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3. Smart Classroom System Based on Internet of Things Technology

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Abstract:

Recent research on smart classrooms encompasses a variety of fields including Information and Communication Technology, Machine Learning, Sensor Networks and Cloud Computing, as well as Hardware and Software. Students, teachers, and administrators are more engaged and empowered as a result of the rapid implementation of smart classroom research. When teaching a subject to a student, a smart class system employs the student's imagination to help them grasp the concept and retain it for a long time.

Performance in relevant subjects increased; students enjoyed studying; students' absence rates fell; their memory, understanding, and application skills grew stronger. There was an increase in their engagement as well. Using this method, abstract concepts are made concrete and a tough issue is made understandable.

Through the use of visual aids, children are able to grasp complex concepts in a fun and engaging way. In multi-dimensional scenarios, these audio-visual aids/images show the data and the mathematical relation between the issues for interpretation.

Notes/Pages are immediately stored and can be printed, emailed, or even pasted into a website using these classes, which allow educators to use multimedia materials and the internet with an entire class.

Keywords:

Smart Classroom, IoT, Network, Internet, Technology, ICT.

3.1 Introduction:

Smart classrooms were viewed as a key technique for transforming traditional teaching approaches. Since 2012, smart classroom research and practice have been increasingly prominent. As new media technology advances, so do the job needs for those who work in educational technology, which in turn raises the bar for those in the field.

Colleges and universities are benefitting from the advancement of educational technology, as well as the improvement of multimedia classrooms' functionality and operability, as a result. [1] With the widespread adoption of multimedia tools in education, a new teaching paradigm has emerged that incorporates these tools. An IoT cloud platform for smart classrooms, based on principles of smart equipment management, safety management, and energy-saving management in the classroom, is designed and developed in this article, which also includes the establishment of a smart campus. [2]

Teachers and students can build a learning platform with strong credibility by integrating into all aspects of the Internet of Things application platform through actual operation and management, which facilitates the fast flow and sharing of information resources through the Internet of Things application platform itself.

Teachers and students will be able to integrate into all aspects of the Internet of Things application platform through the Internet of Things application platform, based on the professional characteristics to promote the integration of theory with application practice in diversified universities. [3]

Table 3.1: Dimensions framework for evaluating smart classroom.

Dimensions	Annotation
Resource	The convenient level for accessing to the internet and sharing digital resources, etc.
Environment	The convenient level for the indicators of the physical environment, like temperature and air condition
Enhancement	The level of facilitation of learning and teaching by using digital devices
Management	The convenient level for conducting flexible pedagogies
Presentation	The convenient level for presenting content and sharing learning outcomes

Smart classrooms can be evaluated in five different ways, as depicted in the above table.

As the world of education evolves, the usefulness of the ancient lecture and note-taking approach is waning. In order to achieve higher degrees of academic progress and conceptual development, varied teaching and learning modalities must be explored. Due to the fact that not all students are interested in all topics. The educational system, on the other hand, has the duty to provide children with a wide range of options for developing interests and advancing academically throughout childhood and adolescence. [4] In the past, ICT was used mostly for communication and information, but it has now evolved into a teaching and learning tool. Smart Class, a company that provides curriculum for grades K–12, is currently doing an excellent job of fulfilling this need. The results of this study will shed light on the impact of smart class instruction on students' performance, achievement, retention, and learning in three distinct domains. Additionally, it would aid curriculum designers in creating materials that will make it easier for educators to impart knowledge and keep up with the technological advancements in the classroom. [5]

The concept of a "smart classroom" is based on a platform that allows students and teachers to engage in constructive conversations about various aspects of education, including teaching methods, educational concepts, and technical advances. Our school's new smart classrooms offer a number of innovative features. In each classroom, a recording and broadcasting system has been installed, allowing teachers to record and broadcast classroom instruction in real time. [6]

Figure3.1: The Layout of the Smart Class.

It can be utilized for students' after-class review and teachers' teaching situation review; each classroom Equipped with a wireless access system for activity class chairs and display screens in any combination, it may actualize interactive connection between study groups; certain classrooms are equipped with Nano blackboards, which can actualize touch interaction, multimedia education and chalk writing, which can alter traditional teaching All of the classroom equipment, including the blackboard and the perceptible interactive blackboard, is linked to an educational administration system that can identify the permissions of teachers and students in the class, collect real-time teaching data, and improve the quality of teaching services and management at all levels. [7]

3.2 Features of Smart Class:

- Students' talents and performance can be improved through the use of smart lessons.
- Teaching pupils in a smart classroom is made easier by the availability of multimedia content and information.
- Smart class allows professors to communicate their ideas and guarantees that every student gets the concept being taught, which in turn affects their school achievement.
- Succeeding is impossible without the need for a comprehensive understanding of the concepts involved. Through the use of Smart class, all knowledge domains can be touched.
- Static images fail to convey a concept as clearly as a well-designed smart class module.
- Smart classroom training is a move in the right direction since it places a focus on students' achievements.
- For students, it provides an engaging learning experience.

