structure of animals	-	-	Structure and function of animals (1 h)
	Benefits of animals	Enjoyable tales (1 h)	-	Benefits of animals (1 h)

Learn- ing unit	Content	Thai language	Mathematics	Science
Importance of agriculture	Food production	Writing a sen- tence (1 h)	-	-
	Income gener- ating	Answering questions based on the reading selection (1 h)	Problem of positivity (1 h)	-
Agricul- tural yield processing	Products from plants	Rhyme (1 h)	-	-
	Products from animals	Lead character letters (1 h)	-	-
Agricultur- al business	Goods exchange selling and buying	Reading (1 h)	Construction of the problem of positivity form a picture (1 h)	Verbally present their work (1 h)

### 3. Trying-out the teaching of integrated agricultural knowledge with the Thai language, mathematics and science subjects

3.1. Learning achievement: This is a comparison of academic achievements based on the teaching of integrated knowledge of agricultural knowledge with the Thai language, mathematics and science subjects. The comparison was conducted between the group of pupils who did not learn through integrated teaching (experimental group and the group of pupils learning through integrated teaching (Control group)). It was found that there was a statistically significant difference in academic achievement at 0.05. The average score of the experimental group was higher than that of the control group by 9.42 (Table 3).

**Table 3.** Comparison of academic achievement between the experimental group and the control group

Sample group	N	$\bar{X}$	S.D.	t	Sig
Experimental group	24	31.62	4.05	-5.88	0.00*
Control group	24	22.20	6.71		

Note: \*Statistically significant at 0.05

3.2. Attitudes towards agriculture: It was found that the control group and the experimental group had a statistically significant difference at 0.05 in attitudes toward agriculture. The experimental group had an average score of attitude higher than that of the control group by 0.27.

**Table 4.** Comparison of attitudes toward agriculture from integrated teaching and learning of agricultural work with the Thai language, Mathematics and science subjects of the first grade of elementary school (Sangkaprachanusorn school) between the experimental group and the control group

Sample group	N	$\bar{X}$	SD.	t	Sig
Experimental group	24	2.80	0.23	4.345	0.00*
Control group	24	2.53	0.21		

Note: \*Statistically significant at 0.05

## **Discussion**

The results of the study showed the difference in the academic achievement of the control group and the experimental group with a statistically significant difference at 0.05, i.e., an average score of the experimental group was higher than that of the control group by 9.42. This implies that teaching and learning of the Thai language, mathematics and science can be integrated into agricultural knowledge. This includes knowledge about plants (78.66%), knowledge about animals (73.33%), and knowledge about the importance of agriculture (70.66%). Almost all the guardians (98.68%) agreed that agriculture is important to daily life of humans and they wanted the pupils to perceive the importance of agriculture more than ever (Satiansiriwivat et al., 2016A). This conformed to the school committee that wants to instil agricultural knowledge and the importance of agriculture into students more than ever (Satiansiriwivat et al., 2016B). However, it was opposed to the guardians of the first grade elementary school pupils, who wish to bring agricultural knowledge to integrate with the 3 subjects: the Thai language (73.68%), Mathematics (56.58%) and Science (78.95%) (Satiansiriwivat et al., 2016A). According to the results of the study, it can be seen that the guidelines for the integration of agricultural knowledge into the Thai language, mathematics and science subjects were correct. Close attention should be paid and practiced continually. Importantly, the teacher must have knowledge and understanding of

sufficiency of agriculture. Also, he must have a good attitude towards agriculture and this will make the guidelines successful in the future.

Regarding the comparison of attitudes towards agriculture between the control group and the experimental group based on the integrated teaching and learning of agricultural knowledge of the Thai language, mathematics and science subjects, it was found that the experimental group had a higher average score than that of the control group with a statistically significant difference at 0.05. This clearly implies that integrated teaching and learning could make the pupils (experimental group) have a better attitude than the control group. The results of the study can confirm the opinions of the guardians of the first grade pupils at Sangkaprachanussorn School, who wanted agricultural knowledge to be integrated into the Thai language, mathematics and science subjects. Almost all of the guardians (98.68%) realized that agriculture is important for the daily life of man. Thus, they wanted their children to have agricultural knowledge (Satiensiriwiwat et al., 2016A). This also conformed to the opinions of the school committee because they wanted the pupils to perceive the importance of agriculture and to instil agricultural knowledge into them (Satiensiriwiwat et al., 2016B).

## **Conclusions**

The presented study included curricular program development, writing of the learning facilitation plan and trying out the teaching of the control group (not learning through integrated teaching) and the experimental group (learning through integrated teaching). The findings show that the academic achievement score of the experimental group was higher than that of the control group with a statistically significant difference at 0.05. This means that the integration of agricultural knowledge with the Thai language, mathematics and science subjects has an effect on the agricultural knowledge of the first grade elementary school pupils.

Moreover, trying-out teaching to measure attitudes toward agriculture between the experimental group and the control group was done. It was found that the experimental group had a higher average score on attitudes than that of the control group with a statistically significant difference at 0.05. Therefore, the integration of agricultural knowledge into the Thai language, mathematics and science subjects creates more positive attitudes toward agriculture than before.

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First, what does it take to be proficient at mathematics teaching? If their students are to develop mathematical proficiency, teachers must have a clear vision of the goals of instruction and what proficiency means for the specific mathematical content they are teaching. They need to know the mathematics they teach as well as the horizons of that mathematics—where it can lead and where their students are headed with it. Familiarity with the trajectories along which fundamental mathematical ideas develop is crucial if a teacher is to promote students' movement along those trajectories. In short, teachers need to muster and deploy a wide range of resources to support the acquisition of mathematical proficiency. The article deals with the peculiarities of skills control for a subject — Foreign language at school. Also, the article reveals the method of test as the main way of formation and correction language knowledge. When checking written vocabulary exercises, first of all, the content, as well as lexical and grammatical correctness and, last of all, spelling, are taken into account, since a letter is only a means and not a goal of learning a foreign language in secondary school [1, crp. 245]. The main object of control in a school subject is a foreign language, speech skills and abilities, and only to a small extent the theoretical knowledge of students. Nowadays the method of tests is widely used at any stage of schooling. The Thai school year consists of 2 terms, the first from early May until late September and the second from mid-October until the end of February, with a long summer break during March and April. In addition to the mid and end of year breaks, there are a number of public and government holidays that are observed by Thai primary schools, which you need to be aware of when making childcare arrangements. Generally speaking, school starts at 8am and finishes around 4pm, although each school may set its own hours, within reason. Most primary schools employ a standard A-F grading system, which corresponds to the same grades used in American and British schools. However, some schools use a 4-point grading system, from 4 to 1, with an F for pupils who fail.