Scholar Publishing Group
Academic Journal of Environmental Biology
https://doi.org/10.38007/AJEB.2020.010304
ISSN 2789-8407 Vol. 1, Issue 3: 28-35

Interactive Environmental Microbiology Teaching Based on Multimedia Technology

Culver Joseph*

Univ Trento, Dept Informat Engn & Comp Sci, Via Sommarive 9, I-38123 Trento, Italy

**corresponding author*

Keywords: Multimedia Technology, Environmental Microbiology, Teaching Effect, Interactive Teaching System

Abstract: Multimedia interactive teaching is essentially a teaching mode that makes full use of multimedia teaching equipment, combines teachers' teaching and classroom control ability, stimulates students' autonomous learning potential, and returns the classroom to students. In the teaching practice of environmental microbiology(EM), infiltrating high-tech into the teaching process can enable students to have a deeper understanding of the learning objectives of the course. For this reason, this paper designs a multimedia interactive teaching system(MITS), which can be applied to any course teaching to realize an intelligent teaching mode. After investigating the use of multimedia technology(MT) in EM classrooms and the teaching effect of schools in a province, it is found that most schools often use MT for teaching in EM. Students believe that multimedia interactive teaching can improve learning interest and inspire thinking. The proportion of the number of people is also very large. The survey results reflect the pivotal role of MT in classroom teaching.

1. Introduction

Today's society has entered the information age. With the continuous deepening of the reform of technical personnel training and the popularization of computers, the traditional teaching methods can no longer meet the needs of the ever-changing science and technology. Especially for subjects such as EM, which require students to have a strong understanding ability, it is more necessary to use interactive teaching mode to arouse students' thinking. Among them, the teaching system based on MT is the research hotspot of modern educational technology, and it is also an important direction of its application field.

At present, MT is widely used in classroom teaching, and MT teaching has achieved good teaching results. For example, a scholar recognized the role of interactive teaching very much. He

combined case teaching method and discussion-based learning in EM teaching, so as to change teachers' teaching concept and improve students' ability to analyze and solve problems [1]. Nowadays, many schools use multimedia technologies such as electronic whiteboards and projectors to teach. This method broadens the teaching channels, and through multimedia audio and video animations and other functions, students can feel that learning is not just boring words. In the process of listening to the class, students can According to the teacher's teaching content, a stylus is used to record notes, and draft calculations can also be performed for some problems, and then the notes and drafts made are classified, organized and saved for future review [2-3]. Some teachers of EM believe that this course not only allows students to understand the role of microorganisms in environmental protection and environmental governance, but also requires students to solve environmental problems through microbial engineering technology in the study of microbial processes [4]. It can be seen that the importance of MT in teaching is of great help to improve the quality of teaching.

This paper first analyzes the effect of multimedia interactive teaching, and then designs a MITS, which can be applied to the actual teaching of EM. Then this paper investigates the application of MT in classroom teaching of EM in a provincial school, and analyzes the current situation of MT in teaching and its help to teaching.

2. The Value of Multimedia Interactive Teaching

(1) Contribute to the transformation of the main role of the classroom

This teaching mode truly realizes the transformation of the classroom role that is required and demanded under the background of the new curriculum reform. Students are no longer passive recipients in the learning process, and teachers are transformed from the "master" of the classroom to become the organizer and server of classroom order and learning process [5]. Such a change is beneficial to the creation of a free and equal, democratic and harmonious learning atmosphere and the improvement of the teacher-student relationship.

(2) Helping to cultivate students' awareness of cooperative inquiry

Under this model, the group inquiry learning mechanism can be better developed and developed, and in a free, equal, democratic and harmonious learning atmosphere, information among students can be exchanged more effectively [6]. Group discussion, group study, representative presentation and other methods are more conducive to students' mutual inspiration, can maximize the role of group inquiry learning, and are more conducive to the cultivation of students' sense of cooperation and teamwork spirit [7].

3. MITS Design

3.1. Teaching System Design Requirements

The classification of interactive technologies is based on the interaction of media. The interactivity of media has two capabilities and characteristics, one is its ability to directly interact with people; the other is the ability and characteristics of media to support the interaction and interaction between people [8]. This article can be described as "interactivity of teaching system". The interactive research of the teaching system should start from the audience's use ideas and start with the design of the teaching system, focusing on the following aspects:

(1) Database system

The main points of interaction in the past were the difficulties and key points of teaching, and

gradually developed into the mastery of knowledge points. At present, it is gradually shifting to the direction of the database. Entering important knowledge content into the database system can solve the difficulties and problems in the teaching process. Focus on real-time calls and queries [9-10].