3.3 Review of Literature:

According to (Weidong et al., 2011) [8], there was an improvement in their study, which focused on the understanding of classroom equipment, showing the more helpful and regular human-PC interaction and its configuration indicates more thoughtfulness for the classroom.

Pervasive computing, electronic intuitive whiteboard markers, dispersed registration designs and keen space serve technologies are just few of the smart classroom features that incorporate innovation (Tawafak et al., 2019). [9]

Laser-based remotes or sophisticated pens are used instead of chalk or markers to stamp out and emphasize key points. The material displayed on the screen was saved for future reference.

Young people benefit from the use of a variety of media for teaching and learning, since they are more able to process the information when taught through visual plans (Saini, M. K., and Goel, N. 2019). [10]

Smart Class Can Never Replace a first-hand Teaching Experience. Even though smart classes may offer innovative methods for teaching, there is no substitute for a teacher who teaches using real-world examples to help students understand what they're learning. Assertion: (Azmiy, N. 2013) [11]

For Huang et al. (2012) [12], a smart classroom was characterized by the authors as a physical classroom setting that was effective for displaying teaching content, easy for management of the class, convenient for learning resources, easy for instruction, and coupled with contextual awareness.

No more study has been done on the design and evaluation of the smart classroom from both pedagogical and technological perspectives, despite the definition starting to incorporate these aspects.

More and more pupils were unable to access and share digital learning materials.

Even in a tablet classroom, many students did not think that technology benefited teaching and learning, revealing that the development and implementation of smart classrooms were just in the primary stage and that there was still more work required.

Pedagogical compatibility should be a primary consideration when implementing a smart classroom. A shift in behaviour might be possible through the use of new technology and better instruction (Yang et al. 2017). [13]

3.4 Objectives:

- To examine the impact of diverse teaching methods in the classroom, such as Smart Classroom teaching and conventional teaching methods, on student performance.
- To compare the academic results of students who were taught either in a Smart Classroom or in a traditional classroom.
- To investigate the impact of Smart Classroom teaching on students' learning.

3.5 Research Methodology:

In the discipline of academics, methodology refers to the systematic and theoretical examination of the procedures used to conduct research. It is the study of a field's corpus of methods and principles from a theoretical perspective. Parameters like paradigm, theoretical model and phases are typically included in this type of research.

Data for this research was gathered from a variety of published sources and is considered secondary in nature. The information gathered for this research came from a variety of sources, including the Website.

3.6 Result and Discussion:

Figure 3.2 depicts the system architecture of the smart classroom system. Registration and log-in of Pad mobile platform users can be completed by receiving instructions from PC workstations, and basic face information can be collected and uploaded; face attendance information can be collected and preprocessed; the submission of face attendance information is completed; the online examination, teaching evaluation, electronic whiteboard display and other functions can be realized; the results of teaching evaluation information can be obtained; [14]

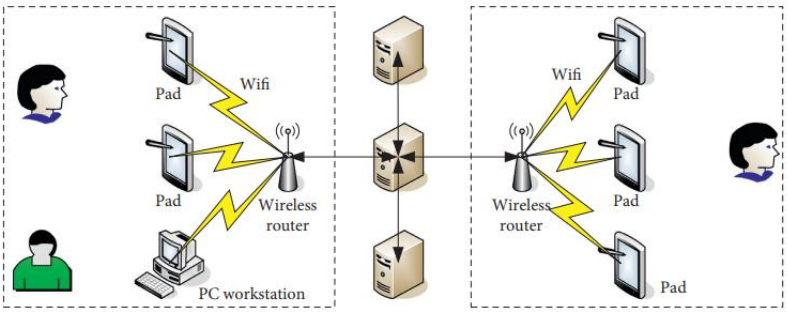

Figure 3.2: The system structure of the smart classroom system.

The smart classroom teaching system's integrated platform is shown in a cascading stack in Figure 3.3. Each smart classroom's sub-end platform forms the foundation of the overall platform.

