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The Flipped Classroom in 21st Century Learning For Development of learning skills Algorithm Analysis of Basic Programming C Language

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Abstract:

Learning management of flipped classroom is a learning style that brings technology to the flipped classroom. The concept is "Study at home - homework at school" to develop the 21st century education which is a new paradigm learning style considered as a basic technology education. Learning with advanced technology will improve the development of learning skills Algorithm analysis of basic programming C language Throughout the course. The students will be encouraged to create a learning conducive environment. The objectives of this study were 1) to evaluate the achievement of flipped classroom concept learning, 2) to evaluate students' satisfaction with the management of flipped classroom concept learning. The sample was 22 undergraduate students majoring in Computer Science. The statistics used for data analysis included mean, standard deviation for the comparison of teaching achievement. The results showed that the students' achievement through flipped classroom concept learning was higher, interpreted from the pre-test (= 4.41, S.D. = 0.94) and the post-test (=6.64, S.D. = 1.16). It can be said that the students' achievement grades after learning were obviously more higher than the pre-test. The evaluation of students' satisfaction on learning and teaching activities based on the concepts of flipped classroom was overall at a high level (= 4.47, S.D. = 0.39).

Keywords: Flipped classroom; Learning skills in the 21st century; Programming learning

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History and Significance of Research

Thai education reform in the second decade of 2009 - 2018, the 21st century, is in a challenging period because it is a time when the world is facing rapid change. All information is not limited to the books around us anymore, computers and media are becoming more and more influenced by everyday life. Just a click, we can cross the border to every corner of the world. Academic world is going beyond teacher-centric instruction and transforming into a new paradigm, called Technology Based Paradigm, while Thailand also recognizes the importance and perspective of the preparation of Thai children into the 21st century (Vijarn Panich, 2008). Today, computers play a huge role in our daily lives, and information and communication technologies also help to make a difference. As a result, in the 21st century, there is a need to increase the potential of children to have more advanced computer and technology knowledge. Moreover, at present, Thai youth have more access to technology and use to meet their needs. The use of technology in various forms, such as online video, website, or application through electronic devices such as computers, tablets, and mobile phones enhances learning efficiency and solves problems with location and time constraints. All of the above is considered a popular media channel in the society.

In addition to being a classroom lecturer, teachers also need to arrange a variety of activities consistent with the 21st century teaching model. A learner-centric approach shifts the focus of instruction from the teacher to the student. The learner is an activist and the instructor is just a consultant. "Flipped Classroom" is a new educational approach that allows the students to "study at home – do homework at school". In other words, in the classroom, the instructor does not focus on teaching the lesson content because the learner can study independently (Cherntawan, 2013). Flipped Classroom is a “Child-center education” and a blended learning approach. Technology is fully used to develop instruction and solve problems in the classroom. The main task of the instructor is to explain when the learner does not understand, rather than to teach them the content. Therefore, in this way, Differentiate Instruction and Project-based learning (PBL) approach also can be applied in the classroom. Flipped Classroom gives the instructor time to guide the learner and help learners to be more creative.

Flipped Classroom is a new teaching innovation that gives learners a well-rounded learning experience. There are 4 elements as follows (Surasak Pahay,2013). First Element: Experiential Engagement, teachers guide students how to learn by using a variety of methods, including customized activities, simulation games, interactive media, experiments or art work. Second Element: Concept Exploration, teachers recommend learning from a variety of media or activities such as video recording media, podcasts, websites or online Chats. Third Element: Meaning Making, Learners build knowledge-based skills from self-directed learning by creating blogs, use of test, social networking and discussion boards. Fourth Element: Demonstration & Application, students create their own knowledge in a creative way by creating a project and through the presentation of their work.

Based on the above theories and principles, the researcher is interested to study Flipped Classroom teaching concept in the 21st century in order to improve the learning skills in analyzing the algorithms of Basic C programming language. for new-age children. Focusing on students’ learning activities increases efficiency And to improve the quality of learning. Therefore, the researcher intended to apply Flipped Classroom teaching concept on Design and Analysis of Algorithms course to develop analytical skills in Basic C programming language under learner-centric approach. for the classroom activities for learning from the practice will stimulate and inspire learning. The objectives are as follows.

