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LEARNING ACTIVITY MANAGEMENT ACCORDING TO THE STEM EDUCATION IN CHEMISTRY COURSE ON POLYMER ISSUE FOR SECONDARY STUDENTS AT THE 12TH GRADE LEVEL

Wilailak Panmueang[1i],
Panwilai Chomchid[2],
Tanawat Soamtoa[3]
[1,2]Department of Science Education, Faculty of Education
Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000
[3]Department of Chemistry, Faculty of Science and Technology
Rajabhat Maha Sarakham University, Maha Sarakham, Thailand 44000

Abstract:
The aims of this research study were to develop the instructional innovative lesson plan with the STEM Education method in chemistry subject on polymer issue for secondary students at the 12th grade level through the effectiveness criteria of 75/75, to compare between students' learning achievements of their pretest and posttest techniques in cording to the STEM education in chemistry class for secondary students at the 12th grade level, 3) to assess students' perceptions of their satisfaction to their learning activity management in cording to the STEM education in chemistry class for secondary students at the 12th grade level. The target group consisted of 42 secondary students at the 12th grade level from Borabu School under the Secondary Educational Service Area Office 26 in academic year 2/2016 with the purposive sampling technique was selected. Using a main instructional innovative lesson plan with the STEM education method in 12 hours was designed, the 30-item *Learning Achievement Test* ranged from 0.37 to 0.80 and 0.22 to 0.69 for discriminative discriminant (B) and as a whole was 0.85, validity; and the 15-item *Science Satisfaction Model* that it was a 5-scale rating scale option. Statistically significant for data analysis with percentage, standard deviation, and independent t-test were analyzed. The results of these findings have indicated that: students were evaluated to determine performance criteria with the efficiency of the processing performance and the performance results (E_1/E_2) of the STEM Education

[i] Correspondence: email wilailak3250@hotmail.com, toansakul35@yahoo.com.au

instructional method's innovation lesson plans to management to the activity-based learning approach indicated that 78.47/76.51, which was higher than standardized criteria of 75/75. Students' learning achievements of their pre-test and post-test assessing differences were also found evidence at the 0.01 level, significantly. Students' responses of their learning activity management in cording to the STEM education, which the whole as the highest level, significantly.

Keywords: Learning activity management, STEM education**,** chemistry course, polymer issue**,** secondary students

1. Introduction

This research focused on the learning activity management in cording to the STEM education in chemistry course on polymer issue for secondary students at the 12^{th} grade level to brief of the introduction section that it following as:

1.1 The Learning Activity Management System (LAMS)

The *Learning Activity Management System* (LAMS) is an open source *Learning Design* system (LAMS Internationalization, 2012) for designing, managing and delivering online collaborative learning activities. It provides teachers with an intuitive visual authoring environment for creating sequences of learning activities. These activities can include a range of individual tasks, small group work and whole class activities based on both content and collaboration. The LAMS is 'inspired' by the concept and principles of *IMS Learning Design* (Kraan, 20013). LAMS is developed in collaboration with LAMS Foundation, LAMS International, and the Macquarie E-learning Centre Of Excellence (MELCOE), all based in Sydney, Australia, in affiliation with Macquarie University (Macquarie E-learning Centre Of Excellence, 2012) LAMS has been developed since 2003 (Australasian Society for Computers in Learning in Tertiary Education, 2003). LAMS creates "digital lesson plans" that can be run online with students, as well as shared among teachers. The LAMS Community allows teachers to share and adapt digital lesson plans, and discuss their experiences of using LAMS. Teachers, trainers and professors can find digital lessons plans that are freely available to use and adapt, and they can share their own and adaptations. There is a Greek LAMS community.

