THE EFFECTIVENESS OF ONLINE TEACHING TOWARDS STUDENTS' INTEREST IN LEARNING PHYSICS OF THE GRADE- 9 STUDENT IN YUNNAN PROVINCE

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ABSTRACT

This study took the 9th grade students of Kunming Changshui Experimental Middle School as the research subjects. The purpose of this study is: 1) To study online learning affects Students' interest in learning Physics. 2) To compare the differences between online learning and traditional teaching in students' interest in learning physics. 3) To investigate how the teachers' perspectives on online learning affect Students' interest in learning Physics. This study adopted quantitative and qualitative research methods. To interpret the data, we used mean, standard deviation and narrative analysis for statistical analysis. The main research tools were questionnaires, tests and course plans, and teacher logs. The results showed that: 1) online learning affects students' interest in learning Physics the overall mean score of all variables was 2.48, and the standard deviation was 0.64, indicating that the consistency of the respondents was generally high; 2) According to the test results, online learning was 69.36 and traditional learning was 75.84, 3) Teachers perspective presented that students who received online teaching performed better in some aspects and average in most aspects. These results show that online teaching did not improve students' interest in learning, which harmed their learning outcomes. This study emphasizes the importance of students' interest in learning. Suggestions include optimizing technical support for online teaching, improving course design, and enhancing interaction. Future research should explore technical support for online teaching, technical training for teachers, and longitudinal impact and integration to continuously improve online teaching strategies.

Keywords: Online Teaching, Interest in Learning, The Effectiveness

INTRODUCTION

Research Background

As Internet technology continues to mature and network bandwidth increases, people can obtain information more quickly and stably around the world. This provides sufficient bandwidth support for online teaching, allowing multimedia elements such as video, audio, and virtual experiments

to be widely used in online teaching.

The innovation of Internet technology provides diversified teaching tools and platforms for online teaching. Educators can use online teaching platforms to create virtual classrooms, integrate multimedia resources, and achieve remote interaction. The dominant position of students is more prominent. Teachers can stop and discuss with students at any time without worrying about disrupting the teaching progress, truly realizing "learning to determine teaching"(Li,2022)

The status students can obtain learning materials, submit assignments, and participate in discussions through the online learning management system. This interactive learning model enriches the educational process and improves student participation and learning experience. The big data and artificial intelligence technology of the Internet have injected more intelligent and personalized elements into online teaching. By analyzing students' learning behaviors and data, educators can better understand students' learning habits and levels and provide personalized learning paths and teaching resources. This intelligent teaching method is more in line with students' individual needs and improves learning effects.

The rise of online teaching has also prompted Internet companies and educational institutions to increase investment in online education platforms and technologies, promoting the upgrading of the Internet industry. Various online learning platforms and educational apps are emerging one after another, and competition is fierce, providing students and educators with more choices.For example, experiments are an important means of physics teaching. In order to better reproduce the experimental inquiry process, teachers can use "digital experiment" software to guide students to conduct inquiry experiments online and review the physics experimental phenomena intuitively and conveniently (Li,2022).

Secondly, the COVID-19 epidemic has had a profound impact on the global education field and promoted the rapid popularization and development of online teaching. China started online teaching in the spring semester of 2020 to implement the Ministry of Education's requirement of undisrupted learning for 276 million students, approximately 40 million of whom were junior secondary school students (China Ministry of Education, 2020). China was the first county that enforced school closures in the name of Suspending Classes without Stopping Learning during the COVID-19 pandemic lockdown, (Hu et al,2021)school teachers' transition was inevitably a challenging process to address ever-emerging problems with a huge population and unbalanced ICT development.

