Development of Academic Achievement in Systemic Anatomy Course Through Flipped Classroom Teaching

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Abstract

Background and Aims: With the rapid development of modern information technology, the popularization of computers and networks not only changes the way of entertainment but also has a profound impact on the reform of teaching. With the diversification of knowledge acquisition methods, traditional teaching ideas and teaching methods have to face reform. The traditional infusing teaching method does not give play to the students' subjectivity, but also seriously blows the students' enthusiasm for learning. The flipped classroom teaching approach, on the contrary, pays more attention to the principal position of students, transforms the one-way transfer of knowledge in traditional teaching into a two-way interaction between teachers and students, to help students better understand and master knowledge, promotes the internalization of knowledge, and enhance students' learning initiative. The purposes of this study were; 1) To develop learning activities for the flipped classroom teaching approach in the Systemic anatomy course and 2) To compare academic achievement scores between pre-test and post-test using the flipped classroom teaching approach. And 3) To study the students' satisfaction with the flipped classroom teaching approach in the Systemic anatomy course.

Methodology: The sample consisted of 40 first-year students of Luzhou Vocational College of Medical Devices. In the first semester of 2023. Obtained by cluster random sampling technique. Research tools are used in lesson plans, academic achievement tests, and satisfaction questionnaires. In data analysis including percentages, means, standard deviations, and paired t-tests.

Results: The results of the study were as follows; 1) The development of learning activities for the flipped classroom teaching approach in the Systemic anatomy course has an average suitability value for all plans equal to 4.31, which is at a high level. 2) Students who studied using flipped classroom teaching approach learning activities had higher academic achievement scores post-test than pre-test at a statistical significance of.05 and 3) Students who learned using the gamification teaching model had overall satisfaction at a high level.

Conclusion: The Systemic Anatomy course's flipped classroom teaching strategy greatly increased students' academic progress and garnered high marks from them, according to the study. The post-test results were much higher than the pre-test results, and the learning activities that were devised were highly appropriate.

Keywords: Flipped Classroom; Academic Achievement; Systematic Anatomy Course

Introduction

Due to the rapid development of modern information technology, the popularization of computers and networks not only changes the way of entertainment but also has a profound impact on the reform of teaching. With the diversification of knowledge acquisition methods, traditional teaching ideas and teaching methods have to face reform.

Compared with traditional media and technical means, open and intelligent modern information technology breaks through the barriers of time and space, facilitating teachers and students to interact anytime and anywhere. In the Education Informatization Development Plan (2011-2020) issued by the Ministry of Education in 2011, it was proposed that we should keep up with the informatization background, strive to realize the integration of education, teaching, and information technology, use information technology to conduct heuristic and participatory teaching, and research and establish a new student-centered teaching model. In 2018, the Ministry of Education also clearly stated in the "Opinions on Accelerating the Development of Higher Education and Basic Education to Comprehensively Improve Talent Training" that classroom teaching reform is imminent, and efforts should be made to promote mixed teaching and actively build a teaching model that combines online learning and offline classroom. The change from "teacher-centered" to "student-centered" requires teachers to use appropriate teaching means and scientific and reasonable evaluation methods according to the teaching practice, mobilize students' learning interest, and improve teaching quality and teaching effect. The rise and development of flipped classrooms provide an opportunity for the realization of these goals.

Human anatomy is divided into systematic anatomy, local anatomy, sports anatomy, and sectional anatomy according to the direction of professional courses, among which systematic anatomy is the main important basic course to learn. Only by learning systematic anatomy well can we lay a solid foundation for other disciplines such as physiology, pathology, medicine and surgery, gynecology, and pediatrics in the later period. Systematic anatomy refers to the science of describing the morphological structure of human organs according to the functional systems of the human body, which is the basis of learning local anatomy and sectional anatomy. Therefore, systematic anatomy is the first thing that medical students need to learn and master. The teaching object of our school is mainly vocational college students, who have a short time in school (medical college students only learn theory in school for two years), anatomy course time is limited, and many subjects are studied, which occupies a large number of anatomy course time. However, anatomy, as a basic professional course with a strong theory and various concepts, is difficult to learn and boring for vocational students.

