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Smart Education in the Context of Puducherry India

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Abstract

This paper explores the concept of smart education and presents its conceptual framework in the context of Puducherry. It aims to enhance the understanding of smart education by analysing its fundamental components, including educational challenges, technological innovations, management strategies, policy frameworks, historical evolution, and emerging trends. The adoption of smart education has accelerated significantly in recent years, particularly during the COVID-19 pandemic, when educational institutions worldwide transitioned from traditional classroom-based instruction to digital and online learning environments. This transformation compelled educators and learners to adopt technology-driven pedagogical methods that foster flexibility, accessibility, and collaboration in education. Government policies and strategic initiatives across the globe have further supported the development of smart education by encouraging the integration of advanced technologies within the learning ecosystem. In the context of Puducherry, this paper discusses the technological architecture, core functions, and key challenges associated with implementing a comprehensive smart education system. It also emphasizes the importance of teacher training, efficient management, and robust digital infrastructure to ensure the sustainability of smart education initiatives. By addressing both hard challenges—such as infrastructure limitations and digital gaps—and soft challenges—including motivation, policy alignment, and adaptability—this study provides valuable insights into strengthening the educational landscape of Puducherry. The paper concludes by underscoring the need for continuous innovation, inclusive policies, and stakeholder collaboration to achieve a sustainable, technology-driven educational transformation that aligns with future learning demands.

Keywords: Smart education, Puducherry, challenges, technological framework, policy

INTRODUCTION

The Gurus provided instruction to students in the Gurukul system of education in the past. Modern culture took the role of the Gurukuls as life progressed and time passed. With the introduction of new teaching techniques, we are witnessing one of science's greatest gifts, known as smart classrooms. The advancement of new technologies makes it possible for students to learn more effectively, and conveniently.

Anything can be instrumented, connected, and imbued with intelligent designs thanks to the exponential advancements in technology, and education is no exception. In recent years, smart schooling has drawn a lot of attention.

The rise of online Education has completely changed the education landscape, resulting in the creation new learning platforms and delivery systems. The accessibility and affordability of online education have contributed to its recent surge in popularity.

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Smart education, a concept that describes learning in digital age. It fulfills the thirst of knowledge and offer online content. Through personally enriched contextual, open, networked, and enhanced learning experiences, personal and smart technologies help students become more engaged in their education and become more independent [1].

The environment of the smart classroom is centered on technology which provides flexibility to learners and mentors to access information and resources at anytime, anywhere, to modify their learnings according to their preference and comfort. Learner subtilizes smart devices to access digital resources through wireless networks. The learner participation is the core aspect of the teaching program. This program encompasses infrastructure, methodology of transaction, hardware and software.

PUDUCHERRY

Puducherry is one of the famous states for quality education. It is located one the southern portion of the nation. As the name implies, Puducherry is also referred to as the land of pandit, specifically, it is the land of learned peoples there are good reasons why the city of Puducherry has become one of the south India's major centers of education. The construction of basic infrastructure has received priority from Puducherry's academic institutions. Apart from schools and colleges the prominent part of Puducherry education is the presence of specialized technical training and research institutes. Today Puducherry is making good development in the field of education several Medical and engineering colleges are located in the city for the residence as well as non-resident of the city today education in Puducherry is also being forecasted in the research level several University are taking fellows for PhD programs after completing the fellowship program for Here they can easily go to the foreign land for completing their post doctorate the procedure includes a lot of research and development you can carry on with your education in Puducherry [2].

RMSA and SSA

The Rastriya Madhyamik Shiksha Abhiyan is a Central Government Program was Launched in March 2009. It aimed at improving secondary education quality and accessibility. The program's implementation got underway in 2009–2010. By placing a secondary school within an acceptable driving distance of the local population, the scheme's secondary enrollment rise target was to reach 75% from 52.26% in 2005–2006. By making all secondary schools adhere to a set of rules, removing obstacles based on a person's gender, socioeconomic background, or disability, providing universal access to secondary education by 2017, or by the end of the 12 Five Year Plan, and achieving universal retention by 2020, the goal was to improve the quality of secondary education [3].