(2) Simple operation interface

The style of the operation interface should be consistent in the interactive design, so that the audience can easily operate it during the learning process. Special attention should be paid to the menu and control buttons that should always be displayed on the interface [11].

(3) Comprehensive knowledge content

The content of knowledge should incorporate all the wisdom of teachers with rich teaching experience into the database system, integrate this knowledge into the corresponding courseware as much as possible, and take the database system as the core to provide the audience with a wealth of knowledge query and knowledge invocation [12] .

3.2. Network Model of Teaching System

This multimedia teaching system takes the IP network as the transmission platform, on which to carry out multimedia interactive synchronous teaching, it needs to transmit a large amount of control data and multimedia data, so appropriate network transmission methods and protocols should be used [13]. The system consists of a teaching terminal and several listening terminals, and multicast is used to transmit data between them to ensure the correct transmission of control data and the consistency of system status; for multimedia data, the main requirement is real-time, which can be A certain amount of packet loss is allowed, so UDP and RTP protocols are used for transmission [14]. Fig. 1 is the network model of the MITS.

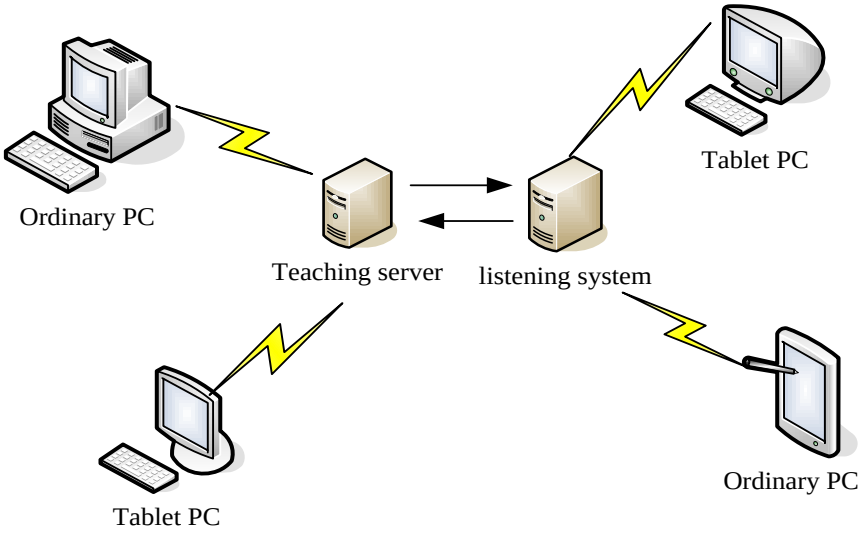

Figure 1. Network model of MITS

(1) Teaching terminal system. This subsystem is mainly to provide support for teachers to teach. The subsystem can not only meet the needs of teachers in general teaching, but also can automatically identify and judge the equipment capabilities of the system, and call the multimedia network transmission module to send multimedia information to the students, providing text chat as an auxiliary function, which is closer to the in the real classroom teaching environment [15].

(2) Listening subsystem. The main function of this subsystem is to meet the requirements of

students to attend lectures, and to support interactive discussions between students and teachers. After students log in to the system, they receive the teacher's audio and video information and screen courseware content information through the multimedia transmission module, and then decode and play them back locally, so as to realize the function of listening to lectures in remote real-time teaching [16]. At the same time, the system will use a variety of interactive means to interact with teachers by sending requests based on the device capabilities and current network capabilities of the listening end to achieve a good lecture effect.

3.3. Realization of Teaching System

In order to meet the system requirements, SVMX, as a screen video stream encoding and decoding algorithm, combines the API hook technology through a system system using the user message mode, which makes the performance efficiency of screen video stream recording particularly high and the screen display particularly clear [17]. In this case, there is no need to increase system hardware resources or system permissions, the running speed is very fast, the function implementation is simple, and it has good portability.

When using this system for teaching, the playback module plays the sound, video and screen synchronously. The screen is the result of the operation sequence acting on the lesson plan. It is necessary to parse the operation sequence triples in the content list and save them into the event timetable TimeTable, and then Use the timer (Timer) to check the schedule and use it at the appropriate time; CPPTView is the parent window of the PPT playback window; the playback of the sound is handled by the decoding class CWaveCodec and the playback class CWavePlayer; the video playback is performed by the decoding class CVideoCodec and the playback window CVideoDlg Responsible [18-19].

