

The Impact of Interactive Classroom on College Students' Engagement and Perception of Classroom Environment: A Case Study of Sichuan University of Culture and Arts in China

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Abstracts

The present study aims to investigate whether the implementation of interactive classroom strategies by teachers has an impact on students' perception of the psychosocial dimension of the classroom environment and their engagement in class. To investigate teachers' attitudes and perspectives towards the implementation of interactive teaching strategies and tools in the classroom. A mixed-method research design incorporating quasi-experimental methods and interviews was employed. This study focuses on students from Sichuan University of Culture and Arts in China, with 64 participants assigned to the control group and 66 to the experimental group. The control group received traditional instruction, while the experimental group was instructed using the Super Star Learning application. The independent samples t-test was employed to test the hypotheses. The findings indicate that the experimental group outperformed the control group in measures of engagement, cohesiveness, satisfaction, task orientation, innovation, individualization, behavioural engagement, cognitive engagement and affective engagement with the exception of personalization. Therefore, the implementation of interactive classroom strategies by teachers can enhance students' engagement and perception of the classroom environment. Moreover, the adoption of interactive teaching approaches also serves as a valuable reference for educators in selecting and utilizing instructional tools.

Keywords: Interactive Classroom; Engagement; Perception; Classroom Environment

Introduction

With the advent of the Internet, profound changes have taken place in all aspects of people's lives. The renewal of educational information technology and the exploration of new teaching methods have led to the continuous emergence of new teaching models and concepts, and also brought huge challenges to the traditional mainstream teaching models. Some teachers have even started experimenting with new curriculum designs and encouraging students to use online resources and activities. However, the process of integrating technology into the science classroom was slower. Even with the increase of technology use in the classroom, teachers found it was challenging to redesign their teaching model to integrate new resources, new functions, or new ways of interaction between students (Alammery et al., 2014; Slotta & Linn, 2009:440-454). Although teachers may try some interactive teaching resources or online adventures as an aid, they may hesitate to undertake the main task of teaching reform. Teachers hope that educational institutions and educational researchers can provide executable cases related to the Internet environment and technology integrated learning, including whether it is effective for students' academic performance. Therefore, providing teachers with professional development plans, implementing technology integration, and making effective use of mobile

devices to assist teaching, while also equipping teachers with mature and effective teaching strategies, has become particularly important.

Psychologist Kurt Lewin believes that human behaviour is the product of the interaction between the environment and people (Lewin, 2013:231). A good learning environment can help improve students' learning outcomes and performance (Fraser, 2007:103-124). With the developing application of IT technology, classroom tools have changed from blackboards, chalk and textbooks to computers, interactive whiteboards and multimedia courseware. However, the improvement of classroom environment only focuses on the change of physical environment and hardware. Teacher-centred classroom teaching structure and the position of learners passively accepting knowledge has not been significantly changed. The traditional learning environment has been criticized because of the lack of learning enthusiasm, participation, and lack of effective communication between peers and teachers (Li, 2020:29-42). The constructivist learning perspective emphasizes that all students need to obtain knowledge through mutual dialogue and communication. Lack of cooperative dialogue makes it difficult for individuals and groups to express and share knowledge, to carry out high-level learning activities such as analogy, analysis, discussion and consensus of knowledge, thus affecting the construction of knowledge and the cultivation and improvement of critical thinking and other qualities of students (2020:29-42). Therefore, it is necessary to improve classroom environment so that students can actively participate in classroom learning.

For contemporary college students, information technology has already been imperceptibly changing their daily life style and integrating it into them. In their cognition, mobile phone is the most indispensable and common tool in life. One study showed that at least 42 percent of U.S. colleges and universities have adopted "Bring Your Own Device (BYOD)" strategy, which allowed students to bring mobile devices, such as smartphones and iPad to the place of study (Afreen et al., 2014:233-236). According to the survey in China, the penetration rate of smart phones among college students has reached 100%, and almost all of them bring their phones into the classroom (Li, 2015:1). BYOD strategies were popular not only for reducing equipment investment but also for adapting to modern lifestyles.

