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The curriculum development for science teachers' training: The action lesson focusing on science process skills

Jesda Khayotha*, Somsong Sitti and Kanyarat Sonsupap

Faculty of Education, Mahasarakham University, Mahasarakham, Thailand.

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The objectives of this research were to develop innovation curriculum and study the effect of curriculum usage in science teachers' training in establishing the supplementary subject curriculum for action lesson. It focuses on science process skills with 10 teachers for 4 days, and 236 Grade 9 students from 10 schools during the first semester of 2014 academic year. It was done in the Office of Kalasin Primary Educational Service Area 3. The research findings include : 1) the propriety of training program was in "High" level, 2) the teachers had knowledge in establishing supplementary training program; training, was significantly higher than the pretest at .05 level. The teachers were competent in establishing the supplementary subject curriculum (93.04%), in learning management (90.20%), passing the criterion (80%), and 3) in the science process skill of students in all of 10 schools, the posttest scores were significantly higher than the pretest scores at .01 level. In addition, the competency in experimentation of students from all of 10 schools, their mean scores passed the criterion.

Key words: Curriculum development, training program, supplementary subject curriculum, action lesson.

INTRODUCTION

The aim of science education is to enable individuals to use science process skills; in other words, to be able to define the problems around them, to observe, to analyze, to hypothesize, to experiment, to conclude, to generalize, and to apply the information they have with the necessary skills. These science process skills can be gained by students through certain science education activities (Aktamis and Ergin, 2008). However, the status of science education in Thailand is in a state of transition. Thailand has been identified in several studies as among the lowest-ranking countries internationally in science education (Yuenyong and Narjaikaew, 2009). Stuessy (1993: 55) summarized the status well by stating: "Reformers in mathematics and science education are attempting to solve the problems of decreasing scores in indicators of mathematics and scientific literacy for the general population".

In Thailand, the science and technology curriculum aims to educate individuals who are aware of science concepts and principles affecting their life and also conscious of individual and social responsibilities. Educating scientifically literate individuals, however, is

*Corresponding author. E-mail: jes_yotha@hotmail.com. Tel: +66 (8) 72323518.

possible not through passing knowledge onto individuals, but through teaching them and enabling them to reach scientific knowledge. In this respect, the place of science process skills is prominent and important to teaching ways of reaching knowledge (Yuenyong and Narjaikaew, 2009). The students need the process skills both when doing scientific investigations and during their learning process (Karsli and Sahin, 2009). For these reasons, teachers and students should be informed about the importance of science process skills.

The most important thing for student development with expected quality was the teacher's quality, and quality of learning management and teachers' evaluation. Therefore, it was necessary to provide the training process for teachers to obtain knowledge and comprehension as well as competency in establishing the curriculum, learning management, and measurement and evaluation to work efficiently. It would be helpful and improve the students' learning as well as applying their knowledge and experience from the training in real work practice. In addition, it also served the educational reform policy of the Ministry of Education focusing on the changes in quality of new age Thais. So, the school, new learning sources, and administration and management system have to depend on development implementation in different processes associated with curriculum process, learning management, measurement and evaluation emphasizing on the students' quality improvement with full potentiality as well as teacher development for increasing the efficiency of learning management (The Office of Basic Education Commission, 2014: 1-3).