1.2 Instructional Lesson Plan

A lesson plan is the instructor's road map of what students need to learn and how it will be done effectively during the class time. Before you plan your lesson, you will first need to identify the learning objectives for the class meeting. Then, you can design appropriate learning activities and develop strategies to obtain feedback on student learning. A successful lesson plan addresses and integrates these three key components: Objectives for student learning; Teaching/learning activities; and Strategies to check student understanding (Fink, 2005). Specifying concrete objectives for student learning will help you determine the kinds of teaching and learning activities you will use in class, while those activities will define how you will check whether the learning objectives have been accomplished to be effective, the lesson plan does not have to be an exhaustive document that describes each and every possible classroom scenario. Nor does it have to anticipate each and every student's response or question. Instead, it should provide you with a general outline of your teaching goals, learning objectives, and means to accomplish them. It is a reminder of what you want to do and how you want to do it. A productive lesson is not one in which everything goes exactly as planned, but one in which both students and instructor learn from each other (Milkova, S. (2016). An important strategy that will also help research team with time management is to anticipate students' questions. When planning our lesson, decide what kinds of questions will be productive for discussion and what questions might sidetrack the class. Think about and decide on the balance between covering content (accomplishing your learning objectives) and ensuring that students understand are designed of an *Instructional Lesson Plan* in cording to the STEM education in 12 weeks on Polymer Issue in Chemistry class of students' learning activities at the 12^{th} grade level in the context of the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) and B.E. 2555 (A.D. 2012) was designed.

1.3 Effectiveness of Instructional Lesson Plan

In this research study, research team plans to design of the target of our teaching effectiveness. There are some principles of effective teaching that can be applied in virtually any educational situation. However, research team will need to implement them differently, based on whether research team is leading a first grade classroom, teaching a neighbor a new skill, Develop an understanding of the topics research team will be teaching. Research team has to know more than our students do if research team is going to present material to them. In addition, research team should be willing to admit when research team don't know the answer to a question to help the student research the answer if possible, or look it up on our own and answer it later. Earn the trust and respect of our students. This is essential to getting them to listen to what research team has to say and follow our guidance. Try to connect with students on an appropriately personal level. In our school setting, this can be as simple as asking a child about his pets after class. It may be harder, but even more important, to do with resistant students. Understand our students' learning styles. Moreover, our teaching methods to them as much as possible were improved. This is much easier in a small group or one-on-one than it is in a classroom, but it can still be done. Provide visual, auditory, and hands-on activities to meet our students' needs for having a variety of tools and resources available to them.

1.4 The Basic Education Core Curriculum of Thailand

The Basic Education Core Curriculum 2008 thus formulated will provide local communities and schools with a framework and orientation for preparing school curriculums. The learning standards and indicators prescribed in this document will enable agencies concerned at all levels to clearly visualise expected learning outcomes throughout the entire course of study. The Basic Education Core Curriculum has therefore prescribed the following eight learning areas: Thai Language, Mathematics, Science, Social Studies, Religion and Culture, Health and Physical Education, Arts, Occupations and Technology, and Foreign Languages. Learning areas comprise bodies of knowledge, skills or learning processes and desirable characteristics, attainment of which is required of all basic education learners. Science also involves technologies, instruments, devices and various products at our disposal, which facilitate our life and work. All these benefit from our scientific knowledge, which is combined with creativity as well as other disciplines. Science enables us to develop our thinking skills in various respects; logical, creative, analytical and critical. The learning area of science is aimed at enabling learners to learn this subject with emphasis on linking knowledge with processes, acquiring essential skills for investigation, building knowledge through investigative processes, seeking knowledge and solving various problems (Ministry of Education, 2008).

In terms of the *Learning Standards and Indicators* in science learning core, the learning standards serve as the goals in developing learners' quality, monitoring for internal quality assurance is essential, as it indicates the extent of success in achieving the quality as prescribed in the pertinent standards. Indicators specify what learners should know and be able to perform as well as their characteristics for each grade level, indicators reflect the learning standards with the eights strands with the thirteen science standards. In the context of chemistry contents, they are obtained at the Strand 3: Substances and Properties of Substances; Standard Sc3.1: Understanding of properties of substances; relationship between properties of substances and structures and binding forces between particles; investigative process for seeking knowledge and scientific mind; and communicating acquired knowledge for useful purposes. The keys stage indicators are to experiment and explain properties of solids, liquids and gases, Categorise substances into groups by using their state or other student-prescribed criteria prescribed, Experiment and explain separation of materials through sifting, precipitation, filtering, sublimation and evaporation, Explore and categorise various substances used in daily life by using their properties and utilization for useful purposes as criteria, Discuss selection of correct and safe application of each kind of substance (Ministry of Education, 2008).