As mobile tools continue to develop and innovate, a wide range of intelligent applications has emerged. Educational applications, among them, break the limitations of traditional education models in terms of space and time. With their user-friendly interface and easy accessibility, they enable students to efficiently access educational resources anytime and anywhere (Qiu-jie, 2017:63-67). The development of the "Superstar Learning System" aims to provide teachers with a robust technical platform to support and encourage the adoption of new inquiry-based teaching methods. It has been widely promoted through collaboration with numerous universities.

Literature Review

1. Classroom Environment

Classroom environment is an important part of pedagogy. However, scholars have not reached a consensus on the definition of classroom environment. In the literature, classroom environment is sometimes described as classroom atmosphere or classroom climate, even as a learning environment (Schunk et al., 2012:113). Fraser (2012:2) defined classroom environment from social psychological context in terms of shared perceptions of the students and teachers in the classroom. In short, scholars' understanding of the classroom environment included two aspects: on the one hand, it refers to the classroom's physical environment, such as spaces or teaching materials; on the other hand, it refers to the socio-psychological environment of the teachers or students' subjective perception of the environment. From historical studies, we know that western scholars did not emphasize the theoretical connotation of the concept of classroom environment, but paid more attention to its construction and measurement.

2. Interactive Classroom Environment

An interactive classroom is a learning environment that is designed to promote active learning and student engagement through the use of interactive technologies and pedagogies. In an interactive classroom, students are encouraged to participate actively in the learning process, collaborate with their peers, and engage with the instructor and the course material in a dynamic and responsive manner (Baeppler, 2014:1-20; Vonderwell & education, 2003:77-90). Interactive classrooms may include a variety of features, such as interactive whiteboards, multimedia displays, online learning platforms, and mobile devices, which are used to facilitate student-centered learning activities such as group discussions, problem-solving exercises, and simulations (Chen & Lu, 2013:1). The goal of an interactive classroom is to create a more engaging and effective learning experience that can lead to improved student outcomes, such as better academic performance, higher motivation, and deeper understanding of the subject matter (Garrison et al., 1999:87-105).

3. Traditional Classroom Environment in China

Since Comenius initiated and organized the implementation of the Classroom Teaching System, classrooms have become increasingly diversified. However, the "factory mode" education has not changed much. Students are divided into grades according to their age, classrooms are where learning is expected to take place, and every classroom has a teacher that gives instruction and standardized tests. The traditional classroom has always been aimed at efficiently transferring information from teachers to students. The design of the classroom was monotonous and boring, with only one goal in mind (Chen & Lu, 2013:10).

With the developing application of IT technology, classroom tools have changed from blackboards, chalk and textbooks to computers, interactive whiteboards and multimedia courseware. However, the teacher-centered classroom teaching structure and the position of learners passively accepting knowledge has not been significantly changed. This is the current situation in most Chinese classroom environments.

4. Measurement of the classroom environment

Before the 1960s, research of classroom environment focused on assessment of the classroom from the perspective of teacher behaviour. It was not until 1968, when Walberg developed the Learning Environment Inventory (LEI) in Harvard Physics Project to describe students' perception of the classroom environment, that classroom environment research started to receive attention (Walberg & Anderson, 1968:414). Moos developed the Classroom

Environment Scale (CES) and summarized psychosociality of the human environment into three main general categories: Relational dimensions, Personal development dimensions, System maintenance and system change dimensions (Moos, 1979:1; Moos & Trickett, 1987:1). LEI and CES scales have strong validity and have been widely used. Many scholars have developed and used the instruments of classroom environment perception based on above scales. Fraser (1998:1) developed the Individualized Classroom Environment Questionnaire (ICEQ) for the personalized classroom environment. My Class Inventory (MCI) has been developed for children aged 8 to 12 and has been well validated at secondary school. Rentoul and Fraser (1983:1) used to evaluate teachers' perception. They developed the School Level Environment questionnaire (SLEQ). The College and University Classroom Environment Inventory (CUCEI) and the Science Laboratory Environment Inventory (SLEI) were intended to assess the classroom environment in higher education institutions (Fraser, 2012:1). There were other measurements that appeared during this time as well, such as QTI, SLEI, CLES, WIHIC, UMCEQ (Fraser, 1998:7-34; Yin & Lu, 2014:655-669). With the development of network technology, the study of classroom environment was not only found in the gradual expansion of the area, but also used in more and more subjects. During this period, a large number of instruments to measure classroom environment of online education appeared. Taylor and Maor (2000:1) developed the Constructivist online Learning Environment Survey (COLES), moreover, Chang et al. (2001:23-34) developed the Web-based Learning Environment Instrument (WEBLEI). These scales were similar to the traditional scales, but the main difference was the addition of specialized online environmental indicators.

