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PAPER

Research of Flipped Teaching to MICE Students' Learning Interests and Learning Effectiveness

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ABSTRACT

The integration of information into teaching through methods such as e-classrooms, interactive whiteboards, and the widespread adoption of "e-textbooks" provided by publishers has equipped educators with dynamic and engaging instructional models. This is progressively becoming the norm in the educational landscape. Recently, flipped teaching methods have received significant attention. By providing online resources and multimedia materials for students to review before class, teachers can allocate more classroom time to facilitating discussions about the lesson. In this study, an experimental investigation was conducted using flipped teaching in an educational setting that focused on training students for exhibitions. The objective was to evaluate the influence of flipped teaching on students' interest in learning and overall academic effectiveness. According to the experimental findings, the group taught using flipped teaching methods outperformed the traditionally taught control group in terms of learning interest. This demonstrates that flipped teaching has the potential to stimulate student interest. Furthermore, the group that was taught through flipped teaching demonstrated superior learning effectiveness compared to the traditional teaching group, indicating that flipped teaching can enhance academic outcomes. These research results can serve as a valuable reference for future enhancements in teaching. The goal is to create a more relaxed and autonomous learning environment for students by replacing traditional textbook learning with information technology-integrated teaching.

KEYWORDS

flipped teaching, exhibition students, learning interests, learning effectiveness

1 INTRODUCTION

Education is in urgent need of reform and a new direction. Traditional education often emphasizes teacher-centered instruction, with students passively receiving the same content. While this approach might emphasize the accomplishments of high-achieving students, it often fails to address the adaptation issues faced by many others. As a result, students who struggle academically under this traditional system

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often feel left behind. This can lead to academic frustration, a loss of interest in learning, and even the abandonment of certain subjects. Indeed, each student possesses unique traits, and education should aim to steer students towards paths that are suitable for their personal development rather than imposing one-way knowledge transfer. With the advent of the Internet, the limitations of this traditional teaching approach have been widely discussed. Properly integrating Internet resources with teaching can provide students with engaging educational materials, thereby boosting their interest in digital subject content. This is the appeal of digital education.

The aim of educational reform is to promote student growth and nurture skills that enable every student to demonstrate self-confidence and creativity at every stage of life. No child should be left behind; instead, they should be empowered with problem-solving skills to unlock their infinite potential through exploration. Unfortunately, our current, standardized education system worsens learning achievement gaps among students of different levels [1]. In school settings, teachers often find it challenging to cater to each student's individual needs due to teaching schedules and time constraints. As a result, content is usually taught at an average level, which can contribute to low academic motivation and helplessness among students who are struggling.

Flipped teaching, which enables students to engage in self-directed learning through Internet resources, has led to a growing emphasis on the concept of flipping in the education world. Furthermore, this teaching style exhibits significant differences from traditional teaching methods. Many scholars have published research on the flipped classroom and have found positive feedback on this new teaching style among students of different ages. The teacher-centered approach in the traditional teaching model needs to be changed. Teachers need to recognize that digitalization should be integrated into students' learning styles, and learning channels should be diverse rather than being confined to blackboards and textbooks. Designing a teaching model that can engage students in active learning and unleash their potential has become an urgent task for teachers. The study discusses the integration of information technology into flipped teaching to enhance MICE students' learning effectiveness. It aims to incorporate information technology into the teaching process to replace traditional text-oriented learning styles with more flexible and relaxing learning approaches for MICE students. Some instructional components are integrated with relevant information and tailored to the family life of MICE students, allowing them to learn calmly through information technology.

2 LITERATURE REVIEW

Chen and Hsu [2] explained that the popularity of flipped teaching is closely related to e-learning, and the success of MOOCs has effectively propelled e-learning into a new learning trend. Flipped teaching involves using digital networks to improve upon traditional teaching methods, breaking the constraints of time and space, and facilitating learning through engaging visuals to enhance students' connections and reduce pressure. Jang et al. [3] classified flipped teaching into two categories: students learning individually in any space using information devices, and students learning collaboratively in peer groups. Before the advent of online teaching, teachers implemented the flipped classroom model, allowing students the flexibility to view course content through lesson videos uploaded by teachers either before or after classes, without the constraints of time and space. Hwang and Chang [4] mentioned that students, after watching the video, could propose questions through the interactive response system, which allowed students who were not used to asking questions in class to speak up.