The Sarva Shiksha Abhiyan is a historic step in the right direction toward realizing the long-cherished objective of Universalization of Elementary Education (UEE), in collaboration with the State, using a time-bound integrated strategy. By 2010, SSA hopes to have transformed the nation's elementary education system by offering all students aged 6 to 14 a valuable and high-quality education. The SSA is an attempt to identify the need for raising the standard of primary education in the community while also providing community-owned, high- quality instruction in mission mode. Additionally, it envisions bridging social and gender disparities. This focuses on providing students with centrally funded programs like class. (computer literacy and education in schools) and ET (educational technology), which introduce students to information technology.

STATEMENT OF PROBLEMS

Challenges Due to Geographical Conditions in Puducherry Educations

The issue was that all student groups in secondary school classes had unequal access to technology. The purpose of this study is to examine how smart classrooms and how they are used to offer education. The use of technological items in schools, such as smart classrooms, is essential to promoting student learning in the twenty-first century. Most research has shown that technology may be a helpful tool for exchanging knowledge. Many educators are now integrating technology or smart

classrooms into their lessons in place of the traditional lecture method. Above all, the RMSA 2009 offered a structure for the curriculum that prioritized intelligent teaching techniques. Over a period of nine years, the investigator aimed to determine the extent of policy implementation and the level of support provided to students for their learning.

Need of Study

An international educational organization with operations in 60 nations launched a trial program in 2008, installing smart classrooms in six Israeli middle and senior high schools to examine the effects of integrating technology into the classroom on teachers, students, and the school community, formative evaluation was included to the pilot research for a two- year period.

A Smart Classroom is defined as an intelligent classroom that allows teachers participating in remote education to use a traditional classroom [6].

Style of instruction to instruct students that are far away. "Intelligent agents—a group of technologies that combine voice recognition, computer vision, and other capabilities—are integrated into smart classrooms to offer tele- education experiences that are comparable to those in traditional classrooms.

LITERATURE REVIEW

An international educational organization with operations in 60 countries launched a pilot project in 2008, installing smart classrooms in six middle and senior high schools in Israel. A two-year pilot study was conducted with formative evaluation to investigate the impact of incorporating technology into instruction on educators, learners, and the school community. Based on instructors' perceptions of the benefits of professional development and improved digital abilities, the study found that students' interest and involvement in the learning process rose when studying in smart classrooms. A Smart Classroom is an intelligent classroom that allows teachers working in distance education to instruct students remotely using a method similar to that of a traditional classroom. "Intelligent agents, which include voice recognition, computer vision, and other technologies, are integrated into smart classrooms to offer tele-education that is comparable to traditional classroom settings. A comparison analysis between schools that had smart classrooms and those that did not in order to ascertain the student's motivation for achievement. Compared to traditional teaching methods, this approach results in an increase in student modalities or sensory learning, and a significant portion of kids in schools with smart classrooms are very driven to succeed. A study conducted in 2000 examined the importance of utilizing Internet of Things (IoT) technology in the construction of a smart classroom. They found that by fusing IOT technology with social and behavioral analysis of gestures, conduct, and other classroom dynamics, any ordinary classroom can be transformed into a smart classroom that actively listens and analyzes voices, talks, and other classroom dynamics to draw conclusions about the interactions in the classroom and the happiness of the listeners. The study came to the conclusion that, in this day of technology, having a smart classroom is essential based on reviews [4].

Data Analysis

Based on the goals of the study, we used descriptive statistical approaches to analyse the data, which are covered in the tables below examines the Students' Reactions to Clever Education Experiences.

Objective: To identify the uses of smart class in teaching learning process.

A study conducted on 150 secondary school pupils revealed that, of those, a maximum of 65.3% reported using computers occasionally for teaching and learning, 5% reported using computers frequently, 22.7% reported using computers infrequently, and 6% reported never using them. A graphical depiction of the use of computers in the teaching and learning process is presented in Figure 4. Additionally, among the 150 secondary school pupils surveyed, 9% said they constantly use smart

classes to search the internet for information to download, upload, or peruse. 46.7% of students use smart classes frequently, 38.7% use them occasionally, and 8% use them infrequently [6]. Figure 1. Uses of computer in learning process in Education.