5. College and University Classroom Environment Inventory (CUCEI)

The CUCEI scale is based on the CES scale by Moos, which is a questionnaire that is designed to assess students' perceptions of the overall classroom environment, including factors such as the instructor's teaching style, the course content, and the classroom climate (Fraser & Treagust, 1986:1). The CUCEI includes subscales that measure various aspects of the classroom environment. Table 1 is a brief summary of seven psychosocial dimensions of actual or preferred classroom environment.

Table 1: Descriptive information for each scale in CUCEI

Variable	Description	Sample Item
Personalization	Emphasis on opportunities for individual students to interact with the instructor and on concern for students' personal welfare.	The instructor goes out of his/her way to help students.
Involvement	Extent to which students participate actively and attentively in class discussions and activities.	The instructor dominates class discussions.
Student Cohesiveness	Extent to which students know, help and are friendly toward each other.	Students in this class get to know each other well.
Satisfaction	Extent of enjoyment of classes.	Classes are uninteresting or unappealing.
Task Orientation	Extent to which class activities are clear and well organized.	Students know exactly what is expected in our class.

Innovation	Extent to which the instructor plans new, unusual class activities, teaching techniques, and assignments.	New and different ways of teaching are seldom used in this class.
Individualization	Extent to which students are allowed to make decisions and are treated differentially according to ability, interest, or rate of work.	Students are allowed to choose activities and how they will work.

6. Classroom Engagement Inventory (CEI)

In this study, the researcher used the Classroom Engagement Inventory (CEI) to measure all dimensions of engagement in the classroom. The CEI is a questionnaire that is designed to measure student engagement specifically, including behavioural, affective, and cognitive engagement (Pentaraki et al., 2017:1-21; Wang et al., 2014:517-535). The Table 2 is a relatively brief summary of three dimensions of engagement in the classroom environment.

Table 2: Descriptive information for each scale in CEI

Variable	Description	Sample Item
Behavioural engagement	Behavioural engagement refers to student attendance and involvement in a course and it includes negative behaviours (Pentaraki et al., 2017:1-21).	If I have trouble understanding a problem, I go over it again until I understand it.
Cognitive engagement	Cognitive engagement reflects interest in learning by going beyond class requirements or even redefining the parameters of assignments (Pentaraki et al., 2017:1-21).	When I study, I try to understand the material better by relating it to things I already know.
Affective engagement	Affective engagement involves emotion reactions such as interest, sense of belonging, enjoyment, boredom, rejection, and frustration (Pentaraki et al., 2017:1-21).	I am very interested in learning.

Both the CUCEI and the CEI assess aspects of the classroom environment, the CUCEI focuses student perception of psychosocial dimension of classroom environment, while the CEI focuses specifically on student engagement. The variables of the model are personalization, involvement, student cohesiveness, satisfaction, task orientation, innovation, individualization, behavioural engagement, affective engagement, cognitive engagement.

Research Objectives

1. To compare students' perception of the psychosocial dimension of the classroom environment between a traditional classroom setting and that of an interactive classroom.
2. To compare students' classroom engagement between a traditional classroom setting and that of an interactive classroom.
3. To understand teachers' attitudes and views on the use of interactive teaching strategies and tools in the classroom.

