



Achievement of Using Multimedia Activities Package on Basic Chemical Thermodynamics with “Gifted” Science Students

Panupat Chaiworn^a, Wichian Saksitthanuphap^b and Janchai Yana^c

^aDepartment of Physics, Faculty of Science and Technology, Chiang Mai Rajabhat University
No. 202 Changpuek Road, Muang, Chiang Mai 50300, Thailand

^{b,c}Department of Chemistry, Faculty of Science and Technology, Chiang Mai Rajabhat University
No. 202 Changpuek Road, Muang, Chiang Mai 50300, Thailand

Corresponding author. E-Mail address: Panupat_cha@outlook.com^a, janchai@g.cmru.ac.th^c

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Abstract

This research aimed to develop students' learning process and teachers' instruction, to construct a multimedia activity package on basic chemical thermodynamics and to study the achievement of using the multimedia activity package with “Gifted” students who were keen on science. The sample group consisted of 40 “Gifted” students from Samakkhi Witthayakhom School, Chiang Rai. The multimedia activity package was implemented for 12 hours. After that, the final exam was conducted to examine the academic performance of the students. The test was comprised of 30 items of four-multiple-choices. The result was analyzed in terms of mean, standard deviation, and t-test values. The results have shown that the efficient criterion were 87.45/86.04 after using the multimedia activity package on basic chemical thermodynamics. It was higher than the standard efficient criterion 80/80. Therefore, the learning achievement of the students in the post-test was better than the one in pre-test with statistical significance at 0.05. Professional Learning Community (PLC) was implemented in the instructional process. It was the process that allowed students to learn through self-directed method and reflective learning method. The results illustrated that the students were satisfied with their performance with the mean of 4.56 or it was accounted for 91.20 percent.

Keywords: Multimedia Activities Package, Science Teacher, Chemical Thermodynamics, Professional Learning Community

Introduction

The basic education core curriculum B.E 2551 aims to develop Thai learners, the human resources of our nation, to be a complete human with the balance in physical health, knowledge, and morality. It also aims to develop the learners to have awareness of local issues and international issues. The learners should also respect the democratic government under the constitutional monarchy. In addition, the learners should also have the knowledge and basic skills for living as well as essential attitude towards further education, careers, and lifelong learning. The core curriculum additionally intends to mainly focus on the learners as it is believed that everyone can learn and develop themselves to their highest potential. To enhance the learners' knowledge and basic skills for living, science is one of the most significant keys to develop learners. For this reason, it is vital for the teachers to provide suitable atmosphere and learning materials in order to teach science effectively. The teachers should also have the role to facilitate the learners to be successful in their learning process. Further, the teacher should be able to use research as part of the learning processes so that the teachers and learners can learn together from the materials and various types of science knowledge (Songsasen, Bangkedphol, and Sakultantimetha, 2010). Teaching material is significant for teaching and learning science especially for chemistry, which is known to be a complicated and challenging field. Therefore, various types of teaching materials shall be used so that learners can learn at their highest potential.



Many studies regarding teaching chemistry have been found. One of the studies discovered that using 3D pictures to teach organic chemistry resulted in a better learning outcome in the molecular structure. The learning outcome was higher when compared with traditional teaching method (Springer, 2014). It has been discovered that learners have a better understanding of difficult science principles when they were taught about elements by using application, animation, and cartoons (Dalacosta, Kamariotaki-Paparrigopoulou, Palyvos, and Spyrellis, 2009). The combination of teaching materials components; namely, texts, pictures, animation, sound and videos implemented through computer techniques could effectively convey the meaning and interact with the users. Thus, the usage of this combination is known as multimedia activity package (Karnjanasuwana, 2009). Moreover, it has been found that the student learning achievement was improved when multimedia activity package was used as an instructional model. The multimedia activity package was utilized to develop the instructions of the teachers from Samakkhi Witthayakhom School, Chiang Rai. The instructions were about cell division. It was used with students studying in science gifted program which promoted academic excellence in mathematics and science. The program focused on enhancing students' learning abilities in mathematics, physics, chemistry, and biology. However, after an interview with the teachers, it was found that students in science program did not study about thermodynamics, one of the most vital contents in chemistry. Thermodynamics can predict the occurrence of chemical reaction (Songsasen, Bangkedphol, and Sakultantimetha, 2010). Thermodynamics is a study of physical chemistry in relation to energy. When the temperature is changed, any physical or chemical changes may occur. Therefore, if the changes are investigated, the occurrence of chemical reaction can be predicted (Ratananukul, Prayongpun, Laobuthee, Koonsang, and Chaivisuthangkura, 2002). Moreover, thermodynamics is included in most of the significant academic competitions in Thailand such as science Olympiads in chemistry and Petch Yod Mong Kud competition in chemistry. As a result, "Gifted" sciences students of Samakkhi Witthayakhom School cannot do the test. For this reason, the researchers are interested in constructing a multimedia activity package on basic chemical thermodynamics to teach "Gifted" science students of Samakkhi Witthayakhom School in order to enhance the potential in chemistry learning of the students by using multimedia activity package on basic chemical thermodynamics for "Gifted" science-students so that they can further develop their scientific skills.