4. Application of MT in EM Teaching

4.1. Investigation on the Application of Multimedia Teaching in EM Classrooms

In order to obtain reliable data and information, I have investigated the application status of interactive teaching of EM classroom MT in provincial, municipal and county-level demonstration schools, aiming to discover the current application of multimedia teaching in EM classrooms. The current situation provides reference and help for the effective implementation of multimedia teaching in the current EM classroom. The results of the survey data are counted on EXCEL, and the statistical formula is as follows:

$$SUM = SUM(num1, num2, ...) \tag{1}$$

$$AVERAGE = AVERAGE(num1, num2, ...) \tag{2}$$

Formula (1) SUM represents the summation function, and formula (2) AVERAGE represents the average value function.

4.2. Analysis of the Application of Multimedia Interactive Teaching

Figure 2 shows the frequency statistics of the use of multimedia in classrooms by EM teachers in different types of schools. It can be seen that most teachers often use multimedia in EM classroom teaching, and occasionally or infrequently use multimedia. less, indicating that multimedia teaching

is currently popular in EM classrooms. However, there are still gaps between different types of schools. The data in the figure shows that the provincial and municipal demonstration school teachers have a high probability of using multimedia in the EM classroom, 90.06% (75.41% + 14.65%) and 89.62% (67.28% + 22.34%), respectively, which can reach nearly 90%; and 25.15% (13.75%+11.4%) of teachers in county-level demonstration schools occasionally and infrequently use multimedia for teaching.