Research Methodology

1. Research Design

This research aims to explore the impact of interactive teaching strategies on classroom environment and student engagement. The main purpose of this research is to measure the variables and prove or disprove the research hypotheses. In order to achieve the purpose of this research, this research uses a quantitative research method. This is done by focusing on a two-group design to collect and analyse data. The research was designed for one instructor to use different teaching strategies for teaching in different two groups. One group used an interactive teaching in the classroom and the other did not. The goal was to compare the classroom environment of art students in different teaching strategies, analyse whether the interactive teaching can improve student's performance of classroom engagement and also gain an understanding of students' perception of psychosocial dimension of classroom environment. The researcher also conducted interview on the teacher to understand the effect of the real experiment perception.

2. Population and Sample

The researcher studied sophomores and juniors at general universities in China. The samples come from sophomore students in Sichuan University of Culture and Arts, aged almost 19-21 years old. Sichuan University of Culture and Arts is a comprehensive university in Southwest China. It is an undergraduate art college in southwest China. The students come from 14 provinces and cities across the country. They were admitted through the Chinese College Entrance Examination. The ratio of male to female is almost equal in each of the classes. Sophomores have also adapted to the university learning style and have a certain understanding of their major. Students of the same major have the same curriculum and teaching syllabus in the same year. In addition, the school management part will assign the same teacher to teach the same course.

There are 130 students in the sophomore year of the animation major of Sichuan University of Culture and Arts. Students of the same major are randomly assigned to four classes at the time of admission. The instructor taught the same lesson for four classes of students. Two classes are a group. The students were categorized into two distinct groups based on their natural class, with the first group comprising of class 1 and class 2, totalling to 64 individuals. The second group constituted the experimental cohort, consisting of classes 3 and 4, encompassing a total of 66 participants. All of the students are experimental subjects.

3. Research Treatment

The instructional treatment includes three aspects, the first of which was to introduce the Superstar Learning application to all instructors, focusing on the use of software. After that, the researcher chose one instructor who was willing to participate in the project research. The instructional treatment alters classroom teaching methods and applies an interactive

function design teaching scheme to classroom teaching. Select two different teaching method classes which are taught by the same instructor. Finally, after experimental teaching, variable data from the students in the experimental group and the control group was collected through a questionnaire survey. This experimental data was then analysed to understand the students' classroom perception. Of course, if the result is effective, teachers can carry out a comprehensive promotion.

Introductory workshop about how to use Superstar Learning application to the instructors:

Step 1: The technical department staff introduced and provided instruction in the software to all instructors through a demonstration workshop.

Step 2: Target training workshop for one instructor on incorporating interactive methods into instruction effectively.

Table 3: Experimental procedural

Week	Class	Activity
1	Group 1- Control group (Class 1 and Class 2)	1. Instructor using traditional teaching method to give lessons to the class. No interactive learning technique involved.
	Group 2 -Experimental group (Class 3 and Class 4)	1. The instructor encouraged students to bring cellphones to the class, and introduced the superstar application in class. 2. The instructor starts to use the application to take attendance. 3. The instructor uses different interactive activity strategies at least 3 times during each session.
2-3	Group 1- Control group (Class 1 and Class 2)	1. Instructor using traditional teaching method to give lessons to the class. No interactive learning technique involved.
	Group 2 -Experimental group (Class 3 and Class 4)	1. The instructor starts to use the application to take attendance. 2. The instructor uses different interactive activity strategies at least 3 times during each session.
4	Group 1- Control group (Class 1 and Class 2)	1. Questionnaire after the course ends.
	Group 2 -Experimental group (Class 3 and Class 4)	1. The well-trained instructor applies the Superstar Learning application functions and strategies freely based on class plans. 2. Questionnaire after the course ends.

4. Research Instruments

The researcher used the questionnaire to understand students' perception of the classroom environment. Based on previous studies, the researcher made an in-depth discussion, extracted the variables in CEI and CUCEI, and modified the questionnaire to make it applicable to be content of this study. The researcher also tested the validity and reliability of the measuring tool through pilot tests.

In order to test the content validity of the questionnaire items, the Item Objective Congruence (IOC) method is employed to measure the questionnaire items' congruency toward measuring the constructs. Three experts were invited to provide ratings for each of the items. The results of the experts' ratings showed that all of the items measuring the constructs had an IOC rating greater than 0.67. According to Turner and Carlson (2003:163-171), the items measuring the constructs were considered valid.