Methods and Materials

The population of this study was 80 "Gifted" science students from Samakkhi Witthayakhom School, Chiang Rai. The sample group consisted of 40 "Gifted" science students from Samakkhi Witthayakhom School, Chiang Rai. The research procedure was to construct the multimedia activity package on basic chemical thermodynamics. The contents and learning activities corresponded with the contents of the third version of the textbook on the promotion of academic Olympiads in chemistry. Reliability of the multimedia activity package was examined by experts in educational science field. After that, the multimedia activity package on basic chemical thermodynamics was later improved. Then it was used to collect data with the sample group which was "Gifted" science students from Samakkhi Witthayakhom School, Chiang Rai. The learning activities were conducted by the researchers. The processes were to orientate and clarify the activity steps. Subsequently, 30 items of pre-test were done by the students in order to measure their basic knowledge. Afterwards, the learning activities were conducted based on 5 lesson plans consisting of 12 hours. In addition, each lesson plan contained a multimedia activity package with contents related to basic chemical thermodynamics. The processes of teaching method were introducing,



instructing, and summarizing. Multimedia materials, exercises, and experiments were used but all of them were not included in the same lesson plan. The researcher collected the scores of the students during each lesson plan in order to analyze the efficiency of the multimedia activity package on basic chemical thermodynamics. The coaching and mentoring process conducted by researcher were based on professional learning community (PLC). Students learnt through self-directed and reflective learning process. After that, 30 items of post-test were done by the students in order to measure the achievement of using multimedia activity package on basic chemical thermodynamics. Mean, percentage, and T-Test were analyzed from the collected data to compare the achievement before and after studying with the package and the efficiency of the multimedia activity package on basic chemical thermodynamics. The scores from the exercise during the class and the post-test exam were considered by using the standard criteria 80/80.

Results and Discussion

A Comparison of Student Achievement Score of Pre-Test and Post-Test

The results of the academic achievement of “Gifted” science students taught by using multimedia activity package on basic chemical thermodynamics were higher in post-test score when compared with pre-test score with statistical significance at the level of 0.05 as illustrated in Table 1.

Table 1 A Comparison of Student Achievement Score of Pre-Test and Post-Test of Students with a Specialty in Science from Samakkhi Witthayakhom School, Chiang Rai

Test	Total Score	Average Score	S.D.	d	S.D.	t	Sig. (2-tailed)
Pre-Test	30	13.70	1.77	1.45	1.60	42.25	0.0000
Post-Test	30	25.15	2.06				

The academic achievement of “Gifted” science-students who were instructed by using multimedia activity package on basic chemical thermodynamics in post-test was higher than pre-test with statistical significance at the level of 0.05. It corresponded with the result of research on the development of multimedia activity package on fluid in physics course of mathayom suksa 5 (Buayad, 2013). The results have shown that the academic achievement after being taught by using the multimedia activity package was higher than before being taught by using the multimedia activity package with a statistical difference at the level of 0.05. Furthermore, the result was consistent with the research (Nasuwan, 2013). In addition, the study of the usage of the multimedia activity package to teach Grade 12 students from Anukoolnaree school about chemical bonding was reviewed. According to the research, the results demonstrated that the academic achievement on the chemical bond of Grade 12 students from Anukoolnaree School was higher than the control group who was taught by using traditional method. The result was higher with a statistical significance at the level of 0.05. It can be seen from the academic achievement of the “Gifted” science students from Samakkhi Witthayakhom school after being instructed by using the multimedia activity package was higher because of the use of various teaching materials such as the use of power point program, videos, experiment, and exercises. These enhanced the students’ understanding of basic chemical thermodynamics especially when videos were used on the topic of the first, the rule of chemical thermodynamics. This was consistent with using the components of different kinds of multimedia and combining text, pictures, animation, sounds, and video through the process of computer in order to convey meaning and interact with its user in order to accomplish the using purposes (Karnjanasuwan, 2009).



