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Research Article

A new way of agricultural farm work in the educational facilitation of dual education between vocational education and upper secondary school curricular programs

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Abstract

This study aimed to compare learning achievement based on blended learning of dual education between vocational education and upper secondary school curricular programs in Agriculture. The sample groups were students learning through a new way of agricultural farm work and those learning agriculture through normal method. They were 90 sixth year upper secondary school students from Buntharik Wittayakhan School, Ubon Ratchathani, Thailand obtained by purposive sampling. This study consisted of 3 steps: 1) investigation and development of model of a new way agricultural farm work (animal science and teaching form); 2) analysis of consistent components suitable for the development of a new form of animal farm work and teaching/learning form; and 3) using the model together with the integration between theories and teaching methods (Learning by doing, POE, Group process, Blended learning, and field trip). This also included learning through application multimedia for learning exchange and activity transfer. There was control group design after testing. The instrument of research were interview schedule, questionnaire, learning achievement test, set of learning activities, and observation form. Results of the study revealed that the students learning through the dual education or a new way of agricultural farm work had higher learning achievement than that of those who learned through a normal class with a significance level ($p>0.01$). This finding indicated that learning through a new way of agricultural farm work was very essential to the development of learning achievement and skills. It was also found that the students had a high level of satisfaction with the blended learning and it should be promoted as part of the dual education in agriculture.

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Introduction

The rapid world's social and economic change has an effect on the adaptation of an individual, family, society, and the country. This is a cause of security issues in various areas, both the economy and the environment, including food security, which is a fundamental necessity of future development (NESDC, 2017; Limnirankul, 2012). The effective solution possible to meet all of the challenges facing humanity today in the fields of economy, ecology, human security, global governance, and peace. The world academy is examining the root causes of these multiple challenges in order to formulate an integrated perspective, comprehensive strategy and detailed policy framework attuned to the realities, needs, and emerging opportunities of the 21st century (WAAS, 2020). The considering of the significant changes in basic living conditions, food security has long been a concern for all countries in the world. This includes a challenging economic context and meet society's new requirements on environmental protection.

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The fighting against climate change, health balanced diets and essential that newcomers are adequately trained to be able to adapt to evolving and increasingly specialized agricultural techniques to produce sufficient food and solve the hunger problem of the world's population (Marie-Laure Augère-Granier, 2017; Dooley & Roberts, 2020; United Nations, 2020). Therefore, to put the importance on food production, it is necessary to educate people in order to have knowledge and capability in food production and self-reliance. Moreover, the National Research Agenda for the American Association for Agricultural Education states that "Enhanced understanding of learning and teaching environments could result in the development of present-day best practices and research-based pedagogies and technologies that not only meet the goal of agricultural education but also society's greatest challenges" and organized it as an important research agenda (Edgar, Retallick, & Jones, 2016; Baldock & Murphrey, 2020).

Education as a Tool for Human Resource Development

Human resources is regarded as the most important factor affecting successful organization up to the country development. In fact, education is an important factor in having an effect on the development of the quality human resources. Besides, education can determine direction of the country but educational promotion must be consistent with the context of the country. Effective planning on human resource production surely makes the country has capable human resource capital to make the country be progressive (Office of National Education Council, 2017). Hence, the educational facilitation on the basis of conservative function (beliefs, arts, culture, science, humanities, social sciences, etc.) may have knowledge dissemination, transfer and keeping. Moreover, there is creative & innovative function which education is like an important tool for social transformation and progress of culture. In other words, education is new thing seeking or creation so as to le future innovation and new culture. It can be seen that education is an important factor for development and new knowledge dissemination. Importantly, the facilitation of education must be consistent with needs and context of the country. For example, more than 60 percent of people in Thailand are engaged in agriculture so agricultural knowledge must be contained in the curricular program of basic education, vocational education and provably higher education. In 2016, the Ministry of Education set a policy to produce more vocational graduates to cope with needs of workforce market. Also, the Ministry of Education needs to accelerate public relations to make students be interested in vocational careers, not only in higher education which seems not to be responsive to needs for skillful workforce of entrepreneurs. Consequently the Thai government must set a policy on Dual education for vocation and upper secondary curricular programs for upper secondary school students to be ready for workforce market. However, this educational facilitation must be on the basis of skills and needs of the students and they will also receive vocational education certificate when they finish upper secondary school education (Office of Vocational Education Commission, 2012). As a matter of fact, the facilitation of vocational education is entirely different from that of basic education. Aside from theory learning, vocational education needs to provide farm work for actual practice or learning by doing (Mike Pegg, 2017), which will have an effect on future career of the student.