According to the research literatures in curriculum development of training program for teacher development, found that the teachers' training could help the teachers to increase their knowledge, expertise, confidence in learning management, good attitude towards leaning management, and competency in developing the professional progress (Bianchini and Solomon, 2002: 53-76). To develop the efficient training program, the development should be performed systematically including 3 cycles as follows: 1) the assessment phase, 2) the training phase, and 3) the evaluation phase (Fisher et al., 1996: 356-357), and teacher development by the training program development. The researchers implemented according to the approach of on the job training which was the process focusing on the learning as well as work practice in work office or nearby place for training place so that the trainees would be more competent in work practice (Jacobs, 2003: 12). According to the Ordinary National Education Test (O-NET), science subject of Grade 9 in 2011 academic year of the Office of Kalasin Primary Educational Service Area 3, we found that there was the low learning achievement since the national level, the mean value was = 32.19, the level of under jurisdiction of the Office of Basic Education Commission, the mean value was = 32.28, and the level of Educational Service Area; the mean value was = 40.38. According to the mean values, it reflected the teachers' teaching quality (The Office of Kalasin Primary Educational Service Area 3, 2012: 88). Furthermore, the report of study in problem situation and need for developing the learning management of Science Teachers shown that the problem situation was in "Moderate" level, the mean value was = 3.50, and the need for development was in "High" level, the mean value was = 4.10 (The Office of Kalasin Primary Educational Service Area 3, 2012: 52). According to the rationale and reason of problem situation and need for teacher development, it was necessary to provide teacher development by workshop so that the teachers would have knowledge and comprehension in the curriculum, learning management, measurement and evaluation I Science subject, and competency in learning management in classroom truly which would accomplish the goal of educational standard and the policy of the National Educational Management further.

METHOD

Population and samples

Population included 58 science teachers, and 1,296 Grade 9 students of the Office of Kalasin Primary Educational Service Area 3.

Samples in experimentation of training program were 10 Science Teachers in Lower Secondary School, under jurisdiction of the Office of Kalasin Primary Educational Service Area 3 who volunteered to participate in the training. In addition, there were conditions for providing the supplementary subject curriculum in instructional management during the first semester of 2014 academic year.

Samples in experimentation of the supplementary subject curriculum in action lesson focusing on the Science Process Skill were 236 Grade 9 Students in 2014 academic year from 10 schools. They were selected by purposive sampling in the schools of the science.

Procedure

This research was to develop the Curriculum Development for science teachers' training in establishing the supplementary subject curriculum for action lesson focusing on science process skills. The three phases of were as follows:

Phase 1: the study of basic information

The study of basic information was the first phase of process in the Research and Curriculum Development including the following steps:

Step 1, the survey of problem situation

The survey aimed to collect ICT information from people regarding their thought, feeling, belief, need, and different aspects of background. Data collection could obtain obvious findings in necessary information for future planning (Kenneth and Bruce, 2011: 259).

The questionnaire was the instrument for surveying 58 science teachers in lower secondary school (the propriety of questionnaire was in "High" level ($\overline{X}$ = 4.50).

Step 2: Focus Group Discussion

The Focus Group Discussion involved collecting data by discussion with informants regarding specific problem. There were 6-10 informants selected from specified target population in studying their opinion, attitude, perception, belief, and behavior using for determining the different questions in Questionnaire in order to search for vague answers of the Survey Research of the Step 1. It was to make the research study to be more perfect. We were a moderator to create the issue for discussion so that the group would express their opinion extensively and intensively (Matthew and Caroll, 2011: 131-137). For this Focus Group Discussion, there were 10 experts in curriculum and learning management by using the Focus Group Record which the specific problem issues were specified (the IOC of Focus Group Record was = 1.00).

Phase 2: the Curriculum Construction

The construction of the curriculum development was the phase connected to the study of basic information including the following steps:

Step 1, the establishment of tentative curriculum

The tentative curriculum development was to determine the factors of tentative curriculum including the major factors as follows: the rationale and principle, objective, content, learning substance, activity, training process and activity, training media, and measurement and evaluation.

Step 2, the Investigation of Tentative Curriculum

The curriculum was outlined from necessary factors based on appropriate information and technique. The tentative curriculum was evaluated. In this study, the issues for evaluation were: the evaluation of the propriety of tentative curriculum by the 5 experts with educational degree or knowledge as well as experience in science curriculum by using the evaluation form of the propriety.

Step 3: the curriculum improvement before using

The curriculum improvement before trying out would be considered from information obtaining from experts, as the criterion for improving and revising the curriculum.

Phase 3: the implementing of the curriculum

When tentative curriculum was evaluated, revised, and corrected, it would be implemented with target group or samples. The research design was the Experimental Design as one-group pretest-posttest design (Mertler and Charles, 2005: 320 -323). Besides, the statistic using for hypothesis testing, included the Wilcoxon matched–pairs signed–ranks test and t-test.