Students watched the video about the experiment of rule 1 on gas extension and contraction in a big testing tube which was covered by a sheet of paraffin. The students had a chance to observe the extension of paraffin sheet when the test tube was dipped in a beaker containing hot water and the contraction of the paraffin sheet while the testing tube was dipped in a beaker of cold water. Instructing with a variety of teaching materials leads to fun, and interesting ways of learning for the students. This finding showed that using the multimedia activity package leads to the interest of the students because it can arouse them while learning (Promwong, 1998; Koontun, 2007; Tobin et al., 2012). The student can acquire more knowledge with a better understanding. It also saves time for the students as they can learn faster as a variety of teaching materials have been used. It can be seen that multimedia activity package leads to better student academic achievement with a statistical significance at the level of 0.05.

The Result of Constructing Multimedia Activity Package on Basic

Thermodynamics with the efficiency of 87.54/83.83 which was higher than the criteria of the standard 80/80 illustrated in Table 2

Table 2 The Efficiency of Multimedia Activity Package on Basic Thermodynamics for the Students with a Specialty in Science from Samakhi Witthayakhom School, Chiang Rai

Lesson Plan	The Number of Students	Total Score	Average Score	S.D.	E_1 / E_2
1	40	10	9.55	0.85	
2	40	10	8.23	0.77	
3	40	20	17.26	0.65	
4	40	10	8.73	0.60	
5	32	10	3.78	0.62	
(E_1)	40	60	47.55	0.67	87.54
(E_2)	40	30	25.15	1.76	83.83

The efficiency of the multimedia activity package (E_1 / E_2) 87.45 / 86.04

(E_1) refers to the scores during the classes

(E_2) refers to the scores after post-test

This study aimed to construct a multimedia activity package on basic chemical thermodynamics and examine the result of using the multimedia activity package on basic chemical thermodynamics on “Gifted” science students from Samakhi Witthayakhom School in order to study the academic achievement of students with a specialty in science in basic chemical thermodynamics and the effectiveness of the multimedia activity package on basic chemical thermodynamics. According to the result of this study, it is concluded that multimedia activity package resulted in the efficiency of 87.54/83.83 which was higher than the criteria of efficiency standard which is 80/80. It reflected that the multimedia activity package led to the stable retention of students with a specialty in science because the score during the classes and the score after being taught were higher than the standard. This coincides with those who have studied the development of lessons using multimedia activity package on fluid in physics course of Grade 11 (Buayad, 2013). The result showed that the lessons using multimedia activity package on fluid in physics course of Grade 11 was effective with 82.30/84.38. This is because the various uses of teaching materials led to a better learning process of the students together with the score during the study. This was collected from exercises at the end of the class in order to review what they have learnt. It was the chance that the instructor allowed student to ask questions while they were in doubt. This



resulted in a better understanding of the contents as well as better retention. Consequently, the post-test score was higher than the pre-test score with a statistical significance at the level of 0.05.

In addition, “Gifted” science students of Samakkhi Witthayakhom School, Chiang Rai, they were learning basic chemistry thermodynamics by the process of building a coaching and mentoring system. The researcher (Coach) and the mentor (Mentee) were working alongside the process professional learning community (PLC), which was the 80 percent threshold set. The instructional process was focused on the learner, the instructor and expertise were used the set of activities that were created. This was a multimedia activities package on basic chemical thermodynamics. The instructional process allowed the researchers to closely observe the students. They students could ask when they did not understand the contents. The students were not pressured and were happy to learn. The students were satisfied with the counseling and helping in the instructional activities. The satisfaction with learning was at the highest level with the efficient criterion of 4.56, representing 91.20 percent. The learning process by Coaching and Mentoring, which was carried out in conjunction with the process, professional learning community (PLC) was implemented. The researcher can review the knowledge and transfer knowledge to the learners that reflect the learning outcomes. Also, the researchers could check if they students did not understand the content.

Conclusion and Recommendation

This study aimed to construct a multimedia activity package on basic chemical thermodynamics and examine the result of using the multimedia activity package on basic chemical thermodynamics on “Gifted” science students from Samakkhi Witthayakhom School, Chiang Rai. The result of the academic achievement of the students who were instructed by the multimedia activity package on basic chemical thermodynamics was higher in the post-test when compared with the pre-test with statistical significance. The efficiency of the multimedia activity package on basic chemical thermodynamics was 87.54/83.83 which was higher than the standard criteria of 80/80. It is recommended that in the instruction by using multimedia activities package, teachers should select proper contents watching the level of students. Further using video as teaching materials in class is better because the teachers can pause the video and additionally explain from the video to help students learn better. It is unnecessary to use power point program, videos, experiment and exercise at the same time to instruct. However, it is suggested that more than one teaching materials should be included. Last but not least, for further research recommendation, the future research can be conducted by using multimedia activity package on basic chemical thermodynamics with students in general. It should not be specific with only students with a specialty in chemistry. A group of students instructed by using multimedia activity package on basic chemical thermodynamics should be compared with a group of students who were not taught by using multimedia activity package on basic chemical thermodynamics.

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