Farm Work for Effective Teaching and Learning

The North-eastern Agricultural Vocation Education comprises 10 colleges of Agriculture and Technology producing knowledgeable and skillful graduates for workforce market in agriculture. Importantly, the facilitation of teaching and learning activities focuses on actual practice on the college farm and private farm. Therefore, "farm work" is an important tool for learning & practicing in the actual situation or direct experience. The college farm is the center of direct farming experience, product processing & selling, academic service and traditional arts & culture conservation. Moreover, the college farm is a learning source having correct data and an operational system which can be responsive to mission of the college. So that farm work is important to the facilitation of vocational education because the students truly learn in the actual situation and solve problems encountered in their farm (Gatphayak, 2019; Siriwan 1998). In addition, a guideline proposed for agricultural learning facilitation which farm work is an alternative that the teacher can academically develop himself by conducting research and creating innovations of learning facilitation which is consistent with the educational level, place, and resources available in the school (Poungsuk, 2018; Siriwan, 2014)

The current teaching and learning facilitation which employed digital technology is the integration of diverse learning facilitation methods and its is consistent with learning of new age learners. As a matter of fact, the learning facilitation for Agriculture subject is able to access to knowledge data and the learning activities involves blended learning as in integrated form (Sirirat, 2010). This includes learning collaboration by using smartphone as a learning media which others through online media such as e-mail, Chat, blogs, etc. (Carman, 2005). This learning facilitation

is employed together with normal teaching and learning activities. It aims to enhance effective and successful learning. Agricultural or farm practice will consequently confirm knowledge and understanding in agriculture learned in the classroom. Experience gained from actual practice on the farm together with agricultural knowledge learned in the classroom can be applicable in real life after graduation (Khammanee, 2013).

Therefore, the dual education program facilitation is very essential that the College of Agriculture and Technology needs improvement and development of farm work for effective teaching and learning. This study aims to facilitate learning and experience in agricultural careers for the learner. Hence, farm work should be improved or development to be consistent with the dual education facilitation. This helps achieve the goal of the educational facilitation for an opportunity in sustainable career development.

Problem of the Study

Today, the facilitation of teaching / learning in agriculture in schools is limited to teaching hours. In addition, the number of students interested in agriculture decrease. Also, when secondary school students have completed their studies and experience difficulties, they have a job with general education qualifications. Therefore, dual-education management provides secondary school students with the opportunity to choose to study in their field of study at the vocational level such as the Agricultural Science Program, Mechanic Program, etc. for their career after they graduate. However, the management of vocational education in agriculture by the College of Agriculture and Technology affiliated with a high school has limitations in teaching and learning. Since agriculture is not only a theoretical course and also it is necessary to work on the farm to enable students to develop their agricultural skills.

Therefore, there needs to develop farms to be suitable for learning and teaching in a dual education program. This includes the creation of various tools to be used to manage learning appropriately and to achieve academic objectives. Due to the policy of joint educational development of educational institutions at two levels, students enrolled in the program are able to apply knowledge and experiences to develop their future careers efficiently and sustainably.

Methodology

Research Design

This was an applied research using Research and Development (Leekitwattana, 2012) consisting of 3 periods as follows:

1. First period - investigation and development of animal farm work of Ubonratchathani College of Agriculture and Technology. This aimed to be a model for the expansion of the facilitation of new knowledge and form of farm work. It was the period of survey research and review of related literature. There were a steps which lasted 2 academic years:

Step 1. Exploration of animal farm work condition

Step 2. Development and improvement of the animal farm work condition, learning facilitation to be consistent with the dual education

Step 3. Trey out the model for animal farm work and learning facilitation

Step 4. Improvement of the animal farm work and learning facilitation to be appropriate

2. Second Period - The model was used with go out of 179 upper secondary school students majoring in Agriculture at Buntharik Wiltayakhan School, Buntharik district, Ubon Ratchathani province (Academic year 2018).

3. Tried Period - Assessment of the student learning achievement. Questionnaire, observation and interview were used for data collection. Obtained data were analyzed and disseminated.