To test the reliability of the questionnaire, 35 samples completed the questionnaire for a pilot test. The internal consistency reliability of the scale was measured with Cronbach's alpha value. All the reliability statistics for the constructs under study were excellent as the reliability score is seen to be above 0.7. According to Taber (2018:1273-1296) a reliability coefficient of ≥ 0.7 or 0.6 is considered acceptable. As a result, the questionnaire for the research is considered reliable and can be employed to collect data for the research.

5. Data Collection Procedures

Data collection was an after-class questionnaire survey. The researchers used Kingsoft to compile the questionnaire, and scored each question according to the Likert scale. The course lasted for four weeks. After the fourth week of study, the links to the questionnaire was sent to the students to conduct a survey, collecting experimental data among the experimental group and the control group. In the questionnaire, students can choose an anonymous ID to fill in. In the preface of the questionnaire, the purpose and significance of the survey are explained and the questionnaire data can be collected only after the permission of the students is obtained. To ensure the collected quantity meets the standard, the researcher instructed all students to scan the QR code displayed on screen at the end of class, complete a questionnaire, and submit it.

The researcher employed a semi-structured interview approach to gather data from the teacher, utilizing open-ended questions to capture their experiences, stress levels, engagement, focus and effectiveness. The information collected from semi-structured interview is presented in the research findings.

Research Conceptual Framework

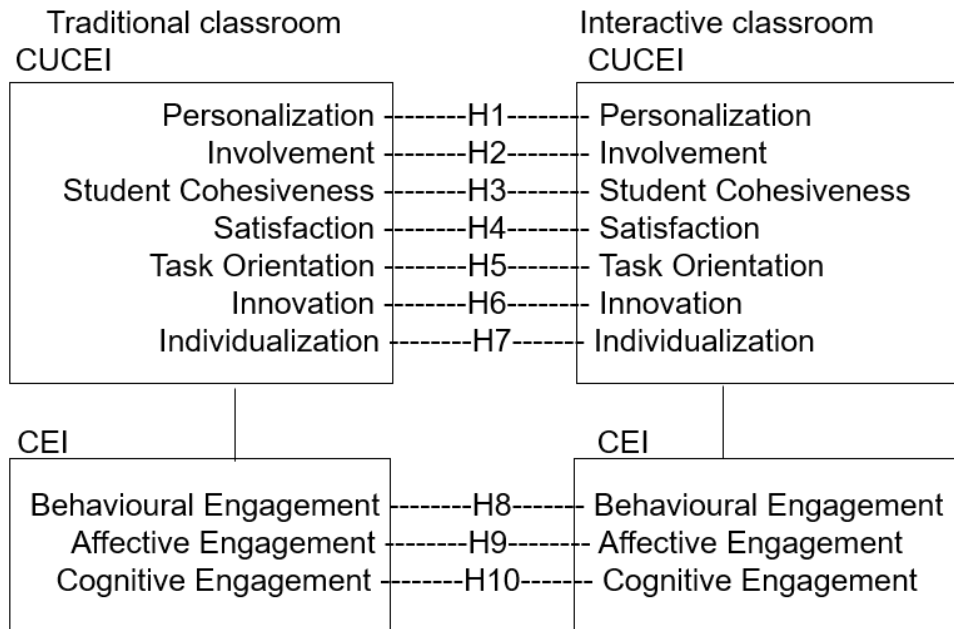


Figure 1: Research Conceptual Framework

Hypotheses

H₀1: The students' personalization in the classroom environment is not different between traditional classroom and interactive classroom.

H_a1: The students' personalization in the classroom environment is different between traditional classroom and interactive classroom.

H₀2: The students' involvement in the classroom environment is not different between traditional classroom and interactive classroom.

H_a2: The students' involvement in the classroom environment is different between traditional classroom and interactive classroom.

H₀3: The students' cohesiveness in the classroom environment is not different between traditional classroom and interactive classroom.