Engels once said: "Without anatomy, there is no medicine", and systematic anatomy is a very important basic course for all medical students to learn first, therefore, constantly improving the quality of anatomy teaching is the primary task of each of us engaged in anatomy teaching workers.

The traditional infusing teaching method does not give play to the students' subjectivity, but also seriously blows the students' enthusiasm for learning. The flipped classroom teaching approach, on the contrary, pays more attention to the principal position of students, transforms the one-way transfer of knowledge in traditional teaching into a two-way interaction between teachers and students, to help students better understand and master knowledge, promotes the internalization of knowledge, and enhance students' learning initiative.

Objectives

1. To develop learning activities for the flipped classroom teaching approach in the Systemic anatomy course.

2. To compare academic achievement scores between pre-test and post-test using the flipped classroom teaching approach.

3. To study the students' satisfaction with the flipped classroom teaching approach in the Systemic anatomy course.

Hypothesis

The students who learned using the flipped classroom teaching approach had higher academic achievement post-test than pre-test.

Literature Review

Johnson (2013) studied students in flipped classrooms, a method of teaching in which the classroom is rearranged from normal instruction, directly reducing the amount of activity. And must follow practice by using technology to help make activities that students can study online. The research sample is high school students who study mathematics in 3 classrooms that allow students to provide knowledge in a form. The flipped classroom has students learn to honor the internet and computers. It has been found that the flipped classroom teaching method promotes student learning and can be found in the content that students are happy and satisfied with the teaching method. The classroom model is more flipped than normal.

Moeller (2014) studied the use of a flipped classroom teaching method to enhance pottery skills and understanding. The results of the study found that teaching using the flipped classroom method is a change from the traditional teaching method in the subject of sculpture and pottery. This emphasizes teaching in classroom lectures and giving homework to do at home. It is a teaching method where the teacher makes a video demonstrating the method. Make pottery and record it for students to study at home. Then the next day, when it's time for class, the teacher will ask questions for the students to answer. And survey each student's opinions from studying the videos at home. The teacher then lets the students do the actual work. There was a summary and discussion of all the content learned. It appeared that the scores in skills and understanding increased significantly from those learned using traditional teaching methods.

Zhang & Baohui (2012) began to study the flipped classroom teaching model. Studied and constructed the teaching mode of flipped classrooms, analyzed the dilemma of flipped classrooms in China, and laid the foundation for future classroom reform. Zhang Yujiang pointed out in the article "Flipped Classroom Revolution" that according to the survey, most teachers believe that flipped

classroom improves their job satisfaction. Although at that time, the relevant literature was not much, but also marked the beginning of domestic flipped classroom research.

Conceptual Framework

From researching textbooks, books, and research documents related to lesson plans using Flipped Classroom. The researcher therefore summarizes the research idea as follows.
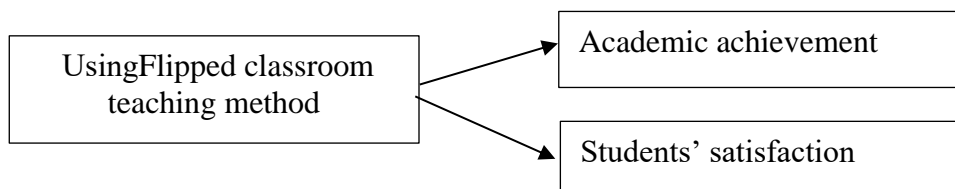
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┌──────────────────────┐        ┌──────────────────────────┐
│  UsingFlipped        │───────▶│  Academic achievement    │
│  classroom teaching  │        └──────────────────────────┘
│  method              │        ┌──────────────────────────┐
│                      │───────▶│  Students' satisfaction  │
└──────────────────────┘        └──────────────────────────┘
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Figure 1 Conceptual Framework