Anderson et al. [5] stated that students could benefit from having more time to think before responding to teachers' questions, allowing them to provide the best answers and gain a better understanding of the discussed issues. Lunzmann-Cooke et al. [6] suggested that teachers could use interactive response systems to address students' problems and enhance interactivity in the classroom. Peers could share their in-class ideas or opinions for discussions. In flipped teaching, teachers serve as guides, using various methods to engage learners and stimulate their interest and motivation in learning.

There are various styles of flipped teaching. Xu et al. [7] suggested that the evaluation of teaching performance in phenomenon-based learning should include (1) overall problem-solving ability, (2) problem awareness, (3) ideal solutions, (4) finding the best solution for problem-solving, and (5) peer learning. This approach showed superior performance in fostering learning attitudes and teacher-student interaction compared to traditional teaching styles. Similarly, Issleib et al. [8] implemented phenomenon-based learning in science and technology courses to enhance students' engagement and data collection skills. This approach not only increased students' interest in learning but also developed their communication skills, knowledge construction, respectful and responsible attitudes, and collaboration through group discussions, task division, cooperation, and peer interaction. This not only enhanced a positive problem-solving attitude but also promoted problem-solving abilities.

Jdaitawi [9] found that project-based learning provides greater enjoyment, broader cognitive learning, and increased learning efficiency. This is accomplished when students engage in critical thinking and develop problem-solving strategies through group discussions with their peers. The problem-solving process can enhance students' understanding of problems and help them develop their professional knowledge, skills, problem-solving abilities, critical thinking, and response capabilities. Cabezas-González et al. [10] argued that the flipped teaching model could help teachers address the learning gap caused by inconsistent teaching schedules. Kuyt et al. [11] found that students experienced higher levels of anxiety with traditional teaching than with flipped teaching, and this academic uncertainty could result in a loss of self-confidence. This may hinder students from actively participating in class discussions or asking questions, thereby reducing teacher-student interaction and peer learning in the classroom. It also makes it difficult for teachers to monitor students' learning environments.

Hu and McGeown [12] define "learning interests" as an "individual's positive inclination toward knowledge and emotional state-related learning." If someone is interested in a subject, they are more likely to consistently engage with and focus on that subject, thereby enhancing the learning outcome. Therefore, interest can both enhance learning and be a result generated and increased by learning activities. Mahayanti et al. [13] define learning interests as the ability of a student to invest time and effort in tasks. Students with stronger learning interests, a more active and positive outlook, high motivation for achievement, and a positive attitude towards completing tasks tend to demonstrate higher self-confidence in completing activities. The willingness to complete tasks is related to a student's interest in the task, which leads to improved learning performance. Psychologists emphasize the importance of capturing learners' interests in educational materials to improve learning performance [14]. Teachers who can stimulate students' interest in learning and transform them from passive recipients to active participants, creating a positive and enthusiastic learning environment, are likely to have a positive impact on both teachers and students [15]. Learning interests are closely linked to learning performance, as they can improve cognitive abilities related to learning tasks, facilitate meaningful learning, and provide additional motivation for learning [16]. Therefore, it seems that your study is proposing certain hypotheses based on these concepts.

H1: Flipped teaching could impact students' learning interests.
H2: Flipped teaching could impact learning effectiveness.
H3: Interest in learning has a significant and positive impacts on learning effectiveness.

3 RESEARCH METHOD

3.1 Measurement of research variable

Learning interests. In the present study, we utilize the theoretical framework outlined by Han et al. [17], who propose that learning interests consists of two distinct dimensions:

1. Personal interests. These are defined as prolonged involvements with specific phenomena or activities that require ongoing commitment from the individual. Personal interests are usually deeply rooted, often stemming from internal motivations or long-standing passions. These interests remain constant over time and often guide an individual's choice of activities, educational pursuits, and potentially, career paths.
2. Situational interests. These are interests evoked by particular events, circumstances, or environmental contingencies, for instance, an intriguing movie or compelling academic content. Situational interests may not possess the same longevity as personal interests, yet they can exert significant influence in the short term. These interests can be ignited by external inducements and can catalyze engagement and learning, especially when the situation or context is designed to be captivating or compelling.