1.5 STEM Education Instructional Method

STEM is more than just a grouping of subject areas. It is a movement to develop the deep mathematical and scientific underpinnings students need to be competitive in the 21st-century workforce. But this movement goes far beyond preparing students for specific jobs. STEM develops a set of thinking, reasoning, teamwork, investigative, and creative skills that students can use in all areas of their lives. STEM isn't a standalone class—it's a way to intentionally incorporate different subjects across an existing curriculum. STEM lessons often seem similar to science lessons and experiments, and in some ways, they are. After all, genuine science experiences are hands-on and inquiry-based. But if you look at the basics of an "ideal" STEM lesson in six characteristics of a great STEM lesson: STEM lessons focus on real-world issues and problems, STEM lessons are guided by the engineering design process, STEM lessons immerse students in hands-on inquiry and open-ended exploration, STEM lessons apply rigorous math and science content your students are learning, and STEM lessons allow for multiple right answers and reframe failure as a necessary part of learning.

In this research study, in STEM lessons, students address real social, economic, and environmental problems and seek solutions. The STEM education instructional method provides a flexible process that takes students from identifying a problem—or a design challenge—to creating and developing a solution. The path to learning is open ended, within constraints (Constraints generally involve things like available materials). The students' work is hands-on and collaborative, and decisions about solutions are student-generated. Students communicate to share ideas and redesign their prototypes as needed. They control their own ideas and design their own investigations. Helping students work together as a productive team is never an easy job. It becomes exponentially easier if all STEM teachers at a school work together to implement teamwork, using the same language, procedures, and expectations for students. Plan to collaborate with other math and/or science teachers to gain insight into how course objectives can be interwoven in a given lesson. Students can then begin to see that science and math are not isolated subjects, but work together to solve problems. STEM classes, by contrast, always provide opportunity for multiple right answers and approaches. The STEM environment offers rich possibilities for creative solutions. When designing and testing prototypes, teams may flounder and fail to solve the problem.

1.6 Students' Learning Achievements

Student achievement has become a hot topic in education today, especially with increased accountability for classroom teachers. The ultimate goal for any teacher is to improve the ability level and prepare students for adulthood. Defining student achievement and factors that impact progress is critical to becoming a successful teacher. Student achievement measures the amount of academic content a student learns in a determined amount of time. Each grade level has learning goals or instructional standards that educators are required to teach. Standards are similar to a 'to-do' list that a teacher can use to guide instruction. Student achievement will increase when quality instruction is used to teach instructional standards. For instance, teachers have a to-do list that involves three tasks: dropping off the cleaning, filling their gas tank, and studying for a final. Questions teacher may ask themselves are: In what order do student accomplish my tasks? How is student going to get each task finished? Should student study at the library where it is quieter or at home where student may be distracted? Is it worth it to purchase gas a few blocks from home at a higher price or drive a short distance to save money? Their goal is to get their to-do list finished in the most efficient and timely way possible (Foundation of Education, 2015).

1.7 Pretest and Posttest Designs

The basic premise behind the pretest–posttest design involves obtaining a pretest measure of the outcome of interest prior to administering some treatment, followed by a posttest on the same measure after treatment occurs. Pretest–posttest designs are employed in both experimental and quasi-experimental research and can be used with or without control groups. For example, quasi-experimental pretest–posttest designs may or may not include control groups, whereas experimental pretest–posttest designs must include control groups. Furthermore, despite the versatility of the pretest–posttest designs, in general, they still have limitations, including threats to internal validity. Although such threats are of particular concern for quasi-experimental pretest–posttest designs, experimental pretest–posttest designs also contain threats to internal validity (Salkind, 2012).