Participants

The initial stage explored conditions and needs for the development of new form of animal farm work. The following were involved: a) 42 out 86 teachers who were care takers of the college animal farm in 10 College of Agriculture and Technology; b) 110 out of 156 higher vocational certificate students obtained by purposive sampling and a table of Krujcie & Morgan; and c) 10 administrators of the Agricultural Vocation Institute in Northeastern Thailand. The model for a new form of animal farm work and learning facilitation was tried out with 30 out of 50 dual education students with 12 males and 18 females at Bua Ngam wittayakom, Muang district, Ubon Ratchathani province.

Research Instruments and Procedures

In the first period was the exploration of farm work condition, new animal farm form, and the development of teaching/learning form (4 steps). Instrument and procedures were as follows:

1) An analysis of related literature. This based on the investigation of school and college farm work principles, farm work management, theories, teaching/ learning form, and related research. The instruments were recording form and data analysis form.

2) Analysis of consistent components suitable for the development of a new form of animal farm work and teaching/learning form as a set of guideline of the dual education program in agricultural (DEPA) using a new form of animal farm work. This instruments used for data collection included interview schedule, 5-rating scale questionnaire (Ivanov et al. 2018), and open ended questionnaire follow item of DEPA. The instruments were checked by 5 specialists in terms of validly and consistency of question items (IOC=0.56-1.00). Then, it was checked based on suggestions of the specialists. The assessment criteria were as follows: (Punpinij, 2011)

Score	Scale Limits	Descriptions
5	4.51 – 5.00	Highest
4	3.51 – 4.50	High
3	2.51 – 3.50	Moderate
2	1.51 – 2.50	Low
1	1.00 – 1.50	Lowest

School/college administrators and teachers were interviewed. Besides, the questionnaire was administered with the students and the teachers who were animal farm care takers. Obtained data were analyzed by using descriptive statistics, and t-test.

Interview was conducted with college administrator (Institute of Agricultural Vocation, Northeastern Thailand) responsible for the college farm and administrators and teacher of upper secondary schools. A set of questionnaires was administered with teachers taking care of the school farm, higher vocational certificate students, and upper secondary school students. Obtained data were analyzed by using descriptive statistics and content analysis.

3) The model of animal farm work and the form of teaching / learning facilitation were tried out. The research instruments included learning achievement test, questionnaire, interview schedule, and observation.

a) The learning achievement test comprised 100 question items (4 multiple choices) with the IOC range of 0.5-1.00 and it was tried out with 30 upper secondary students at Bua Ngam Wittayakom School, academic year 2017. Difficulty and discrimination were analyzed.

b) The behavioural observation for the assessment of skills in agricultural practice was on the basis of 5 aspects: 1) implementation planning, 2) implementation, 3) completeness, 4) outcomes, and 5) tool using and maintenance, and reach aspect had 3 scores (Educational Test Center, 2016).

4) Improvement of the form of teaching / learning facilitation and the animal farm work.

The construction and development procedures of new animal farm from and the development of teaching/learning form are shown in Figure 1.