Learning effectiveness. In alignment with He [18], the dimensions for learning effectiveness in this study are delineated as follows:

1. Learning effect. This includes factors such as test performance, the time required to complete learning schedules, and overall academic performance during a specific term or academic period. This dimension of learning effectiveness is primarily focused on quantifiable measures and outcomes, reflecting the tangible results of the learning process.
2. Learning gain. This includes aspects such as learner satisfaction, educational achievement, and personal preference for the learning materials or methods used. As opposed to the "Learning Effect," the concept of "Learning Gain" considers subjective aspects of the learning experience, including emotional, attitudinal, and preferential aspects of learning. This dimension underscores that effective learning is not only about achieving high scores or completing tasks quickly, but also includes the level of satisfaction, interest, and personal growth experienced by the learner.

3.2 Research design

A university in Taiwan conducted a study using MICE students as research subjects. The study employed an integrated approach that incorporated information technology into flipped teaching. Each student was provided with a personal tablet. Before their lessons, they were directed to download the e-textbooks provided by the textbook vendor. In addition, the teacher selected course-related videos for the

students to review and study at home using their e-textbooks. Two teaching units were selected for this study, which covered a duration of 16 weeks. One class, designated as the experimental group, employed the flipped teaching model. On the other hand, a different class, referred to as the control group, utilized a traditional teaching model without the use of tablets, e-textbooks, or advanced provision of relevant videos. The pretest and posttest performances of the students were measured to determine the differences in learning interests and learning effectiveness between the experimental group and the control group. To minimize performance discrepancies, students were grouped according to a standard S-type normal class implementation for both the experimental group (flipped teaching) and the control group (traditional teaching). With the teacher, students, and course content being the same for both groups, the only variable that was changed was the teaching model in the experimental group. A pretest/posttest analysis was used to investigate the differences between the effects of flipped teaching and traditional teaching methods.

3.3 Research object and sampling data

A total of 196 students from a university in Taiwan participated in a 16-week experimental teaching program, which consisted of 2 hours per week, totaling 32 hours. The data collected from the administered questionnaire were analyzed using SPSS. The statistical analyses conducted included factor analysis, reliability analysis, regression analysis, and analysis of variance. These analyses were utilized to test the hypotheses.

The study participants were divided into two groups, with 98 students in each group. The experimental group, which employed flipped teaching, consisted of 39 males and 59 females. The control group, which used traditional teaching methods, included 44 males and 54 females (see Table 1).

Table 1. Research object

Group	Male	Female	Number in the Group
Experimental group	39	59	98
Control group	44	54	98

3.4 Analysis method

In terms of the analytical methods employed, an analysis of variance was applied to examine the differences in learning interests and learning effectiveness resulting from flipped teaching. Furthermore, regression analysis was used to examine the relationships between learning interests and learning effectiveness.

3.5 Pretest analysis

A pretest analysis was conducted using an independent t-test. This study analyzed the pretest results of both the experimental group (flipped teaching) and the control group (traditional teaching) in order to determine differences in learning interests and learning effectiveness between the two groups. The results showed no significant differences in learning interests or learning effectiveness between the experimental and control groups, as shown in Tables 2 and 3.

Table 2. Analysis of learning interests pretest

Variable			Mean	t	P
Learning interests	Personal interests	Experimental group	3.37	7.283	0.733
		Control group	3.30		
	Situational interests	Experimental group	3.46	8.941	0.623
		Control group	3.43		

Note: ***stands for $p < 0.001$.

Table 3. Analysis of learning effectiveness pretest

Variable			Mean	t	P
Learning effectiveness	Learning effect	Experimental group	3.41	5.721	0.792
		Control group	3.43		
	Learning gain	Experimental group	3.29	4.463	0.877
		Control group	3.32		

Note: ***stands for $p < 0.001$.