Based on as above mentioned concept, the researchers adopted the STEM Education instructional method to compare and provide academic capacity for learning and promoting scientific creativity in chemistry laboratories of the enable learners to be productive and skilled in their thinking processes. Thus, the model of STEM Education method was used to compare of designing teaching and learning was integrated into the model of science experiment of the upper secondary students at the 12th grade level at Borabu School under the Secondary Educational Service Area Office 26 in Maha Sarakham Province in Thailand is the context of research limitation in this study.

2. Methodology

The learning activity management in cording to the STEM education in chemistry course on polymer issue for secondary students at the 12th grade level was creating STEM instructional lesson plan to improve the administrations with the *Learning Activity Management System* (LAMS) to create the instructional lesson plan is effective and productive of the effectiveness with instructional lesson plan in cording to the STEM education instructional method that that it was followed as the Basic Education Core Curriculum of Thailand for assessing students' learning achievements with their pretest and posttest assessing designs.

2.1 Research Aims

1. To develop the instructional innovative lesson plan with the STEM Education method in chemistry subject on polymer issue for secondary students at the 12th grade level through the effectiveness criteria of 75/75.
2. To compare between students' learning achievements of their pretest and posttest techniques in cording to the STEM education in chemistry class for secondary students at the 12th grade level.
3. To assess students' perceptions of their satisfaction to their learning activity management in cording to the STEM education in chemistry class for secondary students at the 12th grade level.

2.2 Steps for Preparing a Lesson Plan

Below are six steps to guide you when you create your first lesson plans. Each step is accompanied by a set of questions meant to prompt reflection and aid you in designing your teaching and learning activities.

Step 1: Outline learning objectives

The first step is to determine what you want students to learn and be able to do at the end of class. To help you specify your objectives for student learning, answer the following questions: What is the topic of the lesson? What do I want students to learn? What do I want them to understand and be able to do at the end of class? and What do I want them to take away from this particular lesson?

Once research team outline the learning objectives for the class meeting, rank them in terms of their importance. This step will prepare us for managing class time and accomplishing the more important learning objectives in case we are pressed for time. Consider the following questions: What are the most important concepts, ideas, or skills I want students to be able to grasp and apply? Why are they important? If we ran out of time, which ones could not be omitted? And conversely, which ones could we skip if pressed for time?

Step 2: Develop the introduction

Now that we have our learning objectives in order of their importance, design the specific activities we will use to get students to understand and apply what they have learned. Because we will have a diverse body of students with different academic and personal experiences, they may already be familiar with the topic. That is why we might start with a question or activity to gauge students' knowledge of the subject or possibly, their preconceived notions about it. For example, we can take a simple poll: "How many of you have heard of X? Raise your hand if you have." We can also gather background information from your students prior to class by sending students an electronic survey or asking them to write comments on index cards. This additional information can help shape our introduction, learning activities, etc. When we have an idea of the students' familiarity with the topic, we will also have a sense of what to focus on.

Step 3: Plan the specific learning activities (the main body of the lesson)

Prepare several different ways of explaining the material (real-life examples, analogies, visuals, etc.) to catch the attention of more students and appeal to different learning styles. As we plan our examples and activities, estimate how much time we will spend on each. Build in time for extended explanation or discussion, but also be prepared to move on quickly to different applications or problems, and to identify strategies that check for understanding. These questions would help us design the learning activities we will use.

Step 4: Plan to check for understanding

Now that we have explained the topic and illustrated it with different examples, we need to check for student understanding – how will we know that students are learning? Think about specific questions we can ask students in order to check for understanding, write them down, and then paraphrase them so that we are prepared to ask the questions in different ways. Try to predict the answers our questions will generate. Decide on whether we want students to respond orally or in writing.

Step 5: Develop a conclusion and a preview

Go over the material covered in class by summarizing the main points of the lesson. We can do this in a number of ways: we can state the main points ourselves. We can ask a student to help us summarize them, or we can even ask all students to write down on a piece of paper what they think were the main points of the lesson. We can review the students' answers to gauge their understanding of the topic and then explain anything unclear the following class. Conclude the lesson not only by summarizing the main points, but also by previewing the next lesson. How does the topic relate to the one that's coming? This preview will spur students' interest and help them connect the different ideas within a larger context.