Step 1: the implementing of the training program

For implementing the program, the target group included 10 science teachers who were willing to participate in the training, and attended the training program for 4 days by using Knowledge and Competency Test in the objective of curriculum research; Knowledge and Competency Test (IOC of the test = 0.80–1.00, P = 0.31-0.75, r = 0.25-0.88, r_{tt} = 0.87), and the Teachers' Competency Evaluation Form in establishing the supplementary subject curriculum as 4 Level Rubric Score. The research design in the present step, the researchers selected the one group pre test, post-test design (O1 X O2). The Pretest and Posttest scores were compared. The findings from the Teachers' Competency Evaluation Form in establishing the supplementary subject curriculum were compared with criterion.

Phase 4: the Improvement and Revision of the Curriculum

The improvement and revision of curriculum was to use the information to improve the curriculum so that it would be more complete.

Data analysis

Basic statistic including the percentage, mean, and standard deviation of scores obtaining from the evaluation of science teachers' training in establishing the supplementary subject curriculum and science process skills were analyzed.

The differences between the pretest and posttest mean values of science process skills were found by using the Wilcoxon matched–pairs signed–ranks test and t-test (dependent samples).

RESULTS

The teachers' training program consisted of the following factors: the rationale and principle, objective, learning substance, training processes, training activities, training media, and measurement and evaluation. The propriety of the program was "High" level ($\overline{X}$ = 4.22, S.D.= 0.12). The tried out program for science teachers' training was classified into 3 issues. The findings of the curriculum in teachers were as follows:

1) The teachers obtained knowledge in establishing the supplementary subject curriculum, action lesson focusing on Science Process Skills. Their posttest scores were significantly higher than the pretest at .05 level as shown in Table 1.
2) The teachers were competent in establishing the supplementary subject curriculum; in overall, the mean value was = 3.72 or 93.04% passing the criterion 80%, as shown in Table 2.
3) The teachers were competent in providing the learning management based on supplementary subject curriculum; in overall, the mean value was = 36.08 or
90.20% passing the criterion 80%, as shown in Table 3.

The findings from curriculum usage by students were as follows:

1) The science process skill of students taught by supplementary subject curriculum in each school, the posttest scores were significantly higher than the pretest at .01 level, as shown in Table 4.

Table 1. The comparison of teachers' pretest and posttest scores in establishing the supplementary subject curriculum.

The order of participant teachers	Posttest score (30)	Pretest score (30)	Differences (d)	The order of differences	The order of mark +	The order of mark -
1	28	25	3	3	3	
2	27	11	16	10	10	
3	26	18	8	8.5	8.5	
4	26	23	3	3	3	
5	27	19	8	8.5	8.5	
6	27	20	7	7	7	
7	26	21	5	6	6	
8	29	25	4	5	5	
9	26	24	2	1	1	
10	25	22	3	3	3	
The sum of order with the addition mark (T+)					55	
The sum of order with the subtraction mark (T-)					-	0
Z					-2.812	
P-Value					0.05	

Table 2. The mean, percentage, and standard deviation of teachers' competency scores in establishing the supplementary subject curriculum.

