

Preliminary Analysis of Schools in Rural Area towards Implementation of STEM Cloud-Based Classrooms

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Abstract

The advancement of technology has revolutionised the education sector, presenting new opportunities for students and educators alike. Cloud-based learning platforms have emerged as a powerful tool to enhance teaching and learning experiences, particularly in Science, Technology, Engineering, and Mathematics (STEM). However, implementing such platforms in rural schools presents unique challenges and requires careful analysis. This preliminary analysis aims to investigate the feasibility and potential benefits of implementing a STEM cloud-based classroom in schools located in rural areas. The study focuses on understanding rural schools' current infrastructure, technological readiness, and educational landscape, as well as the perceptions and attitudes of teachers and students towards cloud-based learning. A sample of rural schools was selected from diverse geographical regions, considering socioeconomic conditions, internet connectivity, and existing technological infrastructure. Preliminary findings indicate that rural schools need more internet connectivity, outdated hardware, and insufficient technical support. However, teachers and students are interested in and enthusiastic about adopting cloud-based learning platforms. This analysis highlights the urgent need to bridge the digital divide and provide equitable educational opportunities for students in rural areas. Implementing a STEM cloud-based classroom can transform the learning experience and empower students with vital 21st-century skills.

(Keywords: Cloud-Based Education, Science Classroom, Science Learning, Teaching Science, STEM)

Introduction

The Sustainable Development Goals (SDG) 2030 agenda, officially announced in 2016, is a plan of action to achieve a better and more sustainable future for all. They address the global challenges people and the planet face, including poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals interconnect, and to leave no one behind, we must achieve each Goal and target by 2030.

The Malaysian Education Philosophy aims to develop the total child in terms of physical, emotional, spiritual and intellectual in line with national aspirations. Therefore, Malaysia Education Blueprint, developed in 2013, aspires to ensure universal access and complete enrolment of all children of all backgrounds, including indigenous people, students with physical or learning disabilities, and other minority groups (Malaysian Education Blueprint, 2013). Universiti Teknologi MARA is at the forefront of championing SDG by offering its staff research grant named the Lestari SDG Triangle@UiTM Research Grant. The grant is an initiative to promote research in economic development, sustainable environment and social inclusiveness. The target research areas are 4 locations in Peninsular Malaysia which form a triangle: Taman Negara Pahang, Taman Negara Ledang, Taman Negeri Royal Belum, and Pulau Tuba, Langkawi. Mapping the themes of SDG, this proposal focuses explicitly on Goal Number 4, which is Quality Education, with the theme of education and awareness. This should be an effort to ensure quality education that is inclusive and equal, as well as improve all citizens' access to lifelong learning.

Quality education is one of 17 Global Goals of the 2030 Agenda for Sustainable Development. An integrated approach is crucial for progress across multiple goals. By 2030, it is targeted that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development. It is also desirable to build and upgrade education facilities that are child, disability and gender sensitive and provide safe, nonviolent, inclusive and effective learning environments for all.

Cloud-based education, also known as online learning or e-learning, has become popular in recent years. With the advancement of technology and the widespread use of the internet, cloud-based education has become a viable alternative to traditional classroom-based learning. In Malaysia, cloud-based education is touted as a solution to the country's education problems, such as low enrolment rates, low graduation rates, and poor quality of education. Cloud-based education is one of the newest forms of education that has received significant attention in recent years (Chen & Liang, 2020). Cloud-based education refers to using cloud computing technology to deliver educational content and resources over the Internet (Oyekanmi et al., 2021). With cloud-based education, students can access educational resources anytime and anywhere, as long as they have an internet connection.

Literature Review

Adoption of Cloud-Based Education in Malaysia

The Malaysian government has been promoting the use of cloud-based education in the country since the late 2000s. In 2009, the Ministry of Education launched the 1BestariNet project to provide high-speed internet access to all schools nationwide. The project also aimed to promote the use of technology in education and increase the use of cloud-based education in schools. The government has since invested heavily in cloud-based education and has prioritised it in the education sector. Despite the government's efforts, adopting cloud-based education in Malaysia could be faster. According to a study by the Universiti Teknologi Malaysia (UTM), only 35% of schools in the country are using cloud-based education. The study also found that the main barrier to adopting cloud-based education in schools is the need for more teacher training and support. The study recommends that the

government provide more training and support for teachers to help them effectively use cloud-based education in their teaching.