Step 6: Create a realistic timeline

GSIs know how easy it is to run out of time and not cover all of the many points they had planned to cover. A list of ten learning objectives is not realistic, so narrow down our list to the two or three key concepts, ideas, or skills we want students to learn. Instructors also agree that they often need to adjust their lesson plan during class depending on what the students need. Our list of prioritized learning objectives will help us make decisions on the spot and adjust our lesson plan as needed. Having additional examples or alternative activities will also allow us to be flexible. A realistic timeline will reflect our flexibility and readiness to adapt to the specific classroom environment. Here are some strategies for creating a realistic timeline.

3. Research Instruments

3.1 A Main Instructional Innovative Lesson Plan

A main instructional innovative lesson plan with the STEM education method in 12 hours was designed on Polymer Issue that composed of Polymer reaction, Structure and properties of polymers, Products from plastic polymer, Fiber Polymer Products, Technological Advances in Synthetic Polymer Products, and Plastic Toy Workshop on Plastic Molding design with the STEM learning activities. The evaluation criteria used for the appropriateness will be from the average of 3.51 to 5.00, which is the criterion of the average quality criteria that can be evaluated in the next study. The appropriateness of the learning management plan was at the highest level with the average means score of 4.58.

3.2 The 30-item *Learning Achievement Test (LAT)*

The 30-item *Learning Achievement Test* (LAT), the quality of the LAT with introducing the test, the 5-professional experts offer the verification of the language, accuracy of content and consistency of question style, options with the purpose of learning to measure Or content validity Using the index of *Item-Objective Congruence* (IOC), select the test that is in the accuracy range of 0.60 or higher. The results of the IOC evaluation ranged from 0.60 to 1.00 and ranged from 0.37 to 0.80 and 0.22 to 0.69 for discriminative discriminant (B) and as a whole was 0.85 were found.

3.3 The Science Satisfaction Model (SSM)

The 15-item *Science Satisfaction Model* that it was structured of the questionnaire was four aspects: content, media, learning activities, and the usability. The SSM was analyzed the consistency index by choosing items with an IOC value of 0.50 or higher. The result was that the question has IOC value of 0.8-1.00 in 15 items with 5-scale rating scale option. The internal consistency (Crnbach alpha reliability was 0.79).

3.4 Sample Target

The target group consisted of 42 secondary students at the 12th grade level from Borabu School under the Secondary Educational Service Area Office 26 in academic year 2/2016 with the purposive sampling technique was selected.

3.5 Data Analysis

Statistically significant for data analysis with percentage, standard deviation, and independent t-test were analyzed.

4. Results

Research on learning activity management in cording to the STEM education in chemistry course on polymer issue for secondary students at the 12th grade level was designed. The comparisons of teaching effectiveness in cording to the guidelines of the STEM education on polymer issue of secondary students at the 12th grade level to make connections between past and present learning experiences and anticipate activities and focus students' thinking on the learning outcomes of current activities were designed. Students became mentally engaged in the concept, process, or skill to be learned and encouraged learners to assess their understanding and abilities and lets teachers evaluate students' understanding of key concepts and skill development. To create the instructional lesson plan with the *STEM education* instructional method in a chemistry class consisted of 42 secondary students. The efficiency of the processing performances and the performance results (E_1/E_2) at the determining criteria as 75/75 to promote students' learning achievements of their *STEM education method* (STEME) was evaluated. Students' learning achievements of their post-test learning outcomes to their STEME were compared; students' responses of their satisfied learning activities in chemistry class with the STEME were created. Using the instructional design model with the STEME innovative lesson plan was administered; students' learning achievements were assessed with the 30-item *Learning Achievement Test* (LAT), students' perceptions of their satisfactions of their learning activities with the 15-item *Science Satisfaction Model* (SSM). The results of this research have found that:

4.1 The Effectiveness of the Innovative Instructional Lesson Plans

To analyze the effectiveness of the innovative instructional lesson plans based on the model of learning management in a STEM Education Method of secondary students at the 10th grade level in physics laboratory environment classes with the processing and performance resulting effectiveness at 75/75 criteria. Table 1 and Table 2 report of the effectiveness of the innovative instructional lesson plans.