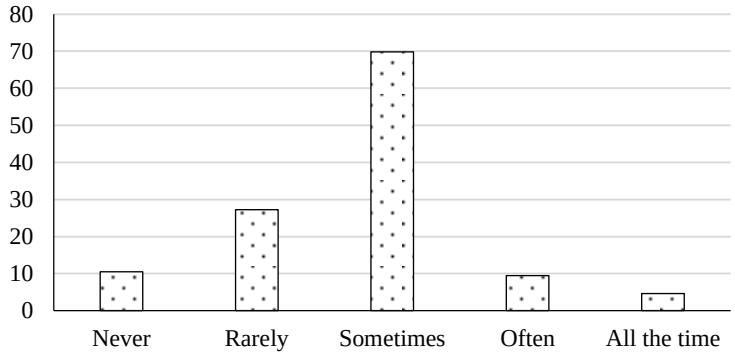

Figure 1. The use of computers in the teaching–learning process.

Figure 2 Shows the reactions of educators and students who use the internet to gather, download, upload, and view resources.

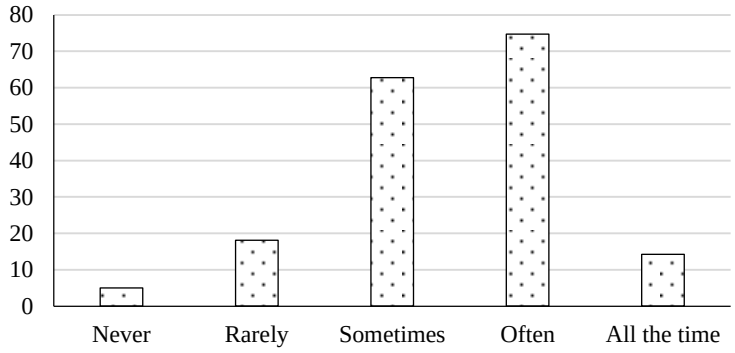

Figure 2. Teachers and students searching the Internet to gather, download, upload, and browse materials.

Objective: Analysing the students' responses on comprehension reveals that 2.7% of the 150 secondary school pupils responded in this way. Teachers use Smart Class to record students' comprehension responses: 4.6% of students with never, 8% of students with frequently, 79.3% of students with sometimes, and 5.3% of students with seldom. The pupils' reaction regarding comprehension is displayed in Figure 3.

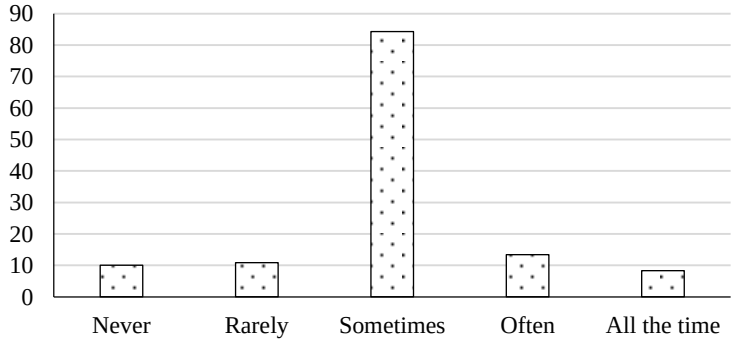

Figure 3. Documenting pupil’s comprehension responses.

Objective: To analyse the Smart Devices usage by Teachers in a week.

Table 1 demonstrates that, out of 150 students enrolled in secondary schools, 6.6% reported utilizing a smart device fewer than once a day,7.3% 1-2 days per week, 20.7% 3-4 days per week, and 65.3% every day. Figure 4 displays the student's response to the teacher's use of smart devices in a week.