Methodology

Population and Samples

The population included 10 rooms. There are a total of 400 students. There are first-year students of Luzhou Vocational College of Medical Devices in the first semester of 2023. The sample consisted of 40 first-year students of Luzhou Vocational College of Medical Devices. In the first semester of 2023. Obtained by cluster random sampling technique. (Worakham, 2021)

The variables studied in the research

Independent Variable: Learning activities using the Flipped classroom
Dependent Variables: (1) Academic achievement, and (2) Students' satisfaction

Content

The content in the systematic anatomy course used to teach students Using Flipped classrooms has 9 lesson plans. Each plan takes 90 minutes. (Excluding pre-test and post-tests)

Step 1 Locomotor system
Step 2 Alimentary system
Step 3 Respiratory system
Step 4 Urinary system
Step 5 Reproductive system
Step 6 Sensory system
Step 7 Vasculature
Step 8 Endocrine system
Step 9 Nervous system

Research period

In the first semester of 2023, there will be 2 teaching periods of 90 minutes per week and 9 weeks of research time.

Research model

This research used an experimental design in the form of experimental research (Experimental Research) One Group Pretest-Posttest Design and One Group Posttest Only Design (Worakam, 2021)

Table 1 Research plan: One Group Pretest-Posttest Design

random	group	Test first	Experimental thing	Test after
-	E	O	X	O2

When   E   means   Experimental group
           O_1 means Measuring variables before experimenting
           X   means Giving an experiment
           O_2 means Measuring variables after the experiment

Research instrument

The research tools used this time include the following important tools:
Lesson Plan 1
To effectively improve students' performance in the systematic anatomy course and provide basic knowledge for medicine and related professions, the teaching of the systematic anatomy course will be

managed by using the flipped classroom teaching mode for a total of 9 weeks, once a week, each time for 90 minutes. The steps are as follows:

1. Study courses in educational institutions, and study curriculum descriptions in Systemic anatomy courses.

2. Analyze the relationship between the content and the learning objectives. Consistent with the flipped classroom teaching method learning activities.

3. Study the concepts, principles, theories, and steps of writing learning lesson plans using the flipped classroom teaching method.

4. Prepare a learning management plan with specific implementation steps aligned with the management plan. A total of 9 plans (Excluding pre-test and post-test)

Table 2 Analyze the relationship between content and learning objectives

Plan and content	Objective	Time (minutes)
1. Locomotor system	Understand and master the Locomotor system	90
2. Alimentary system	Understand and master the Alimentary system	90
3. Respiratory system	Understand and master the Respiratory system	90
4. Urinary system	Understand and master the Urinary system	90
5. Reproductive system	Understand and master the Reproductive system	90
6. Sensory system	Understand and master the Sensory system	90
7. Vasculature	Understand and master Vasculature	90
8. Endocrine system	Understand and master the Endocrine system	90
9. Nervous system	Understand and master the Nervous system	90
Total		**450**

5. Use the lesson plan created by the researcher. Present to the thesis advisor. To check and consider the appropriateness of the lesson plan.

6. Take the lesson plan and revise it. Then present it to experts to assess the suitability of the learning management plan. List of experts, 3 people. The list of experts includes

(1) Dr. Suwit Khammanee, Ph.D. (Curriculum and Instruction) Lecturer in the Department of Curriculum and Instruction, Faculty of Education, Rajabhat Maha Sarakham University.Expert in research, Curriculum and Instruction

(2) Assoc.Prof. Acting Sub Lt.Arun Suikraduang, Ph.D. (Educational Research and Evaluation), Lecturer in Educational Research and Evaluation, Faculty of Education, Rajabhat Maha Sarakham University. Expert in research, statistics, measurement and evaluation

(3) Asst.Prof. Anusorn Chanprathak, Ph.D. (Educational Research and Evaluation), Lecturer in Educational Research and Evaluation, Faculty of Education, Rajabhat Maha Sarakham University. Expert in research, statistics, measurement and evaluation

7. Use the evaluation results from experts. The average value was analyzed. To compare with the evaluation criteria of the rating scale (Rating Scale) according to the Likert method, 5-level option type, with the evaluation criteria as follows (Srisa-ad. 2010)

Most appropriate, give	5 points.
Very appropriate, give	4 points
Moderately appropriate, give	3 points
Less appropriate, give	2 points
At least appropriate, give	1 point

Criteria for interpreting average data are as follows:

An average between	4.51-5.00	means it is most appropriate.
An average between	3.51-4.50	means it is very appropriate.
An average between	2.51-3.50	means it is moderately appropriate.
An average between	1.51-2.50	means it is less appropriate.
An average between	1.00-1.50	means it is least appropriate.