H_a3: The students' cohesiveness in the classroom environment is different between traditional classroom and interactive classroom.

H₀4: The students' satisfaction in the classroom environment is not different between traditional classroom and interactive classroom.

H_a4: The students' satisfaction in the classroom environment is different between traditional classroom and interactive classroom.

H₀5: The students' task orientation in the classroom environment is not different between traditional classroom and interactive classroom.

H_a5: The students' task orientation in the classroom environment is difference between traditional classroom and interactive classroom.

H₀6: The students' innovation in the classroom environment is not different between traditional classroom and interactive classroom.

H_{a6}: The students' innovation in the classroom environment is different between traditional classroom and interactive classroom.

H₀₇: The students' individualization in the classroom environment is not different between traditional classroom and interactive classroom.

H_{a7}: The students' individualization in the classroom environment is different between traditional classroom and interactive classroom.

H₀₈: The students' behavioural engagement is not different between traditional classroom and interactive classroom.

H_{a8}: The students' behavioural engagement is different between traditional classroom and interactive classroom.

H₀₉: The students' affective engagement is different between traditional classroom and interactive classroom.

H_{a9}: The students' affective engagement is different between traditional classroom and interactive classroom.

H₀₁₀: The students' cognitive engagement is not different between traditional classroom and interactive classroom.

H_{a10}: The students' cognitive engagement is different between traditional classroom and interactive classroom.

Research Results

1. Descriptive Statistics of all variables

The table 4 presents group descriptive statistics for various variables related to classroom engagement. Group 2 consistently reports higher mean scores than Group 1 for all variables, indicating that Group 2 perceives higher levels of engagement in the classroom. Additionally, Group 1 tends to have larger standard deviations, indicating greater variability in responses compared to Group 2. The median scores for both groups tend to be higher than the mean scores for most variables, indicating some skewness in the data towards higher scores. Overall, these findings suggest that Group 2 is more engaged in the classroom than Group 1.

Table 4: Descriptive Statistics of all variables

variable	Group	N	Mean	Median	SD	SE
Personalization	1	64	4.85	5.00	0.343	0.0429
	2	66	4.96	5.00	0.154	0.0189
Involvement	1	64	3.92	3.83	0.769	0.0961
	2	66	4.54	4.75	0.551	0.0678
Student cohesiveness	1	64	3.74	3.90	1.091	0.1364
	2	66	4.37	5.00	0.862	0.1061
Satisfaction	1	64	4.42	4.60	0.677	0.0846
	2	66	4.81	5.00	0.414	0.0510

variable	Group	N	Mean	Median	SD	SE
Task orientation	1	64	4.57	4.86	0.542	0.0678
	2	66	4.84	5.00	0.347	0.0427
Innovation	1	64	4.33	4.43	0.639	0.0799
	2	66	4.79	5.00	0.408	0.0502
Individualization	1	64	4.41	4.50	0.615	0.0769
	2	66	4.75	5.00	0.416	0.0512
Behavioral engagement	1	64	4.19	4.09	0.705	0.0881
	2	66	4.71	5.00	0.456	0.0562
Cognitive engagement	1	64	4.35	4.38	0.631	0.0789
	2	66	4.79	5.00	0.387	0.0476
Affective engagement	1	64	4.24	4.19	0.728	0.0910
	2	66	4.72	5.00	0.455	0.0560

2. Independent sample T-test

The data in the table 5 showed the results of T-test performed on various variables. For the personalization group, the p-value is 0.052 ($P > 0.05$), which suggests that the difference between the two groups not be significant. The mean difference is $-2.34e-5$. The effect size is 0.121, indicating a small effect. Except for personalization, the p-values for other variables are very low ($P < 0.05$), indicating that there is a significant difference between the groups for each variable. The mean difference shows the direction of the difference between the groups, with negative values indicating that the first group has lower scores on the variable than the second group. The effect sizes are moderate too large for all variables except for personalization. This suggests that the differences between the groups on these variables are meaningful and not just statistically significant.