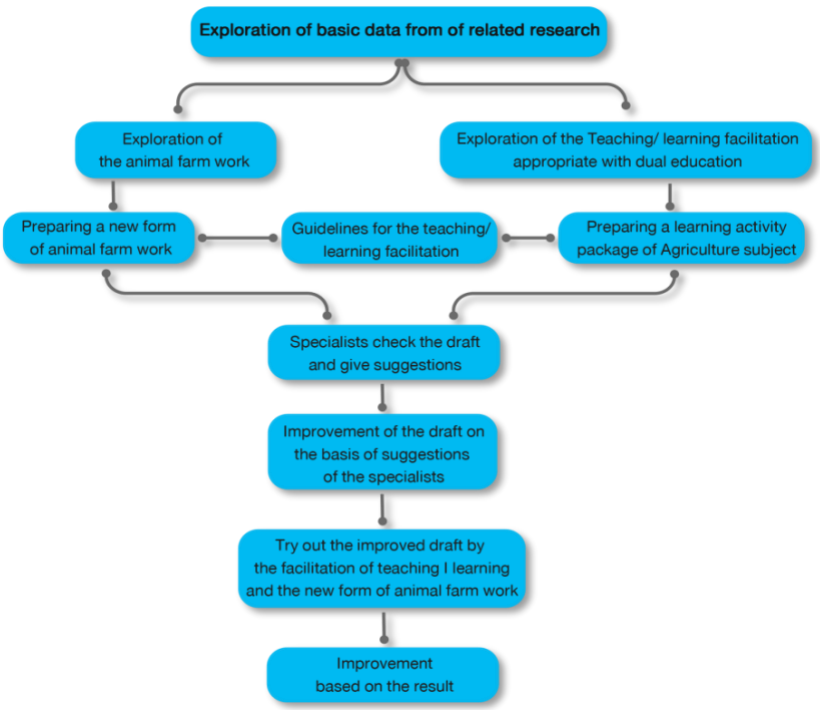


Figure 1.
Procedures and the Development of Teaching/ Learning Facilitation and a New Form of Animal Farm Work

The second and the third period involved model using in the actual situation and an assessment of learning achievement and it was also on the basis of questionnaire, interview, and observation. And disseminated for widespread use in dual education in agricultural program.

Data Collection

The new animal farm form and the development of teaching/learning form was conducted by a joint study between Ubon Ratchathani Agriculture and Technology College and Buntharik Wittayakhan School, Buntharik District, Ubon Ratchathani in the academic year 2018 with 90 high school students who choose to study in dual education in agriculture program. It was divided into 2 groups, 45 persons each, as experimental group and control group conducted joint teaching between teachers of both institutions. This was done by using a set of learning activities and teaching methods that have been defined.

Data Analysis

According to the 3 periods of the facilitation of teaching/learning and a new form of animal farm work, the first period involved data seeking for the construction of body of knowledge about the facilitation of dual education, and exploration of appropriate teachings/learning and methods/animal farm work. Content analysis was employed in this step. Tools used for data gathering were questionnaire interview and observation. In addition, learning achievement test was prepared and improved through try-out technique and inspected based on the KR20 formula. T-test (independent sample) was also employed for testing the difference in an average mean score of the learning achievement.

Results and Discussion

1. Developing a model of teaching/learning facilitation through a new animal science from for dual education of upper secondary school students.

The facilitation of dual education in this study was the coordination (curriculum development) between Ubon Ratchathare College of Agriculture and Technology and Buntharek Wiltayakom School. In this respect, lecture was conducted at the school best practice was conducted at the college. There was the development/improvement of the animal farm work to be consistent with the facilitation of dual education. This was on the basis of results of a study, principles, theories, and related literature of Siriwan et al. (1997), Pangakom (2014), Animal Science Teacher Profession club (2013), Galphayak (2019), and Webster (2011). The curricular program of the dual education in Agriculture (Animal Science) was analyzed in terms of theories and teaching principles/method and 7 teaching packages were obtained. This included the following: 1) knowledge about agricultural work; 2) agricultural