The evaluation criteria must have an average score from 3.51- 5.00, considering the level of quality, suitability, and most suitability. Therefore, it is considered that the learning management plan

can be used in research. The lesson plan has an appropriate value equal to 4.31. There is a high level of appropriateness in every plan.

8. Take the revised lesson plan according to expert recommendations and print it as a complete version for implementation with the sample.

Table 3 Flipped Classroom Lesson Plan

Educational Contents	Phylogenetic Anatomy - Digestive System
Teaching Purpose and Task	1. Master the composition of the digestive tube and the continuous relationship of various organs 2. Master the position and morphological structure of the palate, tongue, teeth, and oral salivary glands in the mouth 3, master the location of the pharynx, divisions, the main structural characteristics of each department, and traffic 4. Master the position, shape, and division of the esophagus and stomach, as well as the three narrow positions of the esophagus and clinical significance 5. Master the location, shape, division, and morphological characteristics of each part of the small intestine and large intestine, and the difference between large and small intestine
Key points and difficulties in teaching	The continuum between the organs of the digestive tract and the position of each organ in itself
Teaching methods	1. Methods of self-study before class. 2. Methods of presentation 3. Methods of discussion. 4. Small classroom method
Teaching methods	Xueyin online platform, multimedia, blackboard writing, specimen model
Process design	self-study before class; 5 minutes to introduce content; 40 minutes of teaching and explanation by the teacher; Students explain and discuss for 35 minutes; Summary and quiz for 10 minutes

Pedagogical step design

steps	The main task	Teacher Activities	Student Activities
Step1 (5minutes)	Introduce new units of teaching	Play a moving picture of food entering from the mouth and excreting from the anus through PPT. Ask students questions: What is the digestive system and what are its components and functions? Have the students ask questions and take notes, and let the students carry the questions to the digestive system lesson.	Watch teaching videos independently according to the teaching focus; Complete pre-chapter quizzes, think about questions, discuss with each other, or ask questions in groups.
Step2 (40minutes)	Teach new course content	Through the production of a complete PPT combined with the content of the students' books, the main teaching objectives,	Review the content and key points of this chapter through the teaching video watched before class, ask questions, and think

Educational Contents		Phylogenetic Anatomy - Digestive System	
		teaching points, and difficulties, as well as the basic teaching content and other theoretical knowledge of the course, at the same time, in the course to answer the questions mentioned by students before class.	about the difficult parts in the process of the teacher's explanation.
Step3 (35minutes)	Students' teaching and discussion	Given the key and difficult parts of the digestive tract raised by the teacher in the course explanation, let the students further explain and discuss with the help of the specimen model.	Discuss in small groups with your questions, and if you can't ask questions to the teacher, the students in charge of the explanation will explain the difficult parts with the help of the specimen model.
Step4 (10minutes)	Summarize the discussion and quizzes	The teacher answers questions, summarizes and reflects, and optimizes the teaching after completing the chapter test.	Post-test, review and consolidate chapter tests, ask questions, summarize, and reflect.

Academic Achievement Tests

The researcher prepared a multiple-choice achievement test with 4 options according to the following steps.

1. Study the theory and documents related to creating achievement tests and multiple-choice tests.

2. Analyze the relationship between content Learning objectives with the number of exams required to cover and be relevant to the content of 9 subjects, an achievement test was created in the form of a multiple choice, 4 choice, 90 questions, with 45 questions selected for implementation.