The order of participant teachers	The mean value of evaluation in teachers' competency; Unit 1-6 by 3 scholars.						Total (24)	$\overline{X}$	Percentage
	1	2	3	4	5	6			
1	3.00	3.00	4.00	4.00	3.00	4.00	21.00	3.50	87.50
2	3.67	4.00	4.00	4.00	3.00	3.00	21.67	3.61	90.25
3	4.00	4.00	4.00	4.00	4.00	3.00	23.00	3.83	95.75
4	4.00	4.00	3.00	3.00	4.00	4.00	22.00	3.67	91.75
5	4.00	4.00	4.00	4.00	3.00	4.00	23.00	3.83	95.75
6	3.67	4.00	4.00	4.00	4.00	3.00	22.67	3.78	94.50
7	3.00	3.00	4.00	4.00	4.00	4.00	22.00	3.67	91.75
8	4.00	4.00	3.00	4.00	4.00	4.00	23.00	3.83	95.75
9	4.00	4.00	4.00	4.00	3.00	3.00	22.00	3.67	91.75
10	4.00	4.00	4.00	4.00	3.00	4.00	23.00	3.83	95.75
Total	37.34	38.00	38.00	39.00	35.00	36.00	223.34	37.22	930.50
Mean	3.73	3.80	3.80	3.90	3.50	3.60	22.33	3.72	93.04
Percentage	93.25	95.00	95.00	97.50	87.50	90.00	93.04	93.04	93.04
S.D.	0.40	0.42	0.42	0.31	0.52	0.51	1.83	-	-

2) The students' experimentation competency while they were practicing the action lesson focusing of Science Process Skills in each school, the mean value passed the criterion 80% at .01 level, as shown in Table 5.

The findings of the improvement in curriculum after the usage are as follows:

1) The major material and activity in training plans was improved to be more appropriate; for instance, Unit 1-6, the major material should be specified correctly and thoroughly in every issue.
2) The duration of activity should be adjust appropriately, for example, the duration for writing the lesson plan, the design, and experiment lesson writing should be expanded.
3) The details should be added in worksheet as well as activity sheet, for instance, the design for action lesson in activity sheet had to include the complete action lesson.
4) The media and supplementary training document,

Table 3. The mean, percentage, and standard deviation of teachers' competency score in learning management.

The order of teachers	The score by the Evaluator's Score (40)						$\bar{X}$ Mean (40)	Percentage
	Session 1		Session 2		Session 3			
	Eva. 1	Eva. 2	Eva. 1	Eva. 2	Eva. 1	Eva. 2		
1	33	33	34	34	36	36	34.33	85.83
2	33	33	37	37	37	37	35.67	89.17
3	36	32	38	38	37	38	36.50	91.25
4	36	32	37	38	35	36	35.67	89.17
5	36	36	36	34	36	37	35.83	89.57
6	37	33	38	38	37	38	36.83	92.07
7	36	37	38	37	38	38	37.33	93.32
8	33	35	38	37	37	37	36.17	90.42
9	36	36	38	38	38	38	37.33	93.32
10	34	33	36	36	36	36	35.17	87.92
Total	350	340	370	367	367	371	360.83	902.04
Mean	35.00	34.00	37.00	36.70	36.70	37.10	36.08	90.20
Percentage	87.50	85.00	92.50	91.75	91.75	92.75	90.20	90.20
S.D.	1.56	1.82	1.33	1.56	0.94	0.87	0.94	-

Table 4. The mean, percentage, and standard deviation of score in science process skill of students from all of 10 schools.

The order of school	Number of students (N)	Mean ($\bar{X}$)		Percentage		S.D.		t
		Pretest (30)	Posttest (30)	Pretest	Posttest	Pretest	Posttest	
1	26	8.62	20.80	28.70	69.33	2.82	3.12	15.24**
2	20	9.60	19.95	32.00	66.50	2.83	1.63	18.22**
3	21	14,57	22.71	48.57	75.70	4.59	2.91	9.72**
4	20	15.60	23.55	52.00	78.50	5.50	2.45	8.81**
5	27	13.44	18.66	44.80	62.22	4.76	1.79	7.98**
6	30	13.10	18.30	43.66	61.00	2.95	1.78	13.31**
7	26	13.53	20.34	45.10	67.80	4.31	2.65	10.08**
8	22	11.04	18.45	36.80	61.51	2.96	2.15	15.37**
9	24	13.79	21.54	45.96	71.80	3.45	2.28	14.84**
10	20	11.40	22.85	38.00	76.16	2.30	2.79	15.82**

** Statistically significant at .01 level.

should be added more, for example, the core curriculum of the Basic Education 2008, the indicator documents and science learning substance, textbook of substance and its characteristic to complete and sufficient with number of the participant teachers.