Table 1: Score Total, Mean, Standard Deviation, and Percentage for the Effectiveness Innovative Instructional Lesson Plans for the STEM Education Method

Efficiency Type	Total Score	$\overline{X}$	S.D.	Percentage
Efficiency Performance Processes (E_1)	70	54.93	2.00	78.47
Efficiency Performance Results (E_2)	30	22.95	1.82	76.51
The Lessoning Effectiveness (E1/E2) = 78.47/76.51				

N = 42

Table 1 shows the result for the effectiveness of the innovative instructional lesson plans based on the model of learning management in a STEM Education Method. Effectiveness of lessons during the learning process (E1) reveals of 78.47 and the performance effectiveness (E2) indicate that of 76.51, so the lessoning effectiveness (E1/E2) evidences of 78.47/76.51 over the threshold setting is 75/75.

4.2 Comparisons between Students' Learning Achievements of their Pretest and Posttest Assessments with the Innovative Instructional STEM Education Method

To compare between students' learning achievements of their pretest and posttest assessments with the innovative instructional lesson plans based on the model of learning management in a STEM Education Method of secondary students at the 10th grade level in physics laboratory environment classes with the 30-item *Learning Achieving Test* (LAT) was assessed. Table 2 reports the statistically significance of the difference between students' learning outcomes of their pretest and posttest assessments. Using paired comparisons between different assessments of the same LAT as reports in Table 2.

Table 2: Average Mean, Standard Deviation, Mean Difference for the LAT

Assessing Test	Total score ($\overline{X}$ =30)	Standard Deviation	Mean Diff.	*t*-Value	ANOVA (eta²)
Pretest	12.07	3.09	10.88	20.43***	0.86***
Posttest	22.95	1.82			

N = 42, *ϱ < 0.05, **ϱ < 0.01, ***ϱ < 0.001

To identify teachers' contributions to students' learning achievements, the district would need assessments at two points in time: before learning begins and at the end of the physics course. These assessments can be thought of as pre-tests and post-tests. The average mean scores of pretest of 12.07 and posttest revealed as 22.95. In most case, the standard deviation for the pretest as 3.09 and for the posttest as 1.82, and the mean difference between pre-tests and post-tests of 10.88 were compared. It also provides support the learning management in a STEM Education Method that teacher needed to take differences into consideration when planning and designing physics curriculum in the physics laboratory were assessed with the independent t-test and ANOVA (eta^2) significantly ($\rho < 0.001$).

4.3 Assessment of Students' Perceptions of their Satisfactions to their Learning Activities with the STEM Education Instructional Method

Student satisfaction is the subjective perceptions, on students' part, of how well a learning environment supports academic success. Strong student satisfaction implies that appropriately challenging instructional methods are serving to trigger students' thinking and learning. Learning environment has a significant role in determining students' academic achievement and learning. Student satisfaction factors are associated with perceived learning as rated by students. To become effective, less-than-optimal learning environments should be redesigned to include a variety of learning activities and opportunities shown to foster achievement of the desired learning outcomes. Table 3 reports the results of student satisfaction to their Learning Activities with the STEM Education Instructional Method in four learning activities when using the SSM to assess.

The 15-item *Science Satisfaction Model* that it was structured of the questionnaire was four aspects: *Learning Content, Learning Media, Learning Activity, and Usability* scales. The SSM was analyzed the consistency index by choosing items with an IOC value of 0.50 or higher. The result was that the question has IOC value of 0.8-1.00 in 15 items with 5-scale rating scale option.

Given in Table 3, students' perceptions of their satisfaction to their learning activates with the STEM education instructional method on Polymer Issue, students' satisfaction as a while was at the highest level ($\bar{X}$ = 4.66, SD = 0.53). In terms of each scale; students' responses of their satisfactions for the *Content of Learning* scale at the highest level ($\bar{X}$ = 4.61, SD = 0.55). The context of learning media was at the highest level ($\bar{X}$ = 4.74, SD = 0.48). The learning activity was at the highest level ($\bar{X}$ = 4.62, SD = 0.56), and the usability scale indicated of their satisfaction level at a high level ($\bar{X}$ = 4.68, S.D. = 0.51).