With the outbreak of the epidemic, many countries and regions have taken emergency measures to close schools. In order to protect students' learning rights, schools have turned to online teaching. This rapid change

has prompted schools and educational institutions to actively seek online teaching solutions. Since traditional classes cannot be held, many schools choose to use various online teaching platforms, such as Zoom, Microsoft Teams, Google Classroom, etc., to achieve remote teaching. The proliferation of these platform applications has contributed to the rapid development of the online education industry. During the epidemic, educational technology companies actively innovated online teaching tools, including virtual experiments, interactive teaching materials, online tests, etc., to provide a richer and more effective teaching experience. This technological innovation helps improve the quality of online teaching.With the spread of COVID-19, we believe the global scale of online courses will grow sharply. Therefore, there should be more focus and attention paid to the occurrent online teaching model, and we do call for more practice of online teaching to avoid the transfer of personnel to reduce the risk of cross-infection to the minimum .

Research Objectives

1. To study online teaching affects Students' interest in learning Physics.
2. To compare the differences between online teaching and traditional teaching in students' interest in learning physics.
3. To investigate how teachers' perspectives on online teaching affect students' interest in learning Physics.

Research Questions

The research questions are listed as follows:

1. How does online teaching affect students' interest in learning Physics?
2. What are the differences between traditional teaching and online teaching in terms of students' outcomes in learning in Physics?
3. What is the teachers' perspective on online teaching affecting students' interest in learning Physics?

Research Hypotheses

1. Online teaching can affect students' interest in learning Physics.
2. Online teaching can influence students' interest in learning physics more than traditional teaching.
3. Teachers believe that online teaching can better influence students' interest in learning physics.

Literature Review

Representative Pedagogical Theory

Constructivism involves several related theories, including some important cognitive psychology theories and educational theories. This study mainly focuses on the related theories of constructivism in the field of education. Piaget's theory of cognitive development: Jean Piaget is an important figure in the field of cognitive psychology. He proposed four stages of cognitive development: the sensorimotor stage, preoperational

stage, concrete operation stage, and formal operation stage. . He believes that children gradually build a cognitive structure of the world through active interaction and experience (Piaget, 1932).

Vygotsky's Sociocultural Theory: Leif Vygotsky emphasized the importance of social interaction and cultural environment on cognitive development. He proposed the concepts of "proximal development zone" and "far development zone" and believed that through social interaction, students can achieve a higher level of cognition based on their potential cognitive level (Vygotsky,1932). Jerome Bruner's constructivist educational theory: Bruner developed constructivist educational theory in the mid-20th century, emphasizing that students construct knowledge through interaction with textbooks and other students. He proposed the concept of "enactive learning", emphasizing that learning is a process of active participation (Bruner,1966).

Social constructivism: Social constructivism is an extension of constructivism and emphasizes the influence of social environment on knowledge construction. This theory emphasizes the importance of sociocultural background, social interaction, and context in the construction of knowledge (Smith,1998). John Dewey's empiricist educational theory: Dewey's empiricist educational theory had a profound impact on constructivism. He emphasized that students construct knowledge through practical experience and practice, and advocated that learning and life are closely connected (Dewey,1938).

Golfstein's Cognitive Development Theory: Golfstein proposed the "Cognitive Development Theory of Regret", emphasizing that in cognitive development, students construct more complex and profound cognitions by constantly adjusting and revising their understanding. Structure (Golfstein,1975). George Keller's theory of subjective experience: Keller is one of the important representatives of constructivism and empiricism. He proposed the subjective experience theory, which believes that individuals construct their understanding of the world through their own subjective experiences (Keller,1925). These theories together form the theoretical basis of constructivism, which emphasizes that students are the constructors of knowledge and learning is an active and participatory process.

Related Studies

Students' active participation: The constructivist concept emphasizes students' active participation and interaction with teachers and classmates.(Decristan et al,2023)In an online teaching environment, researchers can stimulate students' interest in physics learning by designing interactive and participatory learning activities. Students' participation in whole-class discourse is considered a vital part of classroom learning and has gained particular attention in recent research (Böheim et al., 2020). Therefore, this requires researchers to think carefully

and carefully design the online teaching process. For example, the online teaching in this study can use virtual experiments, simulation software, and online discussions to allow students to actively participate in experiments and problem-solving.

