

University-Local School Collaboration in Agricultural and Environmental Education

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ABSTRACT

This paper describes a university-school collaborative project for the development of integrated courses and learning activities in agriculture and environment. A participatory action research was conducted by Kasetsart University (Kampaeng Saen Campus) and 2 local schools. Collaborative researchers consisted of 5 faculty members from agricultural and environmental education program, 7 pre-service teachers, and 2 cooperative teachers.

With guidance, the participating pre-service teachers designed two integrated courses with learning activities and assessment criteria. One course was targeted for primary level, the other for secondary. The courses were then implemented in participating schools during student-teaching practicum of one semester. At the end of the one-year project, a seminar was conducted to provide forum for learning and exchanging of experiences among the project participants and teachers of the other 12 local schools.

The student teachers reflected positively on their achievement and learning experiences as practicing teacher-cum-researcher. The cooperative teachers were satisfied with the integrated courses and the learning outcomes of their pupils, particularly at primary level. Experiences from collaborative research were fruitful for further development of teacher education program. Following this project, university-school collaboration was extended to related activities and to other local schools.

Key words: agricultural education, environmental education, integrated learning, university-school collaboration

INTRODUCTION

Interdependence of Agriculture and Environment

Agriculture is the basis for food security, thus an essential component of societal well-being. As natural resource-based industry, however, agriculture exploits and erodes the environment on which it depends. An FAO report on agriculture and

environment indicated that, “over the past 50 years, humans have changed ecosystems more rapidly and extensively than any comparable period of time in human history”. (FAO, 2007). As humans benefit from agricultural development, environmental depletion is accounted for by agricultural activities at every point of production. Agriculture and environment is interdependent, as evidenced from a report by

Millennium Ecosystem Assessment (MEA, cited in FAO, 2007) on the impact of agriculture, forestry and fisheries on the environment, as well as the impact of natural resources degradation on agriculture.

With the aforementioned scenario, teaching agriculture in today's contexts needs to address the issues of environment. Traditional approach is not sufficient to provide pupils with experiences and understanding of agriculture within the realm of environment. Integrated agricultural and environmental education is an alternative for reinventing basic education in agriculture for school children.

Teaching Agriculture to Children: A Need for Relevance

With exception to special programs in particular schools, typical agriculture subjects for school youths in Thailand have been a subject of criticism as being irrelevant to today's contexts and disconnected to the everyday life of children. Despite current movements on learning reform and increasing awareness of agriculture for sustainable environment, agriculture subject is delivered to children in as much the same old way as has been over the past decades. In accordance with this observation, in a recent review of agricultural education in Thailand, Traimongkolkul and Tanpichai. (2004) called for reinventing of basic education in agriculture. They proposed that relevant agriculture for school children should characterize the following aspects:

- *Aimed for creating awareness and understanding of sustainable agriculture applicable to daily life, be it rural or urban way of living.*
- *Process-oriented. Agriculture subject should be conceived as a means for nurturing desirable characteristics and sense of care to nature and environment.*

If an integrative approach to agricultural and environmental education is an answer for relevant education, schools must be motivated and supported to develop appropriate curriculum.

Integrated Learning in Agriculture and Environment

Integrated learning in agriculture has received high attention in the recent decades. Exemplary cases from the U.S. show that elementary students enjoy learning agriculture blended in activities of other subjects (Dirks and Orvis, 2005). At secondary level, AgriScience as an elective course has been experimented with satisfying results (Sikinyi and Martin, 2002; Vaughn, Edward and Rocca, 2002). Learning units created with AgriScience concepts correspond well with prescribed learning standards in agriculture, environmental sciences, and life sciences (Vogt and Yale, 2001). In Thailand, learning reform studies have indicated that integrated learning within and across subjects provide meaningful learning experiences for pupils, especially at primary level (Boonsue, 2003; Kajornsin et al, 2005; Amornwiwat, 2002). Success cases of agriculture-based integrated learning units are also documented in research (Kajornsin et al, 2005).