Table 3: Mean, Standard Deviation, and Level of Satisfaction for the SSM

Scale/Item	Mean	Standard Deviation	F-test	Level of Satisfactions
Content Scale				
1. The sequence of content is continuous too easy to understand	4.83	0.44		Highest
2. Content non suitable for the student's age	4.26	0.54		High
3. The amount of content each hour is appropriate for the duration.	4.74	0.50		Highest
Average	4.61	0.99	19.22***	Highest
Learning Media Scale				
4. Medias have a variety of interesting things to encourage students to learn.	4.83	0.44		Highest
5. Medias suitable for content and duration.	4.62	0.54		Highest
6. The course materials make for a deeper understanding of the content.	4.76	0.43		Highest
Average	4.74	0.90	2.51*	Highest
Learning Activity Scale				
7. Fun, not boring	4.52	0.63		Highest
8. Training to research and self-knowledge summary	4.79	0.42		Highest
9. Train the students to listen to the opinions of others and dare to express their views.				

	4.81	0.45		Highest
10. Encourage students to be more eager to learn.	4.48	0.55		High
11. Make students proud of participating in self-help activities.	4.52	0.63		Highest
Average	4.62	1.78	5.06***	Highest
Usability Scale				
12. Students can link the polymer content to the events encountered in the battle.	4.74	0.50		Highest
13. Learning about polymers, students can plan and solve problems.	4.69	0.47		Highest
14. Practice allows students to find out the answers by themselves.	4.76	0.48		Highest
15. Students can apply knowledge of polymer to their everyday life.	4.52	0.55		Highest
Average	4.68	0.97	2.89**	Highest
Total Average	4.66	2.88	4.80***	Highest

N = 42, *ϱ<.05, **ϱ<.01, ***ϱ<.001, High level<4.50, Highest Level>4.51

Data for the present study came from a survey designed to measure students' satisfaction with a particular chemistry course and instructor, along with their expectations of academic success in that course, significantly. Figure 1 shows the 5-learning activity steps with the STEM Education Instructional Method.

Figure 1: Students' learning activity management in cording to the STEM education in chemistry course on polymer issue for secondary students at the 12th grade level on Plastic Molding design

5. Conclusions

The learning activity management in cording to the STEM education in chemistry course on polymer issue for secondary students at the 12th grade level was creating STEM instructional lesson plan to improve the administrations with the *Learning Activity Management System* (LAMS) to create the instructional lesson plan is effective and productive of the effectiveness with instructional lesson plan in cording to the STEM education instructional method that that it was followed as the Basic Education Core Curriculum of Thailand for assessing students' learning achievements with their pretest and posttest assessing designs are six steps to guide you when you create your first lesson plans. Each step is accompanied by a set of questions meant to prompt reflection and aid you in designing your teaching and learning activities. The target group consisted of 42 secondary students at the 12th grade level from Borabu School under the Secondary Educational Service Area Office 26 in academic year 2/2016 with the purposive sampling technique was selected. Statistically significant for data analysis with percentage, standard deviation, and independent t-test were analyzed.

The research instruments are validity and reliability A main instructional innovative lesson plan with the STEM education method in 12 hours was designed on Polymer Issue that composed of Polymer reaction, Structure and Properties of Polymers, Products from Plastic Polymer, Fiber Polymer Products, Technological Advances in Synthetic Polymer Products, and Plastic Toy Workshop on Plastic Molding design with the STEM learning activities. The 30-item *Learning Achievement Test* (LAT), the quality of the LAT with introducing the test, the 5-professional experts offer the verification of the language, accuracy of content and consistency of question style, options with the purpose of learning to measure Or content validity Using the index of *Item-Objective Congruence* (IOC), select the test that is in the accuracy range of 0.60 or higher. The results of the IOC evaluation ranged from 0.60 to 1.00 and ranged from 0.37 to 0.80 and 0.22 to 0.69 for discriminative discriminant (B) and as a whole was 0.85. The 15-item *Science Satisfaction Model* that it was structured of the questionnaire was four aspects: content, media, learning activities, and the usability. The SSM was analyzed the consistency index by choosing items with an IOC value of 0.50 or higher. The result was that the question has IOC value of 0.8-1.00 in 15 items with 5-scale rating scale option. The internal consistency (Crnbach alpha reliability was 0.79).