The secondary main-end platform, the middle layer can be arranged and organized in accordance with the school's teaching disciplines. The primary-end platform of the school level is located on the top layer. [15]

Front communication, database, streaming media, and Web server are all part of the front end of the smart classroom teaching system's integrated platform.

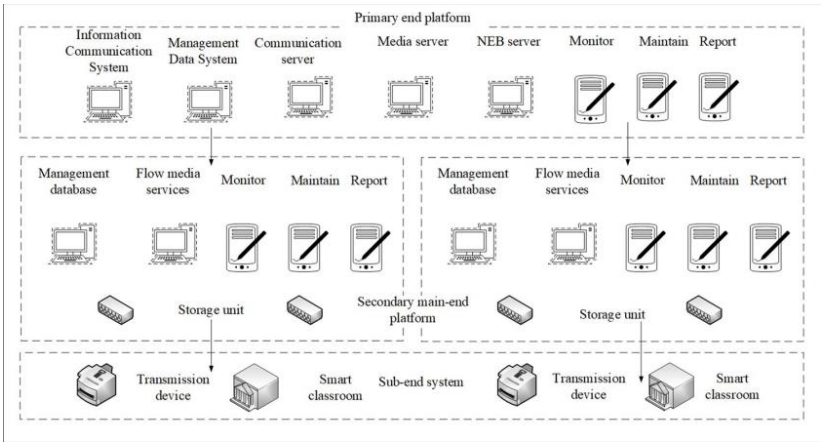

Figure 3.3: The overall topology of the integrated platform of the smart classroom teaching system

Figure 3.4 depicts the smart classroom's basic teaching procedure. Preliminary goals for instruction are determined by taking into account the students' prior knowledge and experience, as well as their age and physical and mental development, as well as their assignments before class even begins.

Teachers determine the teaching design scheme based on the learning scenario, textbook analysis, instructional issues, and problems faced by students in the preview. [16]

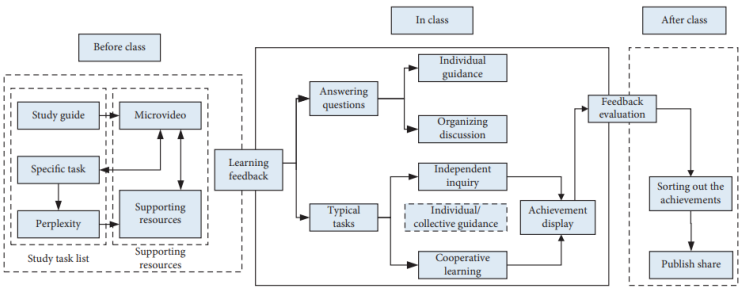

Figure 3.4: The basic teaching process is based on a smart classroom.

Learning, examination, knowledge centre, and personal files constitute the functions of student centre for students (Figure 3.5A). Students can view their study plan, registerable exam, credits, course learning situation, relevant records of online exams, accurate answers, mock tests, and courses, and comprehensive exams through this system.

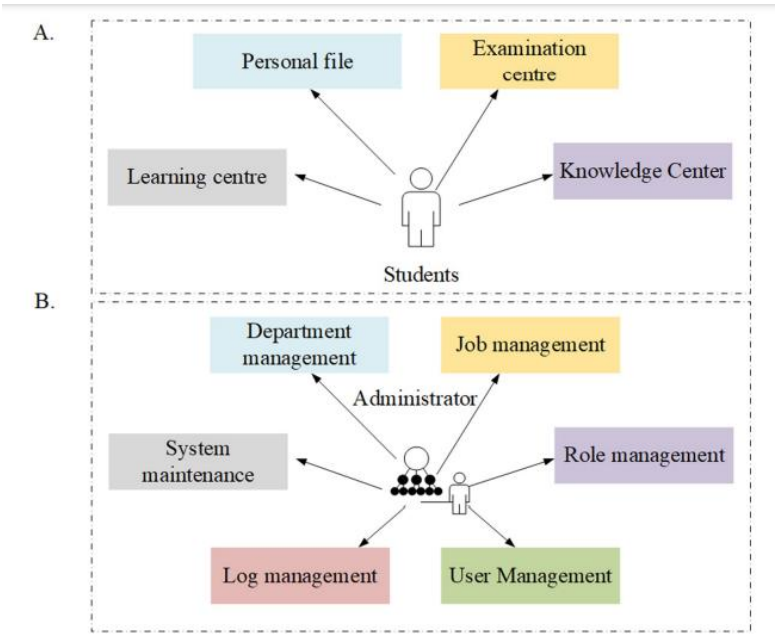

Figure 3.5 A & B: Analysis of students and system management module.