University-School Learning Network

Recent follow-up studies on educational reform in Thailand indicated that development of learning network was a key mechanism to activate change in the teaching-learning methods of teachers. In addition, report from the countrywide whole-school reform showed that external researchers from universities or other local institutions played a significant part for successful school reforms (Khammanee et al, 2005). In turn, such external researchers gained practical experiences from working and learning with school teachers, as Omornwiwat (2002) noted:

Faculty members of teacher education programs must reach out, linking theory to actual practice in schools and community. By thinking together, working together, sharing and learning together, bringing teachers to university and taking pre-service students out to community, development partners will grow together.

The Thai experience in school reform further revealed that supports in the forms of academic mentoring, amicable supervision, and collaborative research are effective strategies for inducing positive change of teaching-learning in local schools. Experiences from other countries also indicated that learning network/partnership is essential factor for effective and meaningful agricultural education and environmental education (Murphy, 2000; Heasey, 2002; Australia Dept of Environment and Heritage, 2005).

Conceptual Framework

Rooted in the Land-Grant Philosophy of the U.S. (NASULGC, 2000), social engagement is regarded as a core mission of agriculture-based universities. Kasetsart University at its agricultural campus is equipped with academics and rich agricultural and environmental learning resources that can be shared to local schools and community. Sharing-learning channel between university and local schools can be created yielding mutual benefits, as conceptualized in figure 1.

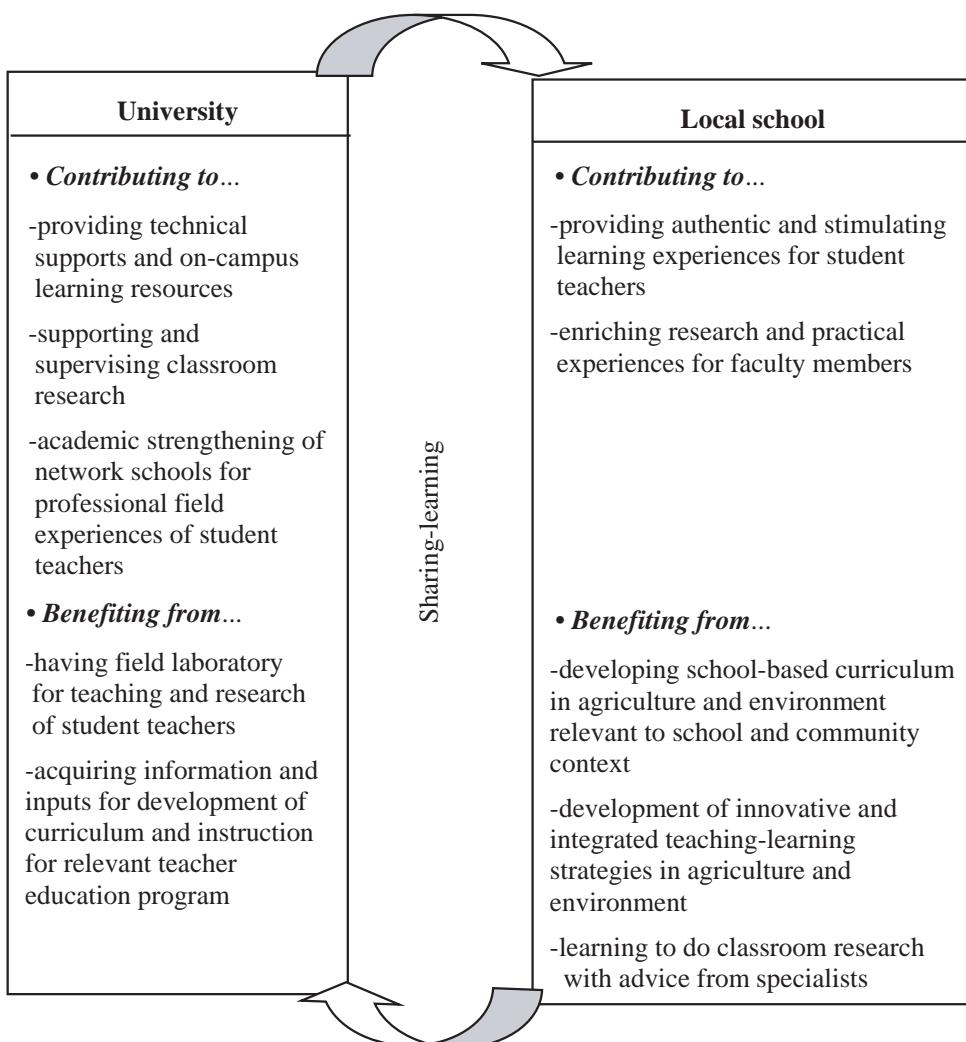


Figure 1 Conceptual Framework: Contributions and benefits envisaged through university-local school collaboration in agricultural and environmental education.