Research Objectives

1. To evaluate the achievement of the flipped classroom teaching model in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language.

2. To evaluate the student’s satisfaction with the flipped classroom teaching model in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language.

Scope of Research

1. The populations were the students in Computer Science Department, Faculty of Information Technology, Thepsatri Rajabhat University

2. The samples were 22 students in Computer Science Department at the 1st year of Faculty of

Information Technology, Thepsatri Rajabhat University who enrolled in the Design and Analysis of Algorithms for Academic Year 1/2017. They were selected by random sampling.

Research Framework

Independent Variable

- Course Description BS 6001103 Design and Analysis of Algorithms, Unit 1: Basics of designing computer programs

- Flipped classroom teaching model

Dependent Variable

- Learning achievement by using flipped classroom teaching model

- Evaluating student satisfaction with flipped classroom teaching model

Research methodology

The purpose of the research of the flipped classroom instruction in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language. The students' opinions on teaching in the first week were collected and analyzed by mean and standard deviation. It was found that most students were unable to do computer programming because they did not have algorithmic concept. Thus, the researcher applied flipped classroom teaching model to evaluate the teaching achievement by organizing learning activities as follows.

Step 1 Analysis: Collecting information used in teaching

- Study documents or texts related to 21st-century learning skills and flipped classroom teaching model to organize activities in accordance with the online classroom. For classroom activities, the students were assigned tasks to do in the classroom. For outside classroom, the students were assigned to study via online classroom.

- Study papers and activities related to the media to convey through the online classroom by using SnagIt for media recording and Google Site for anytime anywhere accessing via internet network system.

- Prepare teaching document related to basics of designing computer programs for online learning, and prepare content for classroom activities to train the thinking process for analysis of algorithms, step by step, with the content levels ranging from easy, medium and hard, respectively.

Step 2 Design: The researcher applied the analyzed content to design the flipped classroom teaching plan as the following details. The researcher used SnagIt, a video media, for recording image, audio and text during teaching Unit 1: Basics of designing computer programs for 2 hours, then uploaded the content file to Google Site via the online classroom system.

Step 3 Learning: For classroom activity, the teacher acted as an instructor encouraging the students to practice computer programming skills. For outside classroom, they could study on online classroom via Google Site where they could access it anywhere anytime through internet system.

Step 4 Evaluation: In the classroom hour, the teacher used the flipped classroom teaching method by creating activities for practicing computer programming skills, without classroom lecture content, but the teacher provided advice and guides them throughout the classroom hour.

Step 5 Summarization: Learning achievement of the first-year students in Computer Science Department for Academic Year 1/2017, learning unit of Basic C programming language in the Design and Analysis of Algorithms course.

Step 6 Questionnaire: The teacher created a satisfaction evaluation by questionnaire of 10 questions. The 22 students in Computer Science Department, Faculty of Information Technology, Thepsatri Rajabhat University, scored their satisfaction with the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language.

Research result

Based on the study of the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language, fundamentals of program design in Design and Analysis of Algorithms course, Computer Science Department, Faculty of Information Technology, Thepsatri Rajabhat University, the learning achievement evaluation from 10 questions resulted as shown in Table 1.

Table 1. Results comparing the learning achievement of students before - after Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language

Learning Management Forms	Learning Outcomes of Students				
	Before-After Flipped Classroom Teaching	Number of Students	k	$\bar{x}$	$S.D.$
Fundamentals of computer program design	Before-class	22 students	10 items	4.41	0.94
	After-class	22 students	10 items	6.64	1.16

Learning achievement of students before Flipped Classroom teaching showed the average score of 4.41 and the standard deviation of 0.94. Learning achievement of students after Flipped Classroom teaching showed the average score of 6.64 and the standard deviation of 1.16. The results implied that after Flipped Classroom teaching, the students scored higher than before Flipped Classroom teaching. Therefore it was clear that the students achieved their self-development. The student satisfaction with the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language were shown in Table 2