Table 5: Independent sample T-test

Variable	Statistic	p	Mean difference	Effect Size
Personalization	1856	0.052	$-2.34e-5$	0.121
Involvement	1109	$< .001$	-0.500	0.475
Student cohesiveness	1348	$< .001$	-0.600	0.362
Satisfaction	1391	$< .001$	$-6.34e-5$	0.342
Task orientation	1442	$< .001$	$-1.54e-5$	0.317
Innovation	1197	$< .001$	-0.429	0.433

Variable	Statistic	p	Mean difference	Effect Size
Individualization	1440	< .001	-0.143	0.318
Behavioral engagement	1220	< .001	-0.454	0.422
Cognitive engagement	1233	< .001	-0.375	0.416
Affective engagement	1285	< .001	-0.375	0.392

3. Summary of hypothesis testing and results

Overall, the results suggest that there are significant differences between the groups on all variables measured except personalization variable, with moderate to large effect sizes for most variables. The table 6 showed the summary of results of the hypotheses testing in the study.

Table 6: Summary of hypothesis testing and results

Hypot heses	Statement	Result after Analysis
H ₀₁	The students' personalization in the classroom environment is not different between traditional classroom and interactive classroom.	P>0.05, the null hypothesis H ₀ cannot be rejected, which indicates that there is no significant difference in students' personalization between traditional classroom and interactive classroom environments.
H ₀₂	The students' involvement in the classroom environment is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' involvement in the classroom environment between traditional and interactive classrooms.
H ₀₃	The students' cohesiveness in the classroom environment is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' cohesiveness in the classroom environment between traditional and interactive classrooms.
H ₀₄	The students' satisfaction in the classroom environment is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' satisfaction in the classroom environment between traditional and interactive classrooms.
H ₀₅	The students' task orientation in the classroom environment is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' task orientation in the classroom environment between traditional and interactive classrooms.
H ₀₆	The students' innovation in the classroom environment is not different between	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' innovation in the classroom

	traditional classroom and interactive classroom.	environment between traditional and interactive classrooms.
H ₀₇	The students' individualization in the classroom environment is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' individualization in the classroom environment between traditional and interactive classrooms.
H ₀₈	The students' behavioural engagement is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' behavioural engagement in the classroom environment between traditional and interactive classrooms.
H ₀₉	The students' affective engagement is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' affective engagement in the classroom environment between traditional and interactive classrooms.
H ₀₁₀	The students' cognitive engagement is not different between traditional classroom and interactive classroom.	P<0.05, therefore the null hypothesis H ₀ is rejected, indicating that there is a significant difference in students' cognitive engagement in the classroom environment between traditional and interactive classrooms.

Qualitative information from teacher's interview

The 6 open-ended questions were formulated to conduct an interview with the teacher in order to finding teacher's suggestions and opinions. The resulting findings are presented below.

1. Are you willing to use new technologies in your classroom?

In my pedagogy, I am inclined to incorporate novel technologies into instructional activities. The integration of innovative teaching technology is congruent with the zeitgeist, and the institution fervently advocates for its implementation. The implementation of new teaching technologies has a positive impact on students' academic performance; however, it also presents various challenges such as the difficulty for educators to adapt to the new pedagogical approach. The utilization of software by students in the classroom is significantly impacted by the network environment, while concurrently, some students exhibit inadequate self-awareness and perceive mobile phones as a source of entertainment rather than solely for academic purposes.

2. The software training you received, did it prove beneficial to you?

Software operation training is beneficial to me as it instils confidence in using new software through school encouragement and comprehensive training. However, while training imparts software usage and flexible application in courses, teachers must constantly explore and possess rich teaching experience to properly apply teaching technology, enhance students' learning enthusiasm, and improve academic performance.

3. Does the utilization of technology and tools in an interactive classroom induce stress?

It can create a certain level of pressure due to the necessity for thorough preparation beforehand, as well as maintaining control over the pace of the class while accurately operating software at specific times and interacting with students. If one is not familiar with teaching or inadequately prepared, they may revert back to traditional teaching methods.

4. Does the utilization of technology and tools in an interactive classroom pose challenges to your teaching?

It does not, but it requires more diligent lesson preparation and greater proficiency.