Table 4 Analyze the relationships between learning subjects. Learning objectives and the number of exams required

content	objective	Number of exams
1. Locomotor system	Explain and analyze the Locomotor system	10
2. Alimentary system	Explain and analyze the Alimentary system	10
3. Respiratory system	Explain and analyze the Respiratory system	10
4. Urinary system	Explain and analyze the Urinary system	10
5. Reproductive system	Explain and analyze the Reproductive system	10
6. Sensory system	Explain and analyze the Sensory system	10
7. Vasculature	Explain and analyze the Vasculature	10
8. Endocrine system	Explain and analyze the Endocrine system	10
9. Nervous system	Explain and analyze the Nervous system	10
Total		**90**

3. Present the academic achievement test that the researcher created to the thesis advisor. To check accuracy and suitability

4. Take the revised test and present it to experts for consideration to evaluate the consistency between the test and the learning objectives (Index of Item Object Congruence: IOC) to check the content validity of the test. By the same expert. (Worakam, 2021)

Give +1 when you are sure that the test item meets the learning objectives.
Give 0 when you are not sure that the test item meets the learning objectives.
Give - 1when it is certain that the test item does not meet the learning objectives.

5. The evaluation results from the original set of experts were analyzed to obtain an index of consistency and internal validity using the IOC formula (Worakham, 2021). Select the exam with an IOC value ranging from 0.50 to 1.00. The evaluation results of this test have The IOC ranged from 0.67 to 1.00 and 45 exam questions were selected for implementation.

6. Take the revised test, 45 questions, 1 point each, and print it as a complete test to use with the sample.

Satisfaction questionnaire

The researcher created a student satisfaction questionnaire using the flipped classroom teaching method in the following steps:

1. Study principles, concepts, and theories related to satisfaction. And how to create a data collection tool using questionnaires.

2. Create a satisfaction questionnaire and design the questionnaire structure according to the type of questionnaire.

3. Set up questionnaire items and create a satisfaction questionnaire with a rating scale (Rating Scale) according to the -5 level Likert method, with scoring criteria and criteria for interpreting satisfaction results as follows (Srisa-ad,2010)

very high satisfied = 5 points
high satisfied = 4 points
medium satisfied = 3 points
low satisfied = 2 points
lowest satisfied = 1 point

Interpreting the meaning of the satisfaction level using the average value compared with the following criteria.

An average of 4.51 – 5.00 means that it is considered very high satisfaction.
An average of 3.51 – 4.50 means that they are highly satisfied.
An average of 2.41 – 3.50 means that there is medium satisfaction.
An average of 1.51 – 2.40 means that there is low satisfaction.
An average of 1.00 – 1.50 means that they are lowest satisfied.

4. The questionnaire has been prepared. Presented to the same set of experts. To consider and evaluate the consistency (Index of Item Conruence: IC) between the definitions of terms and the question list. Using the following criteria:

+1 when you are sure that the question is consistent with the definition of satisfaction.
0 When you are sure that the question is consistent with the definition of satisfaction.
- 1 When you are sure that the question does not correspond to the definition of satisfaction.

5. Analyze the consistency value (IC) of every question item of the created questionnaire. Considering the criteria that can be used from 0.50 and above, this questionnaire has an actual consistency value of 1.00 for every question item. And all 10 items can be used (Worakam, 2021)

6. Prepare a complete satisfaction questionnaire. For use in collecting data with sample

Data analysis

The researcher takes the data obtained from collecting all the data to analyze the research data in quantitative and qualitative research according to the research objectives. The details are as follows: (1) Analyze the quality of all lesson plans by finding the average suitability of the lesson plans by analyzing the mean and standard deviation. (2) Analyze data and compare student academic achievement. Between the average score before and the average score after school Using statistical hypothesis testing, t-test (depending on the sample) using Excel program. (3) Analyze data from the satisfaction test. To study the level of student satisfaction with the use of integrated activities. By taking the scores to find the mean, and standard deviation using the Excel program. And interpreting the data according to the following criteria: (Srisa-ad. 2010

An average of 4.51 – 5.00 means that it is within the most appropriate criteria.
An average of 3.51 – 4.50 means that it is very appropriate.
An average of 2.41 – 3.50 means that the appropriateness is in the middle level.
An average of 1.51 – 2.40 means that the appropriateness is in the low range.
An average of 1.00 – 1.50 means that it is within the lowest criteria.