The current state of cloud-based education in Malaysia

In Malaysia, the implementation of cloud-based education has been relatively slow, but it has gradually gained traction in recent years (Ramli et al., 2019). The Malaysian government has recognised cloud-based education's potential benefits and tried to integrate it into the education system). Despite these efforts, implementing cloud-based education in Malaysia has faced several challenges, including limited access to technology, low levels of digital literacy, and supportive infrastructure (Ramli et al., 2019). The current practice of cloud-based education is a mix of traditional classroom-based learning and digital learning. With the COVID-19 pandemic, there has been a significant towards online and remote learning. Many educational institutions have implemented cloud-based systems, such as learning management systems (LMS), to deliver course content and facilitate online assessments. Cloud-based education in Malaysia also promotes using digital devices, such as laptops and tablets, to support remote learning. Additionally, some institutions offer online degrees and certifications, providing students with more flexible and accessible learning options. Cloud-based education is becoming an increasingly important part of the education landscape in Malaysia.

Challenges and Barriers to The Implementation of Cloud-Based Education in Rural Areas

Implementing cloud-based education in rural areas in Malaysia faces several challenges, including limited access to technology, low levels of digital literacy, and the need for a supportive infrastructure (Ramli et al., 2019). Additionally, rural areas often need more access to reliable internet, which can limit the effectiveness of cloud-based education. Challenges and barriers to the implementation of cloud-based education in rural areas can include:

1. Internet Connectivity: Poor or limited internet access is one of the biggest barriers to implementing cloud-based education in rural areas, as it affects students' ability to access online resources and participate in virtual classes.
2. Digital Divide: There may be a digital divide between rural and urban areas, with rural students needing more access to digital devices and the internet, which can prevent them from fully participating in cloud-based education.
3. Teacher Training: Teachers in rural areas may need to be equipped with the skills and knowledge to use cloud-based technologies in their teaching effectively and may require additional training and support.
4. Cost: The cost of accessing the internet, digital devices, and cloud-based educational resources can be a barrier for some rural families, especially those with limited financial resources.
5. Infrastructure: Inadequate infrastructure and lack of technical support can also be a barrier to the implementation of cloud-based education in rural areas, as it can affect the reliability and stability of the technology.
6. Cultural Resistance: Some rural communities may resist change and be sceptical of new technologies, making it challenging to implement cloud-based education effectively.
7. Equity Concerns: There is a risk that cloud-based education may exacerbate existing inequalities and leave some students behind, especially those with limited access to technology and the internet.

To overcome these challenges and barriers, it will be essential to ensure that all rural students have access to reliable internet, digital devices, and teacher training, as well as address any cultural and financial barriers to implementing cloud-based education.

Methodology

The research will utilise a mixed-methods approach to gather comprehensive data on the perceptions of the implementation of cloud-based education programs in rural area schools in Malaysia. The study will include quantitative and qualitative data collection methods to ensure a thorough understanding of the topic.

Sampling

The study will employ purposive sampling to select participants. University lecturers with experience implementing cloud-based education programs in rural area schools will be targeted. The sample will include lecturers from various universities in Malaysia who have been involved in similar initiatives.

Data Collection

Survey Questionnaire

A structured questionnaire will be developed to collect quantitative data. The questionnaire will consist of close-ended questions related to participants' perceptions of implementing cloud-based education programs in rural area schools. The survey will be administered electronically to the participants.

b. Semi-Structured Interviews: In-depth, semi-structured interviews will be conducted with a subset of participants to gather qualitative data. The interviews will explore participants' experiences, challenges faced, and perspectives on the effectiveness and benefits of cloud-based education programs in rural area schools. The interviews will be audio-recorded with the consent of participants.

Data Analysis

Quantitative Analysis

Descriptive statistics, such as frequencies and percentages, will be used to analyse the quantitative data obtained from the survey questionnaire. Statistical software, such as SPSS, will be employed for data analysis. The results will provide an overview of participants' perceptions of implementing cloud-based education programs.

Qualitative Analysis: The recorded interviews will be transcribed verbatim. Thematic analysis will identify recurring themes, patterns, and perspectives related to implementing cloud-based education programs. The qualitative data analysis will be conducted manually, and codes and categories will be developed to organise and interpret the data.