Purpose and Objectives

This collaborative research aimed to initiate a learning network in agricultural and environmental education between the Faculty of Education and Developmental Sciences of Kasetsart University and local schools. School-based curriculum development was used as a means for which the sharing-learning can take place between faculty members, pre-service students, and school teachers.

METHODOLOGY

Research Design

Participatory action research was employed to facilitate cooperative channel between Kasetsart University and two local schools. The participating schools, one each at primary and secondary levels, were selected from the existing cooperative schools for professional field experiences of Kasetsart University.

Project participants consisted of three groups. Five faculty members from the program of agricultural and environmental education at Kasetsart University took the role of principal researcher and student teaching supervisor. Seven pre-service teachers worked as student teacher and practicing researcher in their designated school. Two cooperative teachers, one from each participating school, took the role of collaborative researcher and field supervisor for their assigned student teachers.

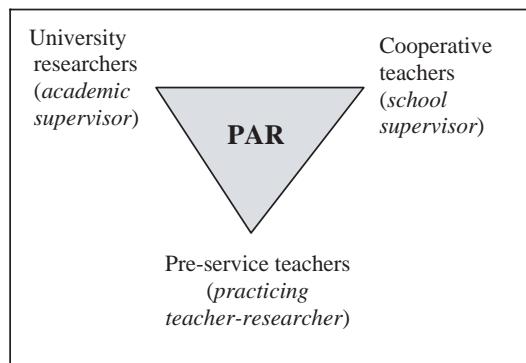


Figure 2 The project participants.

Central to this research project were the pre-service teachers who were encouraged to take initiatives in every step of course development. The faculty members and cooperative teachers took supportive role as supervisor.

The one-year research project was conducted in three consecutive phases: *planning*, *action/implementation*, and *reflection on action*.

Project Planning and Course Development

During the semester prior to student-teaching practicum, a series of workshops was carried out for the project participants to learn and work together on designing of integrated course content and learning materials aimed at basic level of education in agriculture and environment. Work on course development proceeded as follows.

Designing of course syllabus. After an analysis of core content standards and school curriculum, two integrated courses were designed for agriculture and environment; one for primary level, and the other for secondary. Key concepts underlying the design of courses were three-folded:

- 1) Integration of content, activities, and assessment, with the focus on agriculture and environment.
- 2) Balancing “thinking-doing” learning activities.

- 3) Making use of learning resources available within the agricultural campus of Kasetsart University to supplement school and community learning resources.

Planning of learning units. Under closed supervision of the university researchers, the pre-service teachers designed unit lesson plans with details on course content and learning materials and activities.

Planning of learning assessment. The students were supervised on planning of learning assessment for individual learning units as well as for the whole course. Assessment guidelines covered three domains of learning achievement : knowledge and cognitive skills, work skills and process skills, and desirable

characteristics and attitude. A variety of assessment tools and techniques were prepared: test of knowledge, classroom behavior rating scale, rubrics on performance, opinion rating scale, awareness test, and students' reflection.

Checking for course practicality. The two designed courses were examined by the cooperative teachers of each school to check for the suitability of learning materials, activities, and assessment techniques for actual use with their target pupils. Some adjustments were done after the review.

Action and Implementation

During the second semester that followed, the participating pre-service teachers engaged in a full-time professional field experience, the student-teaching practicum, at their designated school. The designed courses were put into practice by the student teachers, with the faculty members and cooperative teachers as supervisor. During and after the course implementation, learning achievement of pupils was assessed in regard to three domains of expected learning outcomes. The student teachers were supervised on data collection, analysis and presentation.

Reflection on Action

Apart from data on learning achievement of pupils, reflections on learning experiences from project participants were obtained. A seminar with exhibition was conducted at the end of the project whereby project results were shared, and responses were obtained from teachers and administrators of 12 other local schools. A total of 55 teachers, school administrators, and educational researchers attended the seminar.