Results
1. Results of developing learning activities for flipped classroom teaching approach in Systemic anatomy course.

In the development of the flipped classroom teaching approach in the Systemic anatomy course, a total of 9 teaching plans were designed by studying the curriculum in educational institutions. And study the description of the course in Systemic anatomy and the relationship between content and learning objectives. Consistent with the learning activities of the flipped classroom teaching approach, the researcher has studied the concepts, principles, theories, and steps in writing lesson plans using the flipped classroom teaching approach, which uses learning activities of 90 minutes per plan.

The lesson plan developed by the researcher has important elements: 1) learning objectives, 2) basketball teaching content, 3) learning activities using the flipped classroom teaching approach, and 4) measurement and evaluation. The teaching plan is then presented to the advisor to consider overall accuracy and to provide additional advice. After that, the lesson plans are presented to experts to evaluate the suitability of all lesson plans. Which are 3 experts with expertise in curriculum and teaching. Educational measurement and evaluation and statistics and research the evaluation criteria are compared with the evaluation criteria of the Rating Scale (Rating Scale) according to the Likert method, 5-level choice (Srisaard,2010), and the teaching plan has an appropriate value of 4.31, which is appropriate in All plans are high level. The researcher has made adjustments based on the suggestions of experts to develop a teaching plan that is of higher quality and can be used appropriately.

2. Compare results of academic achievement scores between the pre-test and post-test using the flipped classroom teaching approach.

Comparative results of academic achievement scores between pre-test and post-test using the flipped classroom teaching approach. The results of the data analysis appear in the following table.

Table 5 Students' academic achievement scores between pre-test and post-test using the flipped classroom teaching approach.

No	Pre-test (45 Point)	Post-test (45 Point)
1	18	32
2	18	36
3	21	34
4	18	33
5	18	33
6	19	34
7	17	34
8	16	32
9	18	34
10	18	32
11	17	32
12	21	34
13	23	36
14	20	34
15	18	32
16	26	36
17	23	37
18	18	32
19	21	34
20	18	32

No	Pre-test (45 Point)	Post-test (45 Point)
21	21	35
22	18	32
23	21	34
24	23	37
25	23	37
26	18	33
27	21	35
28	21	35
29	20	34
30	18	32
31	19	33
32	22	35
33	18	33
34	25	39
35	23	39
36	21	33
37	22	36
38	26	40
39	22	36
40	18	34
Sum	806.00	1375.00
Average	20.15	34.38
S.D.	2.52	2.08

Table 6 Results of t-test statistics and the statistical significance level of academic achievement scores between pre-test and post-test using the flipped classroom teaching approach.

Test	n	Full score	$\overline{X}$	S.D.	t-test
Before	40	45	20.15	2.52	66.69
After	40	45	34.38	2.08	

From the table above, it is found that students who study using the flipped classroom teaching approach. There was a significantly higher learning achievement after studying than before studying at the .05 level when analyzing the difference in the mean scores for both parts between the pre-test scores and the post-test scores. It shows that the average academic achievement score after studying is higher than before studying.

3. The students' satisfaction with the flipped classroom teaching approach in the Anatomy Learning System course.

Results of measuring student satisfaction with the flipped classroom teaching approach in Anatomy Learning System course. The results of the data analysis appear in the following table.