5. Does the use of technology in an interactive classroom enhance focus?

It may also pose a management challenge and disrupt the course rhythm, leading to increased distractions for students and higher demands on teachers.

6. Does the integration of technology in interactive classrooms yield positive outcomes?

Effective use of technology and interactive activities can capture students' attention. As college students are familiar with modern technologies and software, they prefer to engage in learning through these means. This not only enhances classroom effectiveness but also fosters closer relationships between teachers and students.

Discussion

The quantitative data on seven variables related to students' perception of the psychosocial dimension of classroom environment indicate that there is no significant difference between traditional and interactive classroom environments in terms of students' personalization. This is attributed to the Personalization variable, which emphasizes opportunities for individual students to engage with the instructor. Regardless of the type of educational technology employed, its impact on individual welfare is minimal and teachers' classroom attitudes remain consistent. The results of the remaining six variables all exhibited significant disparities between the experimental group and the control group, with involvement having the most pronounced impact due to technology facilitating equitable access for all students and providing them with enhanced opportunities to articulate their viewpoints and showcase their work. After the implementation of interactive classroom strategies, there is a greater emphasis on creating a student-centered learning environment and promoting students' autonomy. These findings suggest that implementing interactive classroom strategies can enhance students' perception of the psychological dimension of the classroom environment.

The quantitative data on three variables pertaining to students' perception of classroom engagement revealed significant disparities in engagement between the experimental group and the control group. In comparison to traditional classrooms, the implementation of interactive classrooms by teachers resulted in more positive behavioural, cognitive, and affective participation from students, thereby enhancing their overall liking for the learning environment.

Through conducting open interviews with the teachers, the researcher explored the perspectives and attitudes of educators following the implementation of interactive teaching strategies and tools. The discussion began by exploring the teachers' hands-on experiences (questions 1 and 2), followed by an exploration of their emotional responses, including feelings of pressure (question 3), engagement (question 4), attention (question 5), and finally concluded with an analysis of the teachers' viewpoints. Based on the interview results with experimental teachers, it is believed that incorporating interactive teaching strategies and tools aligns with current trends and has a positive impact on students' learning outcomes. The implementation of interactive teaching strategies and tools during the experiment can effectively enhance

student engagement, foster a positive classroom environment, and promote students' active participation in academic performances. After undergoing a series of software training, educators will feel more confident in utilizing the latest teaching tools. However, integrating these new strategies and resources into their classrooms may also create added pressure for teachers, potentially leading to increased time and energy devoted towards lesson preparation and instruction.

Suggestion

We have found that the successful implementation of educational technology improvements or changes requires strong support from society, enterprises, and schools. However, many teachers are hesitant to take on the risks and consequences associated with teaching reform, resulting in a lack of innovation and development among educators and a loss of student interest in the classroom. By examining the impact of the relationship between blended learning environments, instructional methodologies, and student perception and engagement, we have determined that the new teaching strategy is effective. This not only instills confidence in educators regarding the utilization of innovative technologies but also serves as a valuable reference for selecting pedagogical approaches and employing educational tools.

Training plays a crucial role in the implementation of interactive classroom teaching strategies, as it determines the extent to which software is promoted, maintained and technically supported, thereby influencing teachers' willingness to invest time in learning and utilizing such tools. Additionally, input from the teaching and research team on interactive approaches for different courses can significantly boost teacher confidence in using these software solutions.

Future Research

In the future, educators can flexibly utilize such software and teaching methodologies to enhance instructional efficacy. Teaching and research groups may be established to improve and promote interactive teaching methods across various courses, ultimately leading to superior educational outcomes.

The interactive classroom environment and teaching strategies can have a significant impact on the overall classroom atmosphere. It is important to consider how different strategies, such as the flipped classroom model, may affect the learning environment in comparison to traditional methods.

Teaching style and the ability to embrace software may influence the effectiveness of different teachers' interactive classroom strategies. Will there be variations in the impact of these strategies? How do college students' participation and perception differ in interactive classrooms? These are the issues we can explore in future discussions.

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