When the improvement and revision of curriculum was implemented based on the above details, the researchers establishing the complete curriculum could be able to use the science teacher training in establishing the supplementary subject of action lesson focusing on the science process skills further.

Table 1 shows that the participant teachers obtained their knowledge and comprehension in establishing the supplementary subject curriculum. Their posttest scores were significantly higher than the pretest scores at .05 level.

Table 2 shows that the participant teachers were competent in establishing the supplementary subject curriculum, in overall, the mean value was = 3.72 or 93.04% passed the specified criterion 80%.

Table 3 shows that the participant teachers were competent in learning management based on supplementary subject curriculum, in overall, the mean value = 36.08 or 90.20% passing the specified criterion 80%.

According to supervision, following up, and evaluation

Table 5. The mean, percentage, and standard deviation of scores in experimentation competency of students from all of 10 schools.

The order of school	The number of students (N)	Students' competency in experimentation (52 points)			
		Mean ($\bar{X}$)	Percentage	S.D.	t
1	26	44.95	86.45	15.79	11.30**
2	20	46.98	90.35	10.77	13.75**
3	21	47.18	94.74	9.54	15.77**
4	20	45.53	87.56	9.09	16.98**
5	27	43.81	84.25	2.82	67.01**
6	30	47.34	91.06	4.21	41.87**
7	26	48.24	92.76	4.11	37.81**
8	22	48.36	93.00	1.68	85.51**
9	24	43.32	83.30	7.86	22.78**
10	20	48.10	92.50	13.81	10.35**

** Statistical significance at .01 level.

of learning management, the teachers prepared teaching very well by using the questions to stimulate the students to develop their thinking skill, learning interest, co-operative learning, and good interaction between teachers and students. As a result, the learning was meaningful and achieved the specified goal.

Table 4 shows that the students taught by the supplementary subject curriculum of action lesson focusing on Science Process Skills in each school, the Posttest mean value of Science Process Skills was significantly higher than the Pretest at .01 level.

Table 5 shows that the students taught by the supplementary subject curriculum in each school, obtained their mean value of students' experimentation competency passing the criterion at .01 significant level. According to the supervision, following up, and evaluation in learning management, the students were more enthusiastic and interested in learning, cheerful with learning by practicing, collaborative in learning from experimental activities, effective learning, and skillful in Science Process Skills.

DISCUSSIONS AND CONCLUSION

The training program consisted of the following factors: rationale and principles, objectives, learning substances, training processes and training activities, training media, and measurement and evaluation. The propriety was in "High" level; the mean value was = 4.22. It might be because the developed program or curriculum, was studied the basic information. The problem situation in Science Learning Management was surveyed. Consequently, it was program development which could serve the teachers' need truly. Furthermore, the Focus Group Discussion by the 7 experts with experience in teacher training, provided guidelines for training as well as establishing the supplementary document for training. It could be concluded that the systematic development of Science teacher training program, consisted of 4 steps of implementation process including: the study of basic information, curriculum development, curriculum trying out, curriculum improvement and revision. As a result, the propriety of program or curriculum, in overall, was in "High" level. It was congruent with Taba's (1962: 422–425) suggestion in the approach of curriculum development by the following steps : the analysis of problem situation and need, determination of curriculum objective, selection of content material, collection of content material, selection of learning experience, learning experience management, and evaluation.

The findings of teachers' knowledge show that the participant teachers obtained knowledge in establishing the supplementary subject curriculum. Their posttest scores were significantly higher than the pretest at .05 level. It might be due to the training could cause one's learning by participating in activities from the supplementary training documents. Consequently, the teachers gained knowledge in theory and approach for establishing the science curriculum and instructional management. Moreover, the training process could help the teachers to be aware of significance in Science Process Skills. Then, they studied according to the activities, practice, collaborative thinking and doing, experience, critiquing, and performance presentation. They learned and shared with each other. As a result, the participant teachers obtained better knowledge and comprehension in establishing the supplementary subject curriculum of action lesson focusing on Science Process Skill. It was supported by theory of Glatthorn and Fox (1996) who stated the importance of adults' training and learning in 4 major parts: 1) the desired experience management, 2)

the learning climate, 3) the learning focus, and 4) the teaching method and media. So, the teacher should more persistence in the training. They also were reinforced, encouraged, and rewarded in training by the scholars. Consequently, the teachers obtained better knowledge and comprehension in the training contents.