Table 2. Analysis results of the student satisfaction with the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language in Design and Analysis of Algorithms course by answering 10 questions

Item	Learning Management Forms	Students' Satisfaction		
		$\bar{x}$	$S.D.$	Satisfaction Level
1	Consistency of the teaching methods and the objectives of the course contents	4.31	0.48	High
2	The language used for communication was consistent with the subjects learned.	4.31	0.63	High
3	The essence of the teaching methods was comprehensive and apparent.	4.54	0.52	Highest
4	The teaching methods were suitable with learning.	4.77	0.44	Highest
5	The learning activities helped students understand the contents more effectively.	4.23	0.44	High
6	The lessons were flexible and suitable to individual difference. Students could arrange contents and learning by themselves.	4.62	0.51	Highest
7	Receiving knowledge and useful contents from the teaching.	4.54	0.52	Highest
8	The teaching methods were interesting and diverse.	4.38	0.51	High
9	Satisfaction with the use of Google Site	4.38	0.51	High
10	Satisfaction with Flipped Classroom teaching	4.46	0.52	High
Total		4.47	0.39	High

From Table 2, in overall, the students were satisfied with the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language at High level with the average score of 4.47 and the standard deviation of 0.39.

Research result

Based on learning achievement of the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language in Design and Analysis of Algorithms, Faculty of Information Technology, Thepsatri Rajabhat University, the results were discussed as follows.

1. The study indicated that the learning achievement of the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language, unit 1 Basics of designing computer programs in in Design and Analysis of Algorithms course, Computer Science Department, Faculty of Information Technology, Thepsatri Rajabhat University, before Flipped Classroom teaching it showed the average score of 4.41 and the standard deviation of 0.94, and after Flipped Classroom teaching it showed the average score of 6.64 and the standard deviation of 1.16.

2. The study indicated that the students were satisfied with the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language at High level with the average score of 4.47 and the standard deviation of0.39.

Discussion of research findings

1. The study indicated that the learning achievement of the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language, unit 1 Basics of designing computer programs in in Design and Analysis of Algorithms course, Computer Science Department, Faculty of Information Technology, Thepsatri Rajabhat University, before Flipped Classroom teaching it showed the average score of 4.41 and the standard deviation of 0.94, and after Flipped Classroom teaching it showed the average score of 6.64 and the standard deviation of 1.16. After attending the Flipped Classroom, the students had a higher score of learning achievement than before. This implied that the students clearly achieved their self-development.

2. Evaluation report of student satisfaction with the Flipped Classroom teaching in the 21st century to improve the learning skills in analyzing the algorithms of Basic C programming language, unit 1 Basics of designing computer programs in in Design and Analysis of Algorithms course, Computer Science Department, Faculty of Information Technology, Thepsatri Rajabhat University, in overall the student satisfaction was at the high level with the average score of 4.47 and the standard deviation of 0.39. This corresponded to Suthep Bhatjanla (2011), referring to Wanchalerm Udomtawee (2013). It was found that the students had a high satisfaction. Doing the activities and searched for information by themselves provided them a sustainable knowledge and understanding. In the learning activity, various learning media made the students have fun learning. Questions were used to keep students motivated. The students were encouraged to express their opinions and share their learning by using a variety of learning media.

Discussion of research findings

- Recommendations for applying

1. Programming is a subject that students have negative thoughts because of complex commands and programming procedures.

2. Teachers must learn to adopt technology for teaching. Flipped Classroom teaching requires content that is appropriate for learners. Since students have different backgrounds and ideas,

- Recommendations for the next research

1. Research results should be applied to improve different subjects to promote thinking skills of the learners. Other teaching methods also should be concerned.

2. The Flipped Classroom teaching via online system can affect students who do not have access to the Internet outside the classroom. However, the teachers may solve this problem by distributing a CD or preparing a thumb drive with video files to the students.

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