Cooperative Learning: Both constructivism and online teaching focus on the importance of cooperative learning. Online platforms can provide collaborative tools that enable students to co-construct knowledge in a virtual environment (Peterson,2023). For example, this study uses DingTalk for live teaching. Students can use public chat rooms in DingTalk to interact with teachers and classmates. They can also create group chat rooms to discuss some classroom issues. Through cooperative learning, students can communicate with each other and share ideas, thereby increasing their interest in the subject of physics.

Practical learning: Constructivism advocates practical learning, and online teaching provides many tools that can support practical learning. Virtual labs, simulation software and online projects allow students to engage in real-world applications in physics, making the subject more attractive. Many schools are not equipped with many experiments because the experimental equipment is expensive or inconvenient to operate. However, virtual laboratories can solve this problem and allow students to do experiments at home.

Problem-based learning: Problem-based learning is a common teaching strategy in constructivism and online teaching (Chueh et al.,2024). By guiding students to solve real-world problems, it stimulates their curiosity and thirst for knowledge, thus making learning more engaging. This is an important aspect of students' learning interests. The physics subject emphasizes that students can connect the knowledge they have learned with the reality of life.

Multimedia and technology applications: Online instruction allows educators to utilize multimedia and technology resources to present physics concept Chen et al.,2012). Through multimedia forms such as images, videos, and simulations, abstract physical concepts can be presented more vividly and improve students' interest in physics. This is the most advantageous point of online teaching, and it is also a feature that traditional teaching does not have. This study should make full use of this point. The above points are some of the connections between constructivism and this study. Researchers should fully integrate the theoretical ideas of constructivism, constantly optimize the research design and process, and combine constructivism, online education, and learning interests well.

METHOD

Population and sample group

This study takes 9th-grade students from Changshui Experimental Middle School in Kunming, Yunnan Province, China as the main research

population. There was a total of 400 students in the 9th -grade that consisted of 8 classes, each class had 50 students.

Research Instruments

1) Questionnaire for students

The student questionnaire is divided into 6 parts:Actively participate in class,Take the initiative to ask questions,Additional learning and reading,In-depth thinking and discussion,Practice and application,Self-driven learning. The questionnaire score is divided into five levels,Strongly agree: 5, Generally agree: 4, Sometimes: 3, Disagree: 2, Never: 1.There are 30 questions in total.The IOC of all questions is between 0.6-1.00, and Cronbach's alpha = 0.85. Since Cronbach's alpha > 0.8, the designed scale is reliable.

2) Test

This study selected 100 students from two classes of Changshui Experimental Middle School in Kunming, Yunnan Province, for course testing. Understanding buoyancy, Exploring the Factors Influencing the Buoyancy of Objects, Archimedes' principle, Conditions for objects to float and sink, Balance of buoyancy. Total 25 items, each item has 4 scores, total 100 scores. The IOC of all questions is between 0.6-1.00, and Cronbach's alpha = 0.85. Since Cronbach's alpha > 0.8, the designed scale is reliable.

3) Teacher Diary

The teacher's diary was kept for 5 weeks, with a total of 10 hours. The researcher wrote the teacher's diary after finishing the lesson every day to record the student performance about student interests. The teacher diary is divided into 6 parts: Actively participating in class, Taking the initiative to ask questions, Additional learning and reading, In-depth thinking and discussion, Practice and application, and Self-driven learning of all questions is between 0.6-1.00, and Cronbach's alpha = 0.85. Since Cronbach's alpha > 0.8, the designed scale is reliable.

Data Collection

Step 1: We will implement different teaching strategies. Specifically, one class uses online teaching and the other class uses traditional teaching.

Step 2: Pos-test: We will conduct a post-test on students in both classes to investigate the learning effects of students after different teaching methods and contents.

Step 3: We will investigate students' opinions through questionnaires. More specifically, we will send the questionnaires to students to obtain their scores.

Step 4: We will collect teacher logs.

Step 5: Finally, analyze the data and write a report.