The findings of teachers' competency in establishing the supplementary subject curriculum, found that the participant teachers were competent in establishing the supplementary subject curriculum, in overall, the mean value was = 3.72 or 93.04% passing the specified criterion 80%. It might be because the teacher training program was evaluated by experts as well as improved and revised by the researcher. As a result, the participant teachers obtained better knowledge and comprehension in the factor of supplementary subject curriculum. In addition, the training classified the participants into appropriate working groups, and provided the scholars to advise and share with them. Consequently, the teachers were able to establish the curriculum successfully. It was congruent with approach of Furjanic and Trotman (2000) who proposed their rationale of evaluating the characteristic being occurred from the training as follows: 1) the participants' characteristics were to evaluate the changes in knowledge, the changes of skills, the changes of attitude, and the changes of work practice behavior, 2) the performance of work unit or organization were to evaluate the training outcome in real practice before starting the training program, during the implementation of training program, the end of training program, and after the training program for a period of time. According to the above theoretical approaches, they were administered as the guidelines for teacher evaluation systematically and continuously. As a result, the propriety of the curriculum or program evaluated by the experts and improved by the researchers, was improved. Consequently, the participant teachers gained more knowledge and comprehension in the factor of the supplementary subject curriculum. They were able to establish the supplementary subject curriculum. Moreover, there were the appropriate assigned groups for working under the suggestions of advice. Therefore, the teachers could establish the curriculum successfully.

The findings of teachers' competency in establishing the supplementary subject curriculum show that the participant teachers were competent in the learning management; in overall, the mean value was = 36.08 or 90.20% passing the criterion 80%. It might be due to the teachers' former experience as well as new knowledge obtaining from the training program regarding to the learning management systematically, the supervision, the following up, the evaluation, the continuous learning management by the scholars, the support and advice by the supervisors as mentors. So, the teachers were confident and had direction in learning management clearer. They were skillful in teaching and able to apply different teaching techniques by sharing and learning among participants for their own instruction. Moreover, the supervisors cooperated with the school administrators in providing support, facilitation, and advice the teachers in some issues of instructional management process by 3 sessions of the supervision continuously. The teachers had opportunity in sharing and learning with the administrators and supervisors. As a result, they could have self-development and be ready for the next supervision. Consequently, the learning management was gradually improved. It was supported by research findings of Punprasert (2008: 135) in "A Development of Training Curriculum for Science Teachers in the Design of Laboratory Experiment Incorporating Local Wisdom", with 13 teachers of the samples. It was found that the participant teachers were competent in learning management and performance presentation for 81.60% which was higher than the specified criterion 75%.

The findings of students' Science Process Skills show that the students taught by the supplementary subject curriculum in each school, obtained the posttest mean value from the Science Process Skill Test, was significantly higher than the pretest at .01 level. It might be because the action lesson was emphasized on students' Science Process Skills. The students participated in activities they could have real practice, group working, meaningful learning, apply in their daily life. So, they were able to learn better. They obtained knowledge, comprehension, and Science Process Skills. Consequently, they had higher learning achievement. Furthermore, the action lesson was focused on Science Process Skills which could lead the students to have better analytical thinking process skill as well as competency in concluding the body of knowledge. It was congruent with research findings of Jansawang (2005: 59-72) in "The Development of a School-Based Elective Science Curriculum with an Inclusion of Local Wisdom for the Lower Secondary", development of the supplementary subject curriculum titled chemical substance in daily life by using the learning management of inquiry learning cycle as one course one cycle, by using local wisdom to increase science knowledge in the cleaning substance, food additives and food preservation, natural dyestuffs, natural substance in eliminating the insect and plant enemy, and herb for treating the disease. The learning management was tried out with 68 Grade 8 students. The students' posttest scores were significantly higher than the pretest.