Table 7 Mean ($\overline{X}$) Standard deviation (S.D.) questions on the Satisfaction of Students at satisfaction of the flipped classroom teaching approach

List of questions	$\overline{X}$	S.D.	Description
1. I like the teacher's unique teaching method.	4.05	0.31	High
2. I like teachers who use minimal teaching. Learn more	4.65	0.48	Very high
3. I like that teachers always review lessons in advance.	3.52	0.40	High

4. I like the teaching process which makes the content easier to understand.	3.62	0.33	High
5. I like activities like this. Because it allows for more interaction in the classroom.	4.45	0.50	High
6. I like this type of teaching as it helps promote learning efficiency.	4.37	0.49	High
7. I like organizing a variety of learning activities and being more hands-on.	4.52	0.50	Very high
8. Learning activities help me pay attention to the subject matter and study more.	4.40	0.49	High
9. I am interested in how activities and learning materials help me learn more easily.	4.35	0.48	High
10. Learning activities help me expand and expand my knowledge of new things. get better	4.02	0.47	High
Total	**4.20**	**0.45**	**High**

From the table above, it is found that students who studied using flipped classroom teaching method Overall satisfaction was at a high level. ($\bar{X}$ = 4.20, S.D. = 0.45).

Analysis results sorted by every item from highest to lowest as follows: I like teachers who use minimal teaching. Learn more. ($\bar{X}$ = 4.65, S.D. = 0.48). I like organizing a variety of learning activities and being more hands-on. ($\bar{X}$ = 4.52, S.D. = 0.50) and I like activities like this. Because it allows for more interaction in the classroom. ($\bar{X}$ = 4.45, S.D. = 0.50).

Discussion

1. The development of learning activities using the flipped classroom teaching approach in the Systemic anatomy course has an average appropriateness value of all plans of 4.31, which is at a high level. This is because the researcher designed the teaching plan by studying the curriculum in the educational institution. And study the description of the Systemic anatomy course, analyzing the relationship between the content and learning objectives. To be in line with the development of learning activity plans using a flipped classroom teaching approach, totaling 9 lesson plans. All lesson plans were then presented to experts to assess the appropriateness of each plan. They are experts in curriculum and teaching. Educational measurement and evaluation and statistics and research by comparing the evaluation criteria with the evaluation criteria Rating Scale (Rating Scale) according to the Likert method (Srisaard,2010) and obtaining a teaching plan with an average the appropriateness of all plans was 4.31 and all plans were appropriate at a high level. Consistent with (Zhang,2012) began to study the flipped classroom teaching model. Study and create a teaching model of the flipped classroom. Analyzing the Dilemma of Flipped Classroom in China and laying the foundation for future Classrooms. Reform. He points out in his article "Flipped Classroom Revolution" that from a survey Most teachers believe that the flipped classroom increases work and learning satisfaction. Consistent with the research (Marlowe,2012) studied and compared the effects of flipped classroom learning on academic achievement and stress. The results of the study found that Learners experience less stress compared to other classes. And the results of the quizzes were found to have improved. The test scores were statistically different. The students were satisfied with the flipped classroom learning method and were able to complete assigned tasks. Of oneself and the ability to research learners' interests in depth.

2. Students who studied using flipped classroom learning activities had higher academic achievement scores after the test than before. Statistically significant at.05. This is because learning activities are organized in a flipped classroom format both in the classroom format. Website and online form Students receive richer multimedia resources and rich experiential learning. This improves learning efficiency and depth. At the same time, shared platforms and online study also allow students to conduct independent research. Demonstrate creative achievement and promote the development of academic research and digital learning capabilities. Helps stimulate students' interest more. Deepen your understanding and help improve the educational level and performance of students. In a 90-minute class, using flipped learning activities can stimulate students' interest. Attract students to gain new knowledge and help improve academic performance It offers a variety of flip-to-classroom learning activities. The classroom is therefore lively and interesting. Student participation and concentration also improved. Using multimedia teaching materials such as images, video, and audio to convey knowledge more naturally. And help students better understand new knowledge by supporting personalized