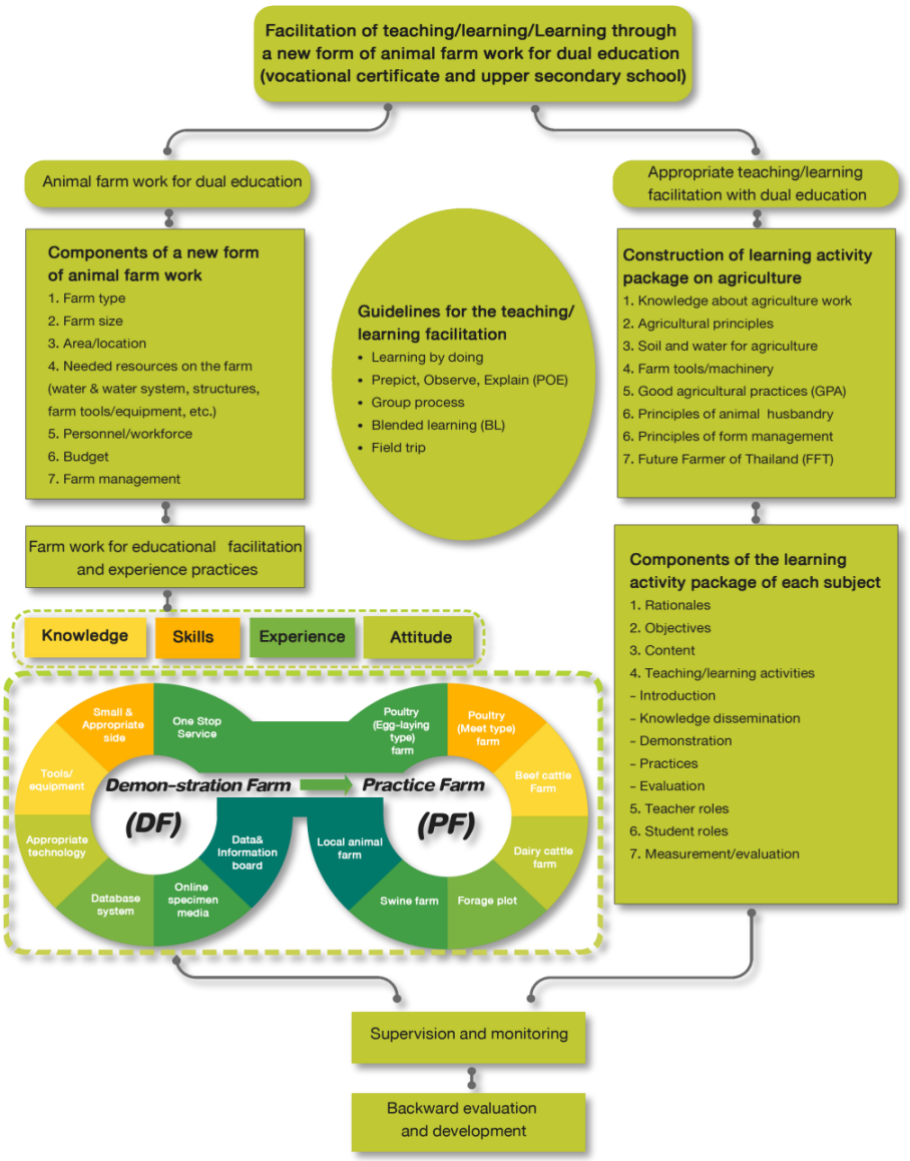
principles; 3) soil and water for agriculture; 4) agricultural tools and farm machinery; 5) principles of animal husbandry; 6) principles of farm management; and 7) Future Farmers of Thailand (FFT).

Appropriate teaching/learning facilitation for dual education involved 2 parts which had been investigated:

1) Form of teaching/learning facilitation (Agriculture). This covered the following: 1) knowledge about agriculture careers; 2) principles of agriculture; 3) soil and water for agriculture; 4) agricultural tools and farm machinery; 5) principles of animal husbandry; 6) principles of farm management; and 7) organization of Future Farmer of Thailand. Each package had the following components; 1) rationales, 2) objectives, 3) content, 4) teaching/learning activities (introductions, knowledge extension, demonstration, practice, and evaluation), 5) teacher roles, 6) student roles, and 7) measurement/evaluation.

2) Regarding methods of teaching/learning facilitation, the following were integrated; 1) learning by doing (Mike Pegg, 2017); 2) predict, observation, explain (POE) (Ornek & Saleh, 2012); 4) group process (Lewin, Khammanee, 2013); 5) and blended learning (BL) (Carman, 2005). This was focused on smartphone using for communication and group forcing among the students and teachers through online media system (application line). Besides, there was experience fulfilment through educational tour on field trip (Phipps et al. 2008).

According to the initial period investigation, a new form of teaching/ learning method and animal farms work obtained (Figure 2).



Figure

Teaching/Learning Facilitation/Learning and a New Form of Farm Work

2. Using the model of teaching / learning facilitation through a new way of animal science farm tasks for dual education of upper secondary school students

This was the teaching / learning facilitation of vocational certificate students for go upper secondary school students. Their learning achievement and skills in agricultural operation on animal science are shown in Table 1 and 2.

Table 1.

A Comparison of Learning Achievement Scores of the Experimental and the Control Groups

Sample group	n	Total scores	An average score	S.D.	t	Sig.
Experimental	45	100	82.75	2.03	20.68	0.00
Control	45	100	53.30	2.25		

** Statistical significance level at .01

According to Table 1, it was found that the students who learned through a new way of animal science farm tastes had a higher learning achievement score than that of the control group with a statistical significance level at .01

Table 2.