RESULTS

The Participative Learning Experiences

The participating pre-service teachers, university researchers, and cooperative teachers gained fruitful learning experiences from working

together during the process of designing integrated courses and learning activities.

- *Benefits perceived by the pre-service teachers.*

The learning process was most beneficial for preparing pre-service teachers for the role of teacher and researcher during their professional internship. The student teachers reflected favorably on their experiences engaging in the research project as practicing teacher-researcher. Sampled reflections are quoted in table 1.

- *Benefits perceived by the cooperative teachers.*

The cooperative teachers reflected that they learned from working with student teachers on the integration of content in agriculture and environment, the learning materials more relevant for their pupils. They asserted that the integrative approach can be applied to course development for all grade levels. Regarding achievement of pupils, the teachers were satisfied with the outcomes on knowledge and perception. Most favorably, the teachers observed their pupils expanding knowledge and perception from being exposed to the rich learning resources in agriculture and environment at Kasetsart University.

- *Benefits perceived by the university researchers.*

Being involved as principal researcher and



Figure 3 *On display:* student teacher sharing her experience to seminar participants at the project conclusion.

Table 1 Sampled reflections from the student teachers.

Dimensions of learning experiences	Quoted expressions
Linking theory to practice: gaining direct experience on integrated course construction	<ul style="list-style-type: none"> o <i>Before student teaching, we had a required course in curriculum development. It was something far from our perception. We just had to imagine on everything. But...</i> o <i>Being involved in this project, we have gained a very concrete experience on how to develop integrated content and learning activities in agriculture and environment.</i>
Designing and experimenting on learning management in actual situation	<ul style="list-style-type: none"> o <i>We have gained truly fruitful experiences from our school and professor supervisors on innovative learning activities</i>
Acquiring fundamental knowledge and skills on participatory research process	<ul style="list-style-type: none"> o <i>We are proud to be part of this research project. It is our first experience becoming part of a research.</i> o <i>As research novice, we have learned a great deal on the research process -- particularly on data collection, analysis, and presentation of findings.</i>
Working skill Development	<ul style="list-style-type: none"> o <i>Through this collaborative project, we have developed working skills in actual situation.</i>

supervisor, the faculty members of Kasetsart University gained direct experiences in the process of school-based curriculum development. They also experienced conducting school-based action research with pre-service teachers and school teachers as collaborative researchers. They indicated that such practical experiences could enrich their instruction in respective courses in teacher education; namely, *learning management strategies*, *school-based curriculum construction*, and *classroom research techniques*. Above all, the faculty members perceived that experiences from this pilot project could contribute to research-based development of the newly institutionalized 5-year teacher education program.

Course Development and Implementation

Two integrated courses were designed as follows:

- o *For primary level (grade 4). A multi-subject integrated course was developed, entitled "GREEN LIFE", by blending the content of agriculture and environment with sciences and social studies. A thematic approach was used, following*

growing cycle of plants. Four learning units were designed.

- o *For secondary level (grade 9). An AgriScience integrated course was developed, entitled "AGRICULTURE AND ENVIRONMENT IN OUR DAILY LIFE", by blending the content of agriculture and environment with sciences into 4 learning units. Project approach was used to encourage the applications of knowledge from all 4 learning units.*

The two courses with learning materials and assessment criteria were implemented for one semester in the two target schools by the student teachers who had been directly engaged in course design. Three classes of pupils were involved; two for primary level in school one, and the other for secondary level in school two.

Learning outcomes of the pupils were assessed by the corresponding student teachers, covering the three domains: Knowledge and cognitive skills, work skills and process skills, desirable characteristics and attitude. Overall, favorable outcomes were observed as summarized in table 2. It was evident from class observation as well as from pupils' opinion ratings

Table 2 Summary of learning outcomes of pupils exposed to integrated courses in agriculture and environment.