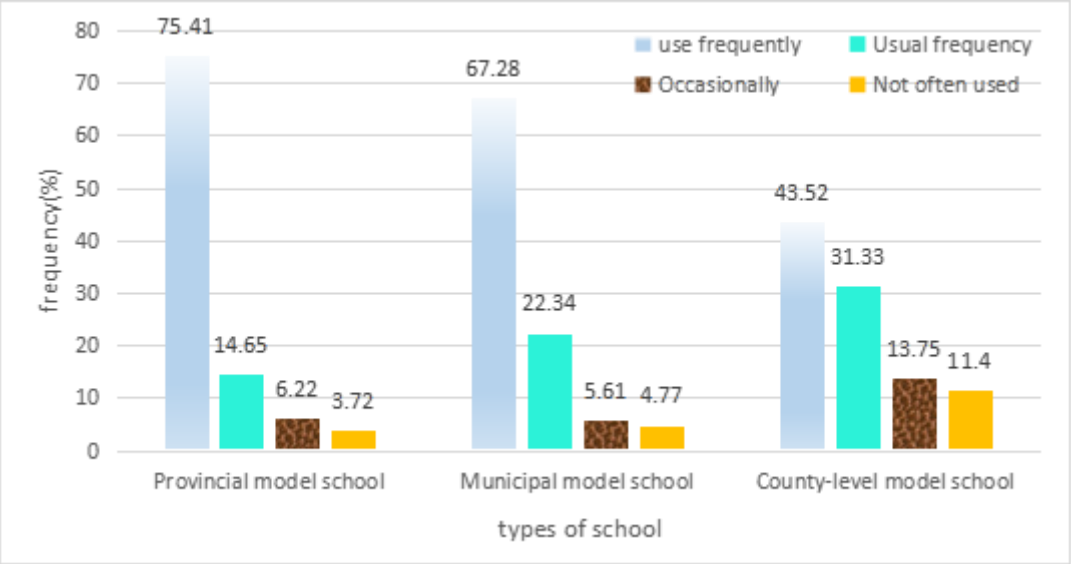

Figure 2. How often teachers use multimedia

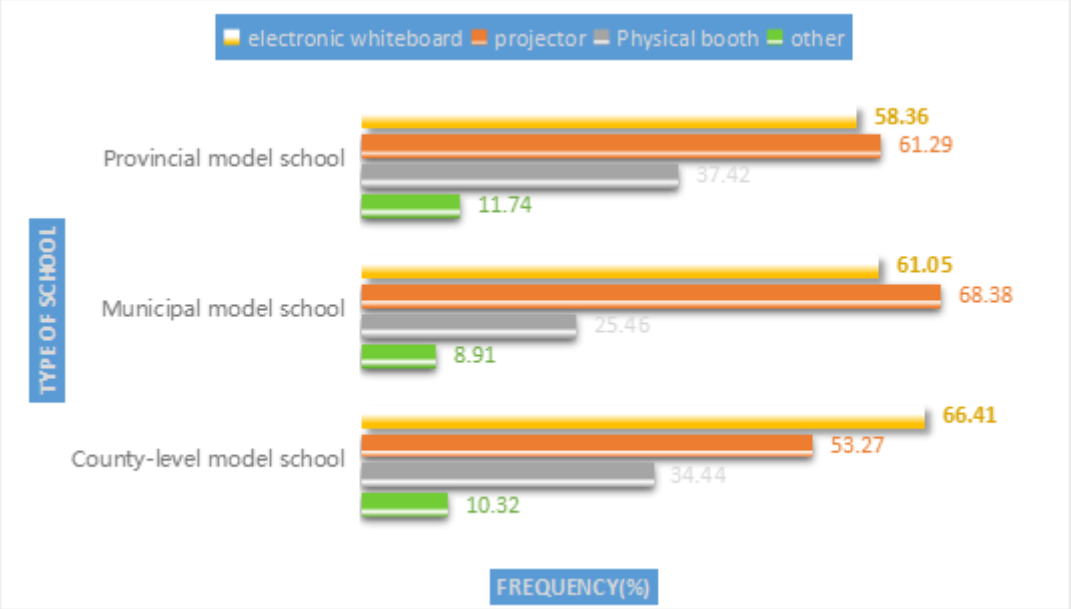

Figure 3. Teachers' use of multimedia opinions

As shown in Figure 3, teachers of different types of school EM choose to use multimedia

hardware in the classroom. There is little difference in the use of multimedia hardware in different types of schools. EM teachers in provincial, municipal and county-level demonstration schools mostly choose electronic whiteboards and projectors when using multimedia software and hardware in classroom teaching, while physical booths and other forms of multimedia software and hardware are rarely used. Considering the standardized construction of educational facilities in the education system, it can be shown that the current multimedia hardware in these schools in the province is basically the same.

Table 1. Whether students think multimedia teaching can improve their interest in learning

	Yes, greatly improved	Yes, but not much	It doesn't feel obvious	Absolutely not
Provincial model school	58.34%	27.46%	12.51%	1.69%
Municipal model school	52.83%	30.62%	14.75%	1.80%
County-level model school	46.56%	34.73%	16.42%	2.29%

As shown in Table 1, students agree that the use of multimedia teaching in the EM classroom can help improve their interest in learning. From the data in the table, we can see that most students in schools in this province believe that the use of multimedia teaching will improve their interest in learning; students from different types of schools agree that the use of multimedia teaching in EM classrooms will enhance their interest in learning. Students in provincial and municipal demonstration schools believed that multimedia teaching greatly increased their interest in learning, accounting for 58.34% and 52.83%, respectively, while those in county-level demonstration schools were relatively low, accounting for 46.56%. The proportion of students in the county-level demonstration schools that multimedia teaching has not improved their interest in learning significantly or at all is slightly higher than that of the provincial and municipal demonstration schools.

Table 2. Whether students think multimedia teaching can inspire thinking

	Great help	Helpful, but not much	Didn't help	Counterproductive
Provincial model school	51.41%	42.35%	5.74%	0.50%
Municipal model school	48.87%	41.76%	7.82%	1.55%
County-level model school	37.96%	51.64%	8.06%	2.34%

As shown in Table 2, students agree that the use of multimedia teaching in EM classrooms can help inspire thinking. Most students in schools in this province believe that the use of multimedia teaching is helpful for enlightening thinking; from the perspective of different types of schools, students of different types of schools have slightly different identifications on whether the use of multimedia teaching in EM classrooms is helpful for enlightening thinking. The proportion of students in provincial and municipal demonstration schools that multimedia teaching helps to inspire thinking accounted for 51.41% and 48.87% respectively, while the proportion of students in

county-level demonstration schools was relatively low, at 37.96%. The proportion of students who did not help at all or had the opposite effect on strengthening memory was slightly higher than that of provincial and municipal demonstration schools.

To sum up, many schools have adopted MT in the classroom teaching of EM, and the multimedia teaching mode can help students improve their interest in learning and inspire their thinking.

5. Conclusion

In this paper, a MITS is designed, which can satisfy the multi-mode interaction between teachers and students and the interaction between students. Through collaborative learning and joint exploration, students can seek their own learning methods in the collision of their own opinions, and can also form their own opinions on knowledge points. In the investigation and experiment of the application of EM classroom teaching, teachers' use of MT in teaching is in good condition.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Morgan K L , Chen W . Pivoting in a COVID-19 teaching environment: developing interactive teaching approaches and online assessments to improve students' experiences. Accounting Research Journal, 2020, 34(3):313-322. https://doi.org/10.1108/ARJ-09-2020-0302

[2] Pinger P , Rakoczy K , Besser M , et al. Interplay of formative assessment and instructional quality—interactive effects on students' mathematics achievement. Learning Environments Research, 2018, 21(1):61-79.