The effectiveness of the innovative instructional lesson plans based on the model of learning management in a STEM Education Method. Effectiveness of lessons during the learning process (E1) reveals of 78.47 and the performance effectiveness (E2) indicate that of 76.51, so the lessoning effectiveness (E1/E2) evidences of 78.47/76.51

over the threshold setting is 75/75. The average mean scores of pretest of 12.07 and posttest revealed as 22.95. In most case, the standard deviation for the pretest as 3.09 and for the posttest as 1.82, and the mean difference between pre-tests and post-tests of 10.88 were compared. It also provides support the learning management in a STEM Education Method that teacher needed to take differences into consideration when planning and designing physics curriculum in the physics laboratory were assessed with the independent t-test and ANOVA (*eta*^{2}) significantly ($\rho < 0.001$). Students' perceptions of their satisfaction to their learning activates with the STEM education instructional method on Polymer Issue, students' satisfaction as a while was at the highest level ($\bar{X}$ = 4.66, SD = 0.53). In terms of each scale; students' responses of their satisfactions for the *Content of Learning* scale at the highest level ($\bar{X}$ = 4.61, SD = 0.55). The context of learning media was at the highest level ($\bar{X}$ = 4.74, SD = 0.48). The learning activity was at the highest level ($\bar{X}$ = 4.62, SD = 0.56), and the usability scale indicated of their satisfaction level at a high level ($\bar{X}$ = 4.68, S.D. = 0.51), significantly.

6. Discussions

This research focused on the *Learning Activity Management System* (LAMS) with the STEM education instructional method, an authentic learning allows students to experience real world complexities by completing authentic tasks (Herrington & Kervin, 2007). In this study, authentic learning allowed these students to explore a resource (in this case, LAMS) so that they experienced all of the complexity, as well as the uncertainty, of the real world. Using an authentic learning framework, second year pre-service trainee students' teachers were introduced to LAMS as an alternative method to create lesson plans. As was found in the study on which it was modeled, the students who used LAMS really felt they benefited from its use. They reported that using the learning activities helped them to plan all aspects of their lesson. The students also found that LAMS provided a visual overview of the lesson that allowed them to identify the learning styles addressed by the activities they had designed. Additionally, LAMS created these lessons in a standardized template that can be easily modified for future re-use. The ability to readily re-use lessons presents new possibilities for increasing the quality and variety of teaching and learning within an STEM education instructional method context.

Testing or practice effects; students who take the same test repeatedly often show improvement on subsequent tests that can be attributed to familiarity with the questions or the testing format. This is an especially important factor in the pre-post testing environment. One solution is to make sure the test chosen has multiple (equivalent) forms available for post-testing. Another solution may be the use of teacher's preparing an instructional pre and posttests that often provide a large question bank. Having a large pool of questions to choose from reduces the likelihood that students will receive the same questions that appeared in the first administration; Fatigue effects, Motivational effects, Characteristics of the test administration situation, and Length of test. However, lack of a perfect test does not mean that there are not tests out there that are better than others. Each facility or program should take all of these assessment criteria into consideration in conjunction with the needs of their students. These considerations should help teachers make informed decisions regarding which assessment instruments and testing procedures to choose and implement.

The study located 4 different satisfaction factors serving as predictors of perceived student learning. In a student-centered environment, students' perceptions of what constitutes adequate intellectual challenge are situational; these perceptions must not be overlooked as instructors refine environments to facilitate learning. The present study's results clearly indicate a need to balance course designers' perceptions of students' skills and abilities with students' own perceptions of their satisfactions of their learning activities with the STEM education instructional method to their skills and abilities. Balance will help the Secondary Educational Service Area Office under the Basic Educational Commission all the learning possible among their students.

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