Domains of learning outcomes	Primary-level course (<i>multi-subject integration</i>)	Secondary-level course (<i>AgriScience integration</i>)
① Knowledge and cognitive skills	<ul style="list-style-type: none"> Moderate achievement on knowledge test High achievement on concept attainment, using mind mapping 	<ul style="list-style-type: none"> Moderate achievement on knowledge test Moderate achievement on concept attainment, using mind mapping
② Work skills and process skills	<ul style="list-style-type: none"> Good work performance 	<ul style="list-style-type: none"> Good project achievement
③ Desirable characteristics and attitude	<ul style="list-style-type: none"> Good learning and working behaviors Highly positive ratings on learning activities 	<ul style="list-style-type: none"> Good learning and working behaviors High awareness score on agriculture and environment

that the primary pupils showed high interest and active participation in all activities of the course. As for secondary level, less active participation of the pupils was observed. Evidently, prior knowledge and cognitive background of pupils are important conditions to be considered when designing AgriScience course at secondary level. Therefore, further adjustments are needed regarding the content level and time management.

Problems and Constraints

Project participants reflected some problems

and constraints limiting the full efficacy of this collaborative approach, as follows.

1. Limitations of the 4-year teacher education program

The pre-service students in this project were under the 4-year teacher education program. Under this program, the students had only one-semester student-teaching practicum. Before that, the students had to carry full-time course work. As such, there was not enough time for designing new course and learning materials. Apart from that, 4th year students mostly lack experiences in designing course content



Figure 4 Active learning: A blend of *learning by thinking* and *learning by doing* activities for primary pupils.

and learning activities. Throughout this project, intense and continuous supervision was necessary. At times, students faced with frustrations in keeping with work schedule as practicing teacher and researcher.

2. Time constraints faced by cooperative teachers

School teachers have normally carried heavy load of duty during school sessions. When student teachers were assigned in school, cooperative teachers took good responsibility in teaching supervision. Other than that, it was difficult for school teachers to commit their time for research.

3. Conditions regarding the nature and academic background of pupils

Previous studies suggested that school children at primary level mostly enjoy learning agriculture with outdoor activities such as growing plants. On the contrary, most secondary pupils do not enjoy such activities as much (Traimongkolkul and Tunpitchai, 2004). This study further found that science-based agriculture is a promising alternative for secondary students. However, adequate science content and fundamental thinking skills of the pupils are essential conditions for the success of such integrated course. To enhance learning effectiveness, AgriScience integrated course should therefore be tailored to the cognitive level of pupils.

From seminar and exhibition at the project conclusion, attendants from the two participating schools and 12 other local schools responded favorably on the integrative approach of course design and learning management in agriculture and environment. In practice, it was recommended that need assessment and appropriate adaptations should be considered when applying the approach to other schools.

IMPLICATIONS

Experiences from this pilot project have led to further collaboration initiatives, as follows.

Expanding Activities of University-School Networking

Following this project, collaborative activities in agricultural and environmental education were extended to other local schools. A network of 13 schools was formed for a collaborative project with Kasetsart University on “*school-based mushroom production to alleviate problems caused by flooding in the local area.*” Follow-up activities have been planned, linking school-home learning environment in agriculture.

Research-Based Teacher Education Program

With fruitful experiences of pre-service teacher development derived from this project, the agricultural and environmental education program at Kasetsart University has initiated a pilot project on research-based model for the 5-year teacher education program. The aim of this teacher preparation model is to equip pre-service teachers with adequate professional experience in teaching as well as in classroom research.

Network Furthering:

University-School-Community Partnership

A recent study in Thailand by Kajornsin (2005) indicated that effective learning about agriculture and environment could be best achieved with school-community collaboration. In addition, a critical review by Traimongkol and Tunpitchai (2004) suggested that relevant and sustainable agricultural education relies on 3 factors: school readiness, community support, and external inputs from local organizations and educational institutions.

Decentralization policy calls for community and local administrative organizations to take active role in school management. Local administrative organizations, in particular, can fulfill the needs of local schools in learning resources. At the other end, universities with specialization in agricultural technology can provide local schools with technical supports through pre-service teachers. In turn, local schools can serve as field laboratory for teaching and

research of student teachers. Such collaborative effort provides a context in which university researchers and students, school teachers, community members, and local development agents come to work and learn together. This way, a learning platform could be created for community education in agriculture and environment. The cooperative project described in this paper is an initial step toward this future direction.

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