To facilitate online learning, students have the option of downloading or browsing the knowledge resources. All users of the system have management functions that include department management, position management, role management, user management, log management, and system maintenance (Figure 3.5B). [17]

Table 3.2: The benefits of the smart classroom model to students in all aspects.

Survey item	Very helpful	Helpful	General	Not much help	No help
Increase interest in learning	10 76.9%	3 23.1%	0 0.0%	0 0.0%	0 0.0 %
Cultivate learning ability	6 46.1%	4 30.8%	2 15.4%	1 7.6%	0 0.0 %
Improve classroom learning enthusiasm	8 61.5%	4 30.8%	1 7.6%	0 0.0%	0 0.0 %
Improve cross-cultural communication skills Survey item	8 61.5%	3 23.1%	2 15.4%	0 0.0%	0 0.0 %

Table 3.2 shows the advantages of the smart classroom model for pupils in all areas. 76.9% students believe that this teaching technique is extremely beneficial in improving their interest in learning, and 23.1% students believe it is helpful.

This shows that everyone has completely realized that this teaching style can boost their interest in learning from the table. [18] 61.5% of students said it was extremely useful in strengthening their capacity to

communicate across cultures, 23.1% said it was helpful, and 15.4% said they had no opinion.

The majority of students believe that this form of education is helpful to their capacity to communicate with individuals from diverse cultures.

For the first time, a link is formed between client computer and a server. Users provide their name and password, which are generated on the platform and sent via hypertext transfer protocol (HTTP) to validate that they are legal before they are sent to the server.

A successful connection between the server and the client can be established when the server verifies a user's name and password [26]. Figure 3.6A depicts the process. [19]

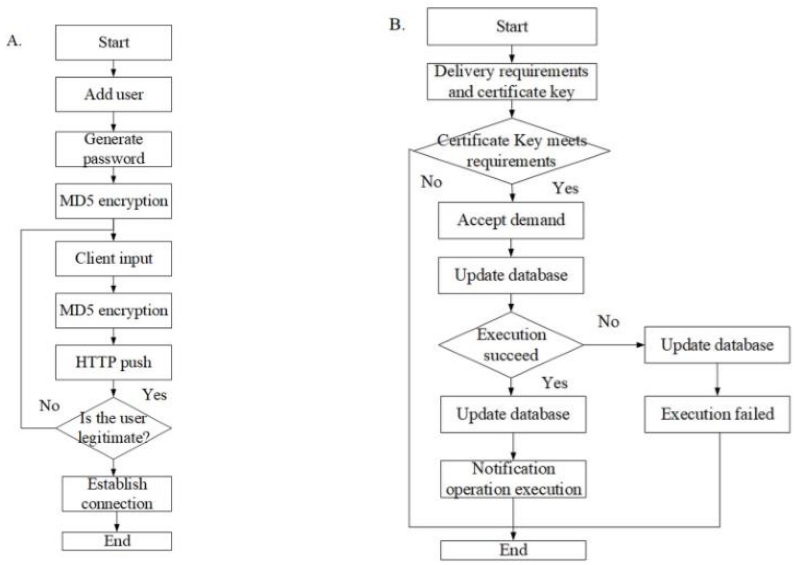

Figure 3.6A&B: Connection between server and client

The second step is the fulfilment of client functions. The database record pushed by the server is received by an application on the Web client. The command is obtained via the get under HTTP [27].

After the database record is received, the value of the command will be placed in the corresponding column in the MySQL database. [20] After the procedure is successful, there will be a Notification status bar to remind the user that the operation is complete. The process is shown in Figure 3.6B.

3.7 Conclusion:

Smart classes are one of the most active and creative ways to learn. A large number of schools and school districts across the country use it as a teaching and learning tool. As a result, parents, instructors, teachers, and students of all ages need to get familiar with this new educational framework. Interactive information, efficient distribution, and comprehensive display are all made possible with the use of cutting-edge class advancements.

In order to effectively transfer information to a large number of students, models for e-learning and distance learning have emerged. Accordingly, in order to optimize classroom environments in order to increase the learning experience of students, this study conducted a large-scale survey to examine smart classrooms from a pedagogical and technological perspective.

Networking application technology and data mining technology combine to solve many information technology problems in classroom management, student attendance, equipment management and teaching activity management in higher education and teaching management through the application of software platforms, hardware platforms and integrated technologies.

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