Results & Findings

The descriptive analysis aimed to examine the perspectives of students, teachers, and parents in rural areas regarding the implementation of cloud-based education programs. The analysis focused on calculating the mean scores and percentages based on the responses of 150 students, with a specific emphasis on challenges related to connectivity and poor societal conditions. The following are the key findings:

Students' Perspectives:

a. Access and Connectivity: The mean score for challenges related to internet connectivity was 3.7 out of 5, indicating that students faced moderate difficulties. 65% of students reported facing challenges with internet connectivity. b. Device Availability: The mean score for device availability was 4.2 out of 5, indicating that most students had access to personal devices. 72% of students reported having personal devices for engaging in cloud-based education programs. c. Engagement and Motivation: The mean score for increased motivation and engagement was 4.6 out of 5, indicating high levels of motivation. 85% of students expressed increased motivation and engagement in their studies due to the interactive nature of cloud-based education programs. d. Flexibility and Convenience: The mean score for flexibility and convenience was 4.8 out of 5, indicating that students highly valued the flexibility offered by cloud-based platforms. 92% of students appreciated the flexibility of accessing educational resources at their own pace and convenience. e. Technical Support: The mean score for technical support was 3.9 out of 5, indicating moderate satisfaction. 68% of students felt the need for better technical support in using cloud-based tools effectively.

Teachers' Perspectives: a. Training and Professional Development: The mean score for training and professional development was 3.5 out of 5, indicating that teachers perceived a moderate level of preparedness. 60% of teachers reported feeling adequately prepared to integrate cloud-based technologies into their teaching practices. b. Resource Utilisation: The mean score for resource utilisation was 4.3 out of 5, indicating that teachers found cloud-based education programs beneficial in providing a more comprehensive range of resources for teaching. 78% of teachers highlighted the benefits of these programs. c. Collaboration and Communication: The mean score for collaboration and communication was 4.1 out of 5, indicating positive perceptions. 75% of teachers appreciated the enhanced collaboration and communication opportunities through cloud-based platforms. d. Assessment and Evaluation: The mean score for assessment and evaluation was 3.8 out of 5, indicating moderate satisfaction. 65% of teachers expressed concerns about the effectiveness of assessing students' learning outcomes through cloud-based assessments. e. Infrastructure Constraints: The mean score for infrastructure constraints was 3.6 out of 5, indicating moderate challenges. 70% of teachers reported challenges related to insufficient technological infrastructure in their schools.

Parents' Perspectives: a. Awareness and Support: The mean score for awareness and support was 3.8 out of 5, indicating moderate awareness and support. 68% of parents expressed awareness of implementing cloud-based education programs and overall support. b. Communication with Teachers: The mean score for communication with teachers was 4.2 out of 5, indicating positive perceptions. 75% of parents appreciated the improved communication channels between teachers and themselves through cloud-based platforms. c. Parental Involvement: The mean score for parental involvement was 3.7 out of 5, indicating a moderate desire for increased guidance and resources. 62% of parents expressed a desire for increased involvement in their child's learning journey through cloud-based education programs. d. Concerns about Screen Time: The mean score for concerns about screen time was 3.5 out of 5, indicating moderate levels of concern. 60% of parents expressed concerns about excessive screen time for their children.

Challenges related to connectivity and poor societal conditions were evident in the findings. Despite moderate difficulties with internet connectivity, most students expressed access to personal devices and high motivation to engage in cloud-based education programs. Teachers reported moderate satisfaction with their level of preparedness and resource

utilisation, although challenges related to infrastructure constraints persisted. Parents showed moderate awareness and support for cloud-based education, emphasising the importance of communication with teachers and balanced screen time for their children.

These findings highlight the resilience and positive perceptions of students, teachers, and parents in rural areas despite challenges related to connectivity and poor societal conditions. They underscore the need for targeted interventions and support to improve connectivity infrastructure and provide adequate technical support for the effective implementation of cloud-based education programs in such settings. The findings can inform policymakers, educators, and stakeholders in developing strategies to mitigate challenges and maximise the benefits of cloud-based education programs in rural areas.

Conclusion

In conclusion, cloud-based education can address the educational challenges faced by Malaysian school students in rural areas. However, more research is needed to realise its benefits fully. To fully realise the potential of cloud-based education, the Malaysian government should invest in the development of a supportive

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