Data Analysis

This study will use descriptive statistics and inferential statistics to analyze the results. The questionnaire uses several measurement methods such as frequency, percentage, mean and standard deviation.Test Analyze the students' scores, including mean, standard deviation, t-test related samples and t-test

independent samples. The researcher analyzed by frequency and percentage. The purpose is to summarize the teachers' views on the classroom performance and learning interest of students in online and traditional teaching

FINDINGS AND DISCUSSION

Research Objective1 To study how online teaching affects Students' interest in learning Physics. The results of online teaching are shown in Table 2, and the results of traditional teaching are shown in Table 3

Table 2:
Means and standard deviation analysis for each study variable
(Online Teaching n=50)

Items	n	($\bar{x}$)	S.D.
Active participation in class	50	2.06	0.63
Ask questions actively	50	2.24	0.70
Additional learning and reading	50	1.91	0.69
In-depth thinking and discussion	50	2.33	0.57
Practice and application	50	3.82	0.58
Self-driven learning	50	2.54	0.68
Total	**50**	**2.48**	**0.64**

All Variables: The mean score is 2.48, with a standard deviation of 0.64. Which means "not sure," interpreted as low. Active class participation: The mean score is 2.06, with a standard deviation of 0.63. The score of 3.00. Which means "Agree," interpreted as low. Additional learning and reading: The mean score is 1.91, with a standard deviation of 0.69. Which means "Agree," interpreted as low. Practice and application: The mean score is 3.82, with a standard deviation of 0.58. Which means "Agree," interpreted as high.

Table 3:
Means and standard deviation analysis for each study variable
(Traditional Teaching n=50)

Items	n	($\bar{x}$)	S.D.
Active participation in class	50	3.86	0.70
Ask questions actively	50	3.99	0.59

Additional learning and reading	50	4.02	0.61
In-depth thinking and discussion	50	4.11	0.66
Practice and application	50	3.02	0.65
Self-driven learning	50	2.46	0.58
total	**50**	**3.58**	**0.63**

All Variables: The mean score is 3.58, with a standard deviation of 0.63. Which means "Agree," interpreted as high. Additional learning and reading: The mean score is 4.02, with a standard deviation of 0.61. Which means "Agree," interpreted as high.In-depth thinking and discussion: The mean score is 4.11, with a standard deviation of 0.66. Which means "Agree," interpreted as high. Self-driven learning: The mean score is 2.46, with a standard deviation of 0.63. Which means "Agree," interpreted as low.

Research Objective 2 To compare the differences between online teaching and traditional teaching in students' interest in learning physics. The results of the test are shown in Tables 4 and 5.

Table 4:
Results from the Test

Teaching Method	Understanding buoyancy (20)	Exploring Factors Influencing the Buoyancy of Objects (20)	Archimedes' principle (20)	Conditions for objects to float and sink (20)	Balance of buoyancy (20)	Total score (100)
Online Teaching	15.2	15.6	10	16.88	11.68	69.36
Traditional Teaching	15.68	16.64	12.4	18.08	13.04	75.84

Table 5:
Results from the Test

	Teaching Method	df.	($\bar{x}$)	S.D.	t-test
Post-test	Online Teaching	50	75.84	30.67	7.46
Post-test	Traditional Teaching	50	69.36	66.36	-0.56

Each class has 50 students in this test, of which the average score of online teaching students was 69.36, and the average score of traditional teaching students was 75.84.

$t_{.05,49} = 1.68$

From table, Traditional Teaching: $\bar{x} = 75.84, S = 30.67$, $t - test = 7.46 \rangle t_{.05,49} = 1.68$

Accept average scores of achievements traditional teaching more than criteria 70 percent at significant .05.

Online Teaching: $\bar{x} = 69.36, S = 66.36, t - test = -0.56 \langle t_{.05,49} = 1.68$

Accept average scores of achievements online teaching less than criteria 70 percent at significant .05. Research Objective 3 To investigate how teachers' perspectives on online teaching affect students' interest in learning Physics.