Table 1. Distribution of scores based on sample responses for teachers' weekly use of smart devices

Statement	Novice	Basic	Intermediate	Advance	Experts
Frequency	6	59	47	26	12
Percentage	4	39.3	31.3	17.3	8

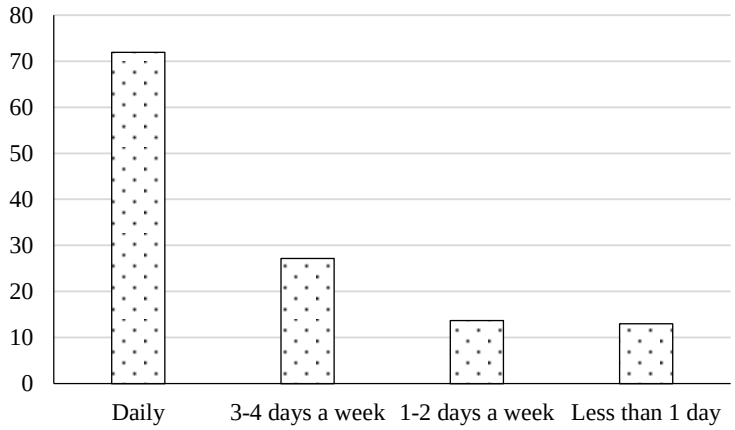

Figure 4. Use of smart devices over a week's time.

Table 2. Board-wise responses based on the objective.

Objectives	Government CBSE Schools	International Board Schools	State Board Schools
1	C.1 – 17.4%	C.1 – 32%	C.1 – 17.3%
	C.2, C.4 & C.6 – 100%	C.2, C.4 & C.6 – 100%	C.2, C.4 & C.6 – 100%
	C.3 & C.5 – 0%	C.3 & C.5 – 0%	C.3 & C.5 – 0%
2	C.1 – 37%	C.1 – 37%	C.1 – 35%
	C.2 – 25.4%	C.2 – 21.9%	C.2 – 40%
	C.3 – 28.6%	C.3 – 21.9%	C.3 – 23.4%
	C.4 – 28%	C.4 – 22.4%	C.4 – 20%
	C.5 – 10.6%	C.5 – 10%	C.5 – 10.6%
	C.6 – 21.8%	C.6 – 24.3%	C.6 – 8.1%
3	S.1 – Sometimes	S.1 – Sometimes	S.1 – Sometimes
	S.2 – Often	S.2 – Often	S.2 – Often
	S.3 – Sometimes	S.3 – Sometimes	S.3 – Sometimes
	S.4 – Rarely	S.4 – Rarely	S.4 – Rarely
	S.5 – Sometimes	S.5 – Sometimes	S.5 – Sometimes
	S.6 – Sometimes	S.6 – Sometimes	S.6 – Sometimes
	S.7 – Often	S.7 – Often	S.7 – Often
	S.8 – Often	S.8 – Often	S.8 – Often
4	Basic comfort level in using Smart board and other components of smart classroom	Intermediate comfort level in using Smart board and other components of smart classroom	Basic comfort level in using Smart board and other components of smart classroom
5	Daily usage	Daily usage	Daily usage

All school boards are using laptop computers, smart boards, and digital projectors at a 100% rate,as indicated by Figure 4. Every school board uses a document camera and wall projector exactly zero times. The use of Erase white boards in international schools is higher than that of other types of boards. Government CBSE schools employ a combination of teaching methods in their Smart classrooms, using the three types of boards less frequently. These methods include brainstorming, storyboarding, real-world learning through demonstration, and audio-visual technologies. Utilizing games and riddles as a teaching tool in their intelligent. Every school board uses the Smart Class teaching and learning method, which involves using the internet for materials. In the classroom, they engage with one other and give students time to exhibit their original work. While other boards employ smart class occasionally, international boards use it frequently while working in groups. Email communications are only sometimes sent by all the boards.

In smart teaching and learning Only sometimes do all of the boards use websites to provide lessons and record the students' understanding replies. Teachers at State Board schools and the Government CBSE board are only somewhat comfortable utilizing smart boards and other elements of smart classrooms. Additionally, itis at the Intermediate level at international schools. Every school uses the smart board almost every day.