4 ANALYSIS RESULT

4.1 Reliability and validity analysis

Factor analysis extracted two dimensions of learning interests: "personal interests" (eigenvalue = 3.755, $\alpha = 0.91$) and "situational interests" (eigenvalue = 2.951, $\alpha = 0.92$). The cumulative variance explained by these factors is 84.266%.

In terms of learning effectiveness, factor analysis identified two dimensions: "learning effect" (eigenvalue = 4.736, $\alpha = 0.90$) and "learning gain" (eigenvalue = 3.285, $\alpha = 0.91$). The cumulative variance explained by these factors amounts to 85.477%.

4.2 Effects of flipped teaching on learning interests and learning effectiveness

Variance analysis of flipped teaching on learning interests. An analysis of variance was conducted to examine the disparities in learning interests between flipped teaching and traditional teaching methodologies. As presented in Table 4 (not provided), the teaching style exhibits significant differences in both personal interests and situational interests.

Table 4. Variance analysis of flipped teaching on learning interests

Variable		F	P
Learning interests	Personal interests	23.755	0.000**
	Situational interests	27.262	0.000**

Notes: *stands for $p < 0.05$; **for $p < 0.01$.

Figure 1 demonstrates that flipped teaching (4.34) elicits greater personal interests compared to traditional teaching (3.42), as well as higher situational interests with flipped teaching (4.26) compared to traditional teaching (3.51). H1 is therefore supported.

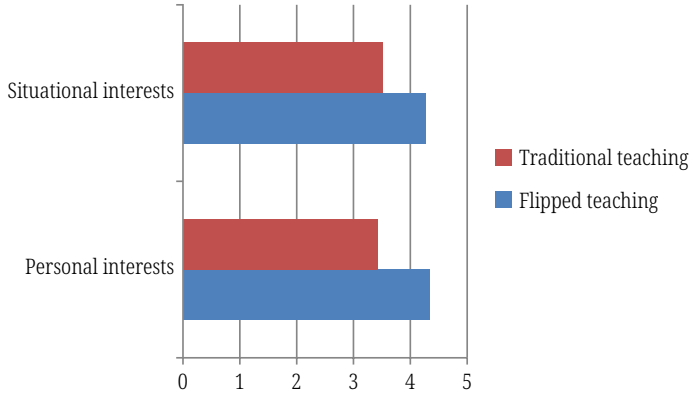

Fig. 1. Variance analysis of learning interests

Variance analysis of flipped teaching on learning effectiveness. According to the analysis of variance used to explore the differences in learning effectiveness between flipped teaching and traditional teaching methods, significant differences were found. As shown in Table 5, the teaching style demonstrates significant variations in both the learning effect and learning gain aspects.

Table 5. Variance analysis of flipped teaching on learning effectiveness

Variable		F	P
Learning effectiveness	Learning effect	18.442	0.000**
	Learning gain	27.592	0.000**

Notes: *stands for $p < 0.05$; **for $p < 0.01$.

Figure 2 demonstrates a greater learning effect with flipped teaching (4.06) compared to traditional teaching (3.47) aa well as a higher learning gain with flipped teaching (4.17) compared to traditional teaching (3.36), thus supporting H2.

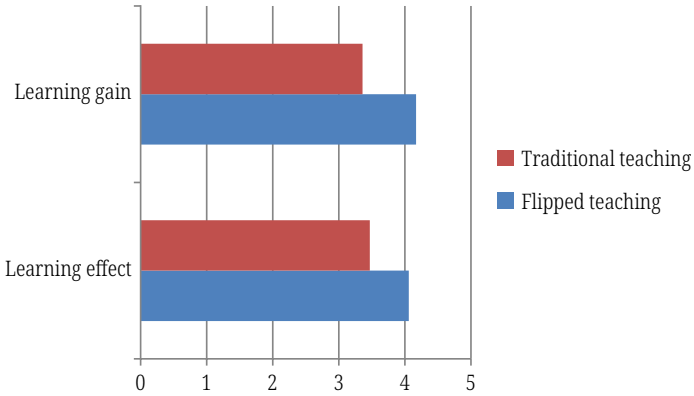

Fig. 2. Variance analysis of learning effectiveness

4.3 Correlation analysis of learning interests and learning effectiveness

Correlation analysis of learning interests and learning effect. To test H3, the analysis results in Table 6 reveal significant effects of personal interests (β = 2.133**) and situational interests (β = 2.247**) on learning effect.