A Comparison of Skills in Agricultural Operation on Animal Science of the Experimental and the Control Groups

Sample group	n	Total scores	An average score	S.D.	t	Sig.
Experimental	45	50	43.27	2.25	22.13	0.00
Control	45	50	36.84	2.57		

** Statistical significance level at .01

According to Table 2, it was found that the students who learned through a new way of animal science farm tasks had a higher skill in operational operation than that of the control group with a statistical significance level at .01

Table 3.

An Average Mean Score, S.D. and the İnterpretation of a Level of Satisfaction with Learning through a New Way of Animal Science Farm Tasks of the Students

Item	A level of satisfaction (n=45)		
		S.D.	Description
1. Content			
1.1 Easy to understand	3.93	.589	High
1.2 Interesting	4.24	.700	High
1.3 Up-to-date	4.43	.535	High
1.4 Consistent with the teaching hour	4.25	.579	High
1.5 Beneficial to knowledge top-up	4.14	.728	High
Total	4.12	.273	High
2. Facilitation of learning activities			
2.1 Consistent with the teaching hour	3.42	.739	High
2.2 The teacher is friendly	4.53	.483	Highest
2.3 Participation in teaching/ learning activities	4.46	.407	High
2.4 The Environment contributes to the facilitation of activities	3.43	.756	Moderate
2.5 Learning by doing	4.57	.453	Highest
Total	4.25	.236	High
3. Leering media			
3.1 Appropriate with the content	4.10	.537	High
3.2 Appropriate with learning activities	4.48	.603	High
3.3 Easy to understand the content	3.47	.549	Moderate

Item	A level of satisfaction (n=45)		
		S.D.	Description
3.4 Up-to-date	4.25	.738	High
3.5 Authentic for each activities	4.71	.462	Highest
Total	4.18	.227	High
4. Measurement and evaluation			
4.1 Appropriate method	3.81	.749	High
4.2 Appropriate criteria	4.00	.632	High
4.3 Appropriate time span	3.86	.654	High
4.4 Based on actual conditions	4.35	.567	High
4.5 Student participation	3.81	.601	High
Total	3.97	.382	High
5. Benefits gained by the students			
5.1 Easy to understand the content	3.85	.659	High
5.2 Learning by doing to gain skills	4.82	.403	Highest
5.3 Learning through diverse processes	4.14	.573	High
5.4 Learning through mobile phone application and computer program	4.80	.401	Highest
5.5 utilization in daily life activities	3.95	.669	High
Total	4.35	.255	High
Net total	**4.11**	**.148**	**High**

According to Table 3, it was found that, as a whole, the students learning through a new way of animal science farm work had a high level of satisfaction (=4.11). Based on its details, they were also satisfied with all of the 5 aspects: content, facilitation of learning activities, learning media, measurement and evaluation and benefits gained by the students (=4.12, 4.25, 4.18, 3.97, and 4.35) Besides, the students had a highest level of satisfaction with the following: learning by doing to gain skills (=4.82); learning through mobile phone application and computer program (=4.80); authentic media for each activity (=4.71); leaning by doing in the actual situation (= 4.57); and the teacher is friendly (= 4.53), respectively.

3. An assessment of the model of a new way animal of science farm tasks and learning facilitation for dissemination

Results of the study revealed that the students using the model had a higher level of learning achievement than before. Likewise they had a higher level of learning achievement than that of the control group. As a whole, they had a high level of satisfaction with the model. In addition, all of the 5 specialists had a highest level of their opinions based on 4 aspects: 1) the content was consistent with objectives of the teaching / learning facilitation (= 4.80); 2) facilitation of teaching / learning activities (= 4.80); 3) components of animal science farm work for dual education (= 2.60); and 4) utilization of Learning by doing for future careers (= 4.60). The two aspects were found at a high level: 1) appropriateness of the module of learning facilitation activities on animal science (= 4.40) and 2) monitoring and assessment of the teaching/learning facilitation (= 4.60).

Discussions

The model development for the facilitation of agricultural teaching and learning by using a new way of animal science farm work for dual education of the upper secondary school students had assessment or evaluation. It was found that the new way of animal science farm work gas important components which cover content of the curricular program of the vocational certificate and the high school certificate. Besides, there were learning activities packages suitable for the students to practice on the farm of the new of animal science farm work as well as to acquire knowledge in the classroom. The farm work practice for enhancing knowledge and understanding of the students as well as their skills can be topped up for their future career. This conforms to results of a study of Sangnate (2019) on "Modern Guidelines of Teaching and Learning for Agriculture Teacher Production in Thailand" as well as the development of guidelines for developing human resource engaged in agriculture of Srisuantang et al. (2014).