learning based on the student's progress and learning level. Provide personalized learning content and suggestions to meet the different learning needs of students. At the same time, clear learning goals are set. Let students know that they will learn new knowledge and skills. According to (Bergmann & Sam,2013) stated that in organizing teaching activities in a flipped classroom The role of the teacher will change completely, that is, the teacher will not be the transmitter of knowledge. Instead, the role is similar to that of a tutor or trainee. Asking questions to stimulate students' curiosity and creativity Enthusiastic and fun to answer questions and learn and be a facilitator of teaching and learning. Teachers take time to interact with students. Makes students who study slowly Not before my roommate caught my attention Students have more time to complete learning activities and will save more time than traditional classes. Having students learn the content in advance at home and then discuss it in class will make them learn better and faster. This leaves time for additional things, especially for students to develop analytical thinking skills. Consistent with (Marlowe's,2012) research, we studied and compared the effects of flipped classroom learning on academic achievement and stress. The study found that students were less stressed than other classes. And found that exam results improved Test scores are statistically different. Students were satisfied with the flipped learning method and were able to complete their assignments. And the ability to research students' interests in-depth and consistently (Thammakul & Phongkiattichai,2022) Improving the learning outcomes of nursing students using the flipped classroom. The research results show learning outcomes in each area. Ethics and morality, knowledge, cognitive skills Interpersonal skills and responsibility Numerical analysis Communication and information technology skills, and the overall learning results were at a high level and the average learning results scores Knowledge after the study was significantly higher than before the study ($p<.01$). The results of this research indicate that the flipped classroom helps students increase effective learning outcomes. Therefore, it can be used for the appropriate development of students at the higher education level. (Pornsiyawaran C, Premwichai Y., and Kongudomsap S,2022) Have studied Developing a Flipped Classroom for blended learning at work in the new normal era. The research results found that the flipped learning model consists of two parts: Part 1 is online learning, which consists of a preparation phase. Online learning management and evaluation phase. In this section, teachers must prepare all online lessons on pre-selected media. It is necessary to apply technology to online learning activities. Instructors must test, review, and train all activities before each online teaching session. The second part is classroom learning. Factors affecting learning in the flipped classroom for work-integrated learning (WIL). Students from all faculties had different opinions that technology was the most influential factor. Followed by the teacher and the grouping of students accordingly.

3. Students who learn using the gamification teaching model Overall satisfaction was at a high level ($\bar{X}$ = 4.20, S.D. = 0.45). Analysis results sorted by every item from highest to lowest as follows: I like teachers who use minimal teaching. Learn more. ($\bar{X}$ = 4.65, S.D. = 0.48). I like organizing a variety of learning activities and being more hands-on. ($\bar{X}$ = 4.52, S.D. = 0.50) and I like activities like this. Because it allows for more interaction in the classroom. ($\bar{X}$ = 4.45, S.D. = 0.50). Consistent with Zhang Jinlei's idea, Zhang Baohui and others (2012) began to study the flipped classroom teaching model. Study and create a teaching model of the flipped classroom. Analyzing the Dilemma of Flipped Classroom in China and laying the foundation for future classrooms. Reform He points out in his article "Flipped Classroom Revolution" that from a survey Most teachers believe that the flipped classroom increases work and learning satisfaction. And is consistent with the research of (Panyajirawut and Panyajirawut,2023) who studied the impact of the flipped classroom approach on academic achievement in contemporary physics. The results of the research found that the students' post-test scores were higher than their pre-test scores. At the significance level of.01 and overall student satisfaction with learning using the Flipped Classroom Approach in a learning management atmosphere was at 4.72, which is at the highest level (S.D. = 0.44). Overall student satisfaction with Learning activities in the Flipped Classroom Approach has a value of 4.70, which is at the highest level (S.D. = 0.46), and the overall satisfaction of students with the benefits of learning management in the Flipped Classroom Approach is at 4.58, which is in the highest level (S.D. = 0.49)

Recommendation

1. There should be a study of the effects of learning management using the flipped classroom concept on other variables such as collaborative skills, and problem-solving skills. Online media skills and life skills, etc.

2. In the next research, results should be compared. Theoretical learning and practical skills of students during teaching to develop academic achievement through integration with other teaching methods.

3. In the next research, research and learning achievement should be integrated through the internet network.

4. Research should be done on teaching integrated with other subjects or other grade levels to study the academic achievement and attitude toward the learning of students.

5. The relationship between media literacy and students' learning ability should be studied.

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