Correlation analysis of learning interests and learning gain. To test H3, the analysis results, Table 6, show significant effects of personal interests (β = 2.204**) and situational interests (β = 2.388**) on learning gain. H3 is supported as a result.

Table 6. Analysis of learning interests to learning effectiveness

Dependent Variable →	Learning Effectiveness			
Independent Variable ↓	Learning Effect		Learning Gain	
Learning interests	β	P	β	P
Personal interests	2.133**	0.000	2.204**	0.000
Situational interests	2.247**	0.000	2.388**	0.000
F	31.735		38.691	
Significance	**0.000*** **		**0.000*** **	
R^2	0.283		0.334	
Adjusted R^2	0.268		0.325	

Notes: *stands for p < 0.05; **for p < 0.01.

5 CONCLUSION AND DISCUSSION

This study aimed to investigate the differences between information technology-integrated flipped teaching and traditional teaching methods. Relative to the control group, the experimental group showed significant improvements in both learning interests and learning effectiveness in the posttest results. This clearly suggests that flipped teaching can be beneficial for MICE students.

Upon a comprehensive review of the study findings, one essential factor cannot be overlooked. The experimental group was provided with digital preview materials. According to the responses from the MICE students, they tended to spend more time on pre-activity tasks. In the control group, although high-performing MICE students dedicated time to preview, those with lower performance did not invest as much time in this activity. However, in the experimental group, even the lower-performing MICE students were engaged by the video content, thereby increasing their preview time. Therefore, the extended preview time" might be a contributing factor to their outstanding performance in the posttest. Moreover, flipped teaching encourages MICE students to actively engage in class discussions and group learning. The preview phase also allowed the teacher to delve deeper into the questions. This is seen as a benefit that cannot be adequately assessed through testing. These observations constitute the conclusion of the flipped teaching experiment conducted in this study.

To practice flipped teaching, a classroom requires adequate equipment. Each MICE student has their own tablet, and the classroom is equipped with independent WiFi. Additionally, the computer system is connected to the tablets of MICE students. The teacher could manage students' tablets with the teaching computer and

deliver data to them. MICE students could deliver data from their personal tablets to the teacher for sharing with their classmates. It is considered a great advantage. Flipping has become popular in recent years, but it cannot completely replace traditional teaching methods. The combination of face-to-face and flipped learning makes teaching more flexible. Similar to synchronous and asynchronous teaching models in e-learning, the mixed teaching model is derived with the advantage of both in order to develop a model that is more suitable for learners.

6 SUGGESTION

To practice flipped teaching, each MICE student writes down their opinions or organizes points about the preview and shares them with their classmates through the teacher's teaching computer to encourage discussion and learning among students. It is a significant advantage of flipping. In this case, before adopting the flipping method, a teacher should clear their mind and reconsider new teaching styles. The lectures from the past are converted into prepared videos for students to preview. A teacher should embrace the new learning model, create an innovative learning environment, shift away from lecture-centered teaching strategies, and utilize digital resources to establish a new teaching approach. Flipped teaching allows teachers to cultivate new teaching abilities. In this approach, teachers do not simply play the role of knowledge providers but also enhance students' thinking abilities by encouraging them to propose problems. Teachers then provide assistance, prompts, and encouragement, as well as observe students' learning conditions, in order to adjust the teaching model. For instance, when many students do not preview lessons, a teacher has to find out the reasons. These reasons may include students not having enough time or losing interest due to the preview being too difficult or overwhelming. By identifying these factors, the teacher can gradually adjust the new flipped teaching model.

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