The findings of students' competency in experimentation show that the students taught by the supplementary subject curriculum in each school, had their mean score of competency in experimentation passing the criterion 80% significantly at .01 level. It might be due to the students had practiced the experimentation activity continuously. In addition, the teachers assigned the students to participate in group working. So, the students

obtained both of skill and competency in experimentation more. They collaborated in thinking, doing, and sharing. They changed their role and duty in group work until they could experiment quickly as well as conclude the body of knowledge by themselves. As a result, they improved their Science Process Skills. Besides, the teachers advised their students while they were participating in activities. In addition, the students also were given the good advice from the supervisors. So, they were able to conduct the experiment very well. It was congruent with research findings of Chan (2004: 11) in "The Assessment of Laboratory Performance Skill in Grade 9 Science via Individuals and Pairs", The comparison of the effect of students' science experiment of the world titled chemical substance from the wind and the rain by the knowledge inquiry process, with 466 Grade 9 students from 5 schools in the West of New York, the Unites State of America. The students were assigned into 2 groups. 150 students from the first group conduct individual experiment. Another group of 296 students conducted the experiment in pair. Then, they were evaluated the action skill, working plan, data collection, competency in presenting the experiment findings by graph and logic from the instruments as evaluative criterion. The findings of the 2 groups were compared; it was found that there were significantly differences. Furthermore, it was found that the students' overall action skill increased as well. It should be noted that one limitation of the study was the use of a quasi-experimental design, although this can be overcome in future studies by randomly selecting the participants of the groups.

Conflict of Interests

The authors have not declared any conflicts of interest.

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Appendix

Learning Substance, Learning Performance, Action Lesson, and Product

The teacher development for enhancing the efficiency in learning management is based on work units as original affiliation in supervision, following up, and evaluation systematically and continuously in order to be the mentor for stimulating, monitoring, caring, following up, supporting, and inspiring the teachers in learning management by focusing on the students' real life, learning condition, and perception. The students had freedom to develop based on human beings' potentiality in mental, physical, intellectual, emotional, and social aspects. The students participated in learning activity, learning how to learn, learning by practicing, lifelong learning, and learning persons. They could learn meaningfully and be able to apply their knowledge in daily life as shown in Table 6.

Table 6. Learning substance, learning performance, action lesson, and product

Learning substance	Learning performance	Action lesson	Product
Cleaning agents	1. Experimenting and explaining how to produce the cleaning agents.	1. How to produce herb dishwashing liquid. 2. How to produce liquid hand soap.	 
Substance Purification and Extraction.	2. Experimenting, Checking, and Explaining the substance purification and extraction.	3. How to extract the coloring matter in food from some kinds of plants. 4. How to extract the Phyllanthus acidus or otathete goose-berry to investigate formalin in food.	 

Table 6. Contd.

Learning substance	Learning performance	Action lesson	Product
Substance and Food Preservation	3. Experimenting and Explaining the substance use in daily life for food preservation.	5. How to make herb salted egg. 6. How to make salted vegetable. 7. How to make shredded and salted beef.	
	4. Experimenting, Explaining, Being Aware, Valuing, Decision Making in using the substance in daily life by Science Mind, Ethics, Morality, and Desirable Characteristics.	8. How to make bio fertilizer or effective microorganisms. 9. How to make ginger tea. 10. How to produce the Dried Teak Leaf for eliminating the termites.	 

Table 6 shows the experiment Lesson 1-10 that the students had meaningful learning. The above experimental activities were applied by the students in their daily life, for instance, the herb dish washing liquid, hand washing soap, herb salted egg, Pea Jelly, Panden Jelly, Pickled Vegetable, shredded and salted beef, Bio Fertilizer, ginger tea, and Dried Teak Leaf for Termiticide. The students could do it as sideline for increasing their income as well as their family.