Outcomes and Discussions

The researcher used various aspects of the smart classroom in this study. These are instructional strategies (six aspects), physical facilities (six elements), and smart class in the teaching and learning process (8 assertions), the amount of time spent using smart class, and the degree of comfort that teachers have using smart class in the classroom. The researcher created a questionnaire for this purpose and gave it to the pupils. The goals of this study are accomplished by utilizing all five of these dimensions. Based on the data analysis above, it can be deduced that there are six components in total under the physical facilities goal of a smart classroom. Of 150 secondary school students, 66.7% said they would prefer to have a "eraser whiteboard" in their classroom, 100% said they had a "smart board," a "laptop computer," and a digital projector; however, none of them had a "wall projector" or a "document camera" in their classroom [5]. During these nine years, recommendations for smart classroom facilities according to the RMSA are established in the majority of schools There are six components that make up the goal of teaching methods in a smart classroom. 89.3% of 150 secondary school students responded favorably to the use of audio-visual aids by teachers in the classroom; 87.3% of students responded favorably to the use of real-world learning through demonstration; 68.7% of students responded favorably to brainstorming; 68% to storyboard telling; 100% of students responded favorably to working as a team on a computer; and 53.3% of students responded favorably to puzzles and games.

The use of Smart class teaching learning There are eight assertions in all under the heading of the purpose of using smart classrooms in the teaching and learning process. Based on the study above, it is clear that the majority of teachers use smart classrooms to facilitate learning. Out of 150 secondary school students, 8% said that teachers are at the "expert" level of comfort when it comes to using the smart board and other smart classroom components, followed by 17.3% in the "advance" category, 31.3% in the "intermediate" category, 39.3% in the "basic" category, and 4% in the "novice" category [7].

The application of smart classroom instruction In a study of 150 secondary school students, 6.6% said they used a smart board less than once a day, 7.3% said they used one or two days a week, 20.7% said they used one or two days a week, and 65.3% said they used one every day. It is inferred that, of 150 secondary school students, 8% said that teachers' comfort level with smart boards is expert, 17.03% said that teachers are in the advanced stage of using smart boards and other components of smart classrooms, and 31.3% said that teachers are in the intermediate level. This information is intended to provide a general overview of how smart classrooms work and the educational context in particular.

The application of smart classroom instruction It can be inferred that, of 150 secondary school students, 6.6% reported using them less than once a week, 7.3% reported using them 1-2 days a week, 20.7% reported using them 3–4 days a week, and 65.3% reported using them every day in relation to the aim of finding out how frequently teachers use smart boards.

The use of Smart class teaching learning Smart classes are operational in nearly every Puducherry school run by a different board. In smart classrooms, they operate the boards using different techniques.

However, they don't seem to be interested in blog or mail usage. It is only utilized for transactions in the classroom and to gather online materials. After seeing how at ease teachers were using smart rooms, the researcher came to the conclusion that teachers do need practice-oriented training programs and incentive [8-10].

In order to determine its impact on students' growth, the researcher gathered instructor reflections and spoke with principals. Based on a qualitative study of the reflective reports, all teachers believe that students have become more proficient in using technology for learning and have developed a sense of self-confidence. It equips individuals with the ability to locate resources, write and read proficiently, and effectively express themselves. Their involvement in the smart classroom motivates them to come frequently, and the student-teacher exchanges are lively and beneficial.

The use of Smart class teaching learning. The principals report that it raised the school’s overall performance. Additionally, parents are supporting their children more. Parents are proud and confident in their children's development of 21st century skills.

CONCLUSION

The findings show that a smart classroom facilitates learning more effectively. Smart classrooms reconsider the nature of the learning environment and the expectations of students regarding its features, resources, and methods. A smart classroom can be defined as an environment in which educators and learners strive to acquire all the skills and resources necessary to make the most out of them and expand their knowledge. The results of this study made the authorities and other interested parties aware of the true state of the RMSA Smart Classroom program. According to the study mentioned above, technology-based smart classrooms must be implemented, and teachers must always keep in mind that children have a wide range of demands and learning preferences. It should never be forgotten that the instructor's primary objective should be deep learning, and that proficient instruction is a prerequisite for making effective use of technology and getting beyond its drawbacks.

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