Most students have a positive attitude towards virtual experiments in class. One student told me, "I don't need to worry about operational safety and operational errors in virtual experiments, and there will be corresponding operational prompts, which has greatly improved my confidence." This is indeed the advantage of virtual experiments. Under the premise of ensuring safety, it can also provide a lot of experimental equipment that is difficult to obtain in reality, and the phenomena and conclusions of the experiment are presented in a very specific way. Regarding virtual experiments, one student also said, "I would rather touch those experimental equipment and operate them myself." This shows that not all students have a positive attitude toward virtual experiments. Some students prefer to operate them themselves and observe the experimental phenomena with their own eyes. As for the discussion link in online teaching, the overall interactivity is low. Some groups did not even notice that the teacher entered the group discussion room to listen, and no one spoke.

Discussion

Students who received online instruction generally had a negative attitude toward the impact of online instruction on students' interest in learning physics. Among them, the mean score of variables such as practice and application were high (3.82), indicating that students generally recognized the importance of these factors in promoting students' interest in learning physics. Theoretically, these findings support the views of constructivism, interest development theory, and motivation theory emphasized by scholars such as Li (2021) and Chen (2022). These theories emphasize the importance of interaction, motivation, and a rich environment in learning. Therefore, the results of this study not only confirm these theories, but also emphasize that when implementing online instruction to improve students' interest in learning, student diversity, motivation cultivation, and learning conditions and environment should be considered.

The scores of students who received online teaching were lower than those who received traditional teaching, which to some extent indicates that online teaching has less impact on students' interest in learning physics than traditional teaching. Paul and Jefferson (2019) aimed to compare the scores of students who took online and face-to-face courses in environmental science from 2009 to 2016, focusing on the impact of different teaching modes on student scores. The study used traditional chi-square analysis and independent sample t-test to analyze the data, which is the same as this study. This study believes that the reasons for the lower scores of students in online teaching are as follows:

Technical problems: The effective use of technology is crucial to the success of online learning. Technical problems and lack of skills can affect learning interests and grades. This is also shown in Hongsuchon et al. (2022). Lack of learning initiative: The online learning environment is usually asynchronous, requiring students to have stronger autonomous learning abilities. Online learning requires higher self-discipline and time management skills. This is also shown in Ordway (2020). Lack of feedback and interaction: This includes two aspects. On the one hand, it is the problem of teachers, that is, the interaction between teachers and students is not direct enough, and when students are active, they may not get the expected teacher feedback.

CONCLUSION

Summary

Research objectives 1) To study how online learning affects Students' interest in learning Physics. Result online teaching has no positive impact on students' interest in learning physics, 2) To compare the differences between online learning and traditional teaching in students' interest in

learning physics. Result, online students, have lower learning outcomes than traditional students and, 3) To investigate how the teachers' perspectives on online learning affect Students' interest in learning Physics. Result from a teacher's perspective, online teaching has no positive impact on students' interest in learning physics in most aspects. The results of this study have the following implications for the impact of online teaching on students' interest in learning physics: 1) Students lack autonomy and self-discipline, which requires cooperation between home and school, as well as continuous improvement of online teaching design, such as feedback and supervision of online teaching. 2) It is crucial to enhance students' self-confidence, which can be achieved by strengthening teachers' training on online technology and optimizing online teaching tools to make them more convenient and easier to operate.

Future Research

Based on the findings of this study, the following recommendations are made to enhance the impact of online teaching on students' learning interests. Future research should track the long-term impact of online teaching and provide insights into academic performance and personal growth. Comparative studies in different educational settings can reveal the effectiveness of online and traditional teaching and optimize hybrid teaching models. Research should focus on the best practices of hybrid learning and optimize course design by combining the advantages of online and offline. In addition, explore the application of virtual reality and artificial intelligence in online teaching to enhance students' immersive learning experience and engagement. Research should also examine the impact of online teaching on different student groups to ensure equal educational opportunities.

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