Furthermore, the learning facilitation in the farm of diverse teaching methods and techniques as an integrated form can be a part which makes the dual education program in this study be successful in term of learning achievement and skills gained farm the new way of animal science farm form. This included the adoption of smartphone or online media (Application line) for rapid communication or data sharing. In addition, experiential learning such as field trip or education tour was part of successful learning of dual education.

The model of a new way of animal science farm tasks for the duel education of upper secondary school students can help develop learning achievement of the students. Also, they were satisfied with the model at a high level. Based on details of the student satisfaction, they had a highest level in terms of the following: learning by doing to gain stills; learning through mobile phone application and computer program; using authentic media for each activity; and the teacher is friendly. This conforms to the philosophy of educational facilitation of Dewey (1958). Ascending to a study of Saduak et al. (2017), it was found that students who learned in actual situations (learning by doing) made them improve then knowledge and skills. Likewise, experience in educational trips enhanced their understanding about then learning activities. In addition, the facilitation of convenience equipment, and learning environment together with teaching methods had an effect on good attitudes of learners, particularly on gifted students (Al – Zoubi & Bani Abdel Rahman, 2016).

The teaching/learning facilitation by using appropriate technology and up-to-date partly promotes the students be interested in agricultural teaching/learning more than before. According to Ritsongmuang et al. (2018) it was found that the blended learning through online media system and knowledgeable and able to solve problems during practice. Moreover, they could share knowledge through online media system both inside and outside the classroom. Not only this, they could find a guideline for solving problem in chicken rearing all the time through media phone application and computer program. Importantly everyone participated in data retrieval, discussion, goal setting, and rapid problem solving (Robroo & Wattananarong, 2010). This conforms to iNACOL (2009) which claimed that combination learning was the sending of knowledge content through online. Special characteristics of classroom interaction including of the learner and there was the transformation of interaction between learners. Besides, Strother (2003) cited that diverse learning methods, activities, and criteria could stimulate the learning the importance on learning which resulted in a high level of learning achievement.

Regarding the student satisfaction, the module and the dual education program, it can be seen that the students have good attitudes towards the new way of agricultural teaching and learning activities more than before. This conforms to a study of Saduak et al. (2019) and Srisuwan et al. (2019). It was found that secondary school students learning through the agricultural learning center before. Besides, the application of a guideline based on prediction, observation, and explanation (POE), blended Learning (BL), group process, and field trip for agricultural teaching/learning activities. Wang (2008), Anodat, et al. (2018) and Ratchawet et al. (2018) had conducted a study and found that the learning facilitation applied to the blended learning and the POE could effectively develop the learner due to high efficiency in learning performance of the learner. In addition, using authentic media in the teaching/learning facilitation together with diverse teaching techniques and methods make the learner learn through learning by doing to gain skills this conforms to a study of Siriwan (2014) and Thanapanyachatchawong (1988) who claimed that the agricultural teaching/learning facilitation put the importance on agricultural education focusing on learning by doing could enhance the learner to learn and gain skills.

Recommendations

For Further Studies

The facilitation of dual education can chance knowledge and skill for the students. Animal farm work experience is an opportunity of the student to gain knowledge and skills in the actual situation. Hence, it is recommended that the dual education can be used in non-formal education for interest person to acquire knowledge and skill in a specific field of agriculture. The adoption of a new form animal farm work types such as aqua-culture and crop cultivation. In addition, this can be applied to module development in other subjects. Importantly, this can provide an opportunity for those have less opportunity in education and the disabled.

For Applicants

People who are interested in the dual education program in Agriculture should truly be on the basis of their preference and needs. It is believed that they would be able to do their job effectively after their graduation on the basis of their knowledge and skills acquired from the dual program in agriculture.

Limitations

This study has a limitation on time consuming of the animal farm work development for readiness and completeness. In fact, in conforms to be lesson practice as set. Another limitation is that secondary school students had the constraint which has an effect on agricultural skill practice. Besides, the discontinuity in agricultural skill practice is a weak point of the dual education facilitation.

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