[3] Sprute D , Tnnies K D , Koenig M . Interactive restriction of a mobile robot's workspace in a smart home environment. Journal of Ambient Intelligence and Smart Environments, 2019, 11(6):475-494. https://doi.org/10.3233/AIS-190539

[4] Asad M M , Hussain N , Wadho M , et al. Integration of e-learning technologies for interactive teaching and learning process: an empirical study on higher education institutes of Pakistan. Journal of Applied Research in Higher Education, 2020, 13(3):649-663.

[5] JM Díaz, Dormido S , R Costa-Castelló. An interactive teaching/learning approach to the design of robust linear control systems using the closed-loop shaping methodology. IFAC-PapersOnLine, 2020, 53(2):17174-17178.

[6] Eng, Leong, Tan, et al. M1-D FDTD Methods for Mobile Interactive Teaching and Learning of Wave Propagation in Transmission Lines [Education Corner]. Antennas and Propagation Society Newsletter, IEEE, 2019, 61(5):119-126.

[7] Cristina M , Annie L , Luis M , et al. Substituting Lectures with Interactive Teaching in OBGYN Clerkship: Integrating Hands-on Learning with Theory. Journal of Obstetrics & Gynaecology Canada, 2018, 40(6):845-846. https://doi.org/10.1016/j.jogc.2018.03.087

[8] Da R T , Cbnd B , Csmhd C , et al. Using mobile multimedia platforms in teaching dental diagnosis. Journal of Taibah University Medical Sciences, 2020, 15(4):265-271.

[9] Hartman H , Johnson P . The effectiveness of multimedia for teaching drug mechanisms of action to undergraduate health students. Computers & Education, 2018, 125(OCT.):202-211.

[10] Jose, Manuel, Diaz, et al. Closed-Loop Shaping Linear Control System Design: An Interactive Teaching/Learning Approach [Focus on Education]. IEEE Control Systems Magazine, 2019, 39(5):58-74.

[11] Mitric C , Leung S , Monton L , et al. O-OBS/GYN-EDU-209 – Substituting Lectures with Interactive Teaching in OBGYN Clerkship: Integrating Hands-on Learning with Theory. Journal of Obstetrics & Gynaecology Canada, 2018, 40(6):845–846. https://doi.org/10.1016/j.jogc.2018.03.087

[12] Lee T T , Liao W L , Jiang W W , et al. Augmented Reality Teaching System Based on Cognitive Theory of Multimedia Learning -An Example System on Four-Agent Soup. Applied Science and Management Research, 2019, 6(1):54-69.

[13] Ranga J S . Multipurpose Use of Explain Everything iPad App for Teaching Chemistry Courses. Journal of chemical education, 2018, 95(5):págs. 895-898.

[14] Uzun A M , Yldrm Z . Exploring the effect of using different levels of emotional design features in multimedia science learning. Computers And Education, 2018, 119(1):95-111.

[15] Masania J , Grootveld M , Wilson P B . Teaching Analytical Chemistry to Pharmacy Students: A Combined, Iterative Approach. Journal of Chemical Education, 2018, 95(1):págs. 47-54.

[16] Tran K , Beshir A , Vaze A . A Tale of Two Lab Courses: An Account and Reflection on the Teaching Challenges Experienced by Organic and Analytical Chemistry Laboratories During the COVID-19 Period. Journal of Chemical Education, 2020, 97(9):3079-3084. https://doi.org/10.1021/acs.jchemed.0c00649

[17] Tsai S C . Implementing interactive courseware into EFL business writing: computational assessment and learning satisfaction. Interactive Learning Environments, 2019, 27(1-4):46-61.

[18] Logothetis T A , Flowers C M . Squaring the Circle by Attempting to Teach a Lab Class in the Cloud: Reflections after a Term in Lockdown. Journal of Chemical Education, 2020, 97(9):3018-3022. https://doi.org/10.1021/acs.jchemed.0c00872

[19] Park S , Mcleod K . Multimedia Open Educational Resources in Mathematicsfor High School Students with Learning Disabilities. Journal of computers in mathematics and science teaching, 2018, 37(2):131-153.