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Technology Revolution in Learning: Building the Future of Education

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ABSTRACT

Background. This research explores the impact of the technological revolution on learning, with a focus on teacher and student perceptions. In this digital era, technology integration has become the main foundation in the educational process.

Purpose. The research aims to analyse the extent to which technology is integrated in learning, evaluate teachers' perceptions of the role of technology, assess the influence of technology in increasing student motivation and participation, and identify the main barriers to adopting technology.

Method. This research method uses a quantitative research survey model with 15 education students selected by purposive sample. The data collection process included an initial questionnaire, direct observation of the use of technology in learning, and in-depth interviews.

Results. The results of the study revealed that the use of technology has become a daily habit for education students, indicating significant integration of technology in the learning experience. The majority of respondents believe that technology can increase student motivation and have positive beliefs regarding the potential to personalize learning according to student needs.

Conclusion. The conclusions of this study highlight the need for ongoing support for the development of teachers' technology skills, expanded integration of technology in the curriculum, and empowerment of students through technology to increase motivation and learning experiences. By adopting a thoughtful approach to the technological revolution in education, inclusive learning experiences and greater opportunities for innovation can be created, equipping students to face a future that is dynamic and responsive to technological change.

KEYWORDS

Education, Era Society 5.0, Technology Revolution

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INTRODUCTION

In an era dominated by technological advances, a revolution in education is becoming increasingly inevitable. The Technology Revolution in Learning is not just a developmental phenomenon, but a profound paradigm shift in the teaching-learning process (Zhakata, 2023). Using digital tools and platforms, education has travelled a significant journey from traditional methods to the use of technology as a support for

learning (Avci dkk., 2021).

Education in the 21st century faces great challenges that cannot be ignored, but at the same time brings great opportunities (González-Pérez & Ramírez-Montoya, 2022). The rapid development of information and communication technology has opened the door to more dynamic, interactive and affordable learning. Involving the utilisation of software, applications and online platforms, the technological revolution has had a significant impact on every aspect of education (Focacci & Perez, 2022).

Students are not only recipients of information, but also part of a more collaborative and responsive learning process (Carless, 2022; Dadaczynski dkk., 2021). The importance of integrating technology in education is becoming increasingly urgent along with the demand for skills that are relevant to the times. Globalisation and economic development are haunted by the need for individuals who have a deep understanding of technology (Huo dkk., 2023).

In this context, understanding the extent to which technology can build the future of education is crucial. However, it needs to be recognised that the application of technology in education also brings a number of challenges (Dwivedi dkk., 2021). Inequality of access, lack of digital skills among educators, and issues related to privacy and data security are some of the barriers that need to be overcome to ensure that the benefits of technology can be felt equally (Ding dkk., 2020).

Prior Research Before delving further into the technology revolution in learning, it is important to review previous research that has been conducted in this area (Ahmed dkk., 2020). The study by Moorhouse & Wong (Moorhouse & Wong, 2022), blending asynchronous and synchronous digital technologies and instructional approaches to facilitate remote learning. However, it also highlights the challenges of addressing technology and digital skills gaps among educators.

In an empirical study by Anderson and Dron (Dron & Anderson, 2023), pedagogical paradigms in open and distance education. In Handbook of open, distance and digital education. Their results show that teacher involvement in designing digital learning experiences can improve student motivation and achievement. However, it should also be noted that challenges related to the lack of training and support for teachers in adopting technology were also found in this study.

Previous research (Burbules dkk., 2020) has highlighted the urgency of quality education as one of the pillars in the United Nations' 2030 Sustainable Development Agenda. This general goal is related to several general trends influencing education in the information age. This research claims that education is the key to the quality of human life in the future and world sustainability. With the advent of new digital technology, education is undergoing a transformation in both formal and informal learning contexts. These main innovations can be summarized in several main aspects, namely: 1) educational goals and objectives; 2) educational ecology and learning context; 3) learning process; 4) teaching process; and 5) education governance and policy. However, along with these developments, it is worth noting that there are some risks and negative impacts of this technology trend. In a sustainability perspective, our review shows great potential for educational reform, but this achievement is only possible if we are willing to reconsider and even abandon some traditional methods in education.

Local context, resource availability, and community readiness are key determinants in the successful implementation of technology in learning (Naveh & Shelef, 2021). This research aims to provide a deeper understanding of the impact and potential of the technology revolution in learning by focusing on students' perceptions and experiences.

The specific objectives of this study involve: Analysing the extent to which technology has been integrated in the learning process. Evaluating teachers' perceptions of the role of technology in teaching. Assessing the influence of technology in increasing student motivation and participation.

Determining the main barriers to adopting technology in an educational context. By identifying and analysing these factors, this research seeks to contribute to our understanding of how technology can shape the future of education. The novelty of this research lies in its quantitative approach in measuring the impact of technology in learning.

Using a survey design, this research will provide a more detailed picture of participants' perceptions and experiences (Wang dkk., 2019). The special focus on teachers and students as research subjects will provide a holistic view of technology implementation in the learning environment (Roth & Moencks, 2021). In addition, this study enriches the literature by providing a deeper understanding of the challenges and potentials of technology integration in education, especially in environments that may have limited resources. By broadening our horizons on how technology can shape the future of education, this research is expected to provide practical guidance for policy makers, educators and researchers interested in the development of education in this digital era.

RESEARCH METHODOLOGY

The research method chosen was a survey qualitative research design, which allows in-depth exploration of students' perceptions, experiences, and views (Arnetz dkk., 2020; Braun dkk., 2021). The research sample consisted of 15 education students who were purposively selected, considering criteria such as semester level, education major, and level of understanding of technology. The data collection process involved a pre-survey questionnaire to gain an initial understanding of respondents' perceptions prior to the intervention, direct observation of technology use in learning, and in-depth interviews to explore experiences and views in detail (Woolverton & Pollastri, 2021).

Firstly, an initial questionnaire will be administered to respondents to gain an initial understanding of their perceptions towards the use of technology in learning. This questionnaire includes questions related to their level of understanding of the concept of technology, previous experience in using technology in learning, and their expectation towards the use of technology in the future. The results of this questionnaire will provide the foundation for further data collection.

Furthermore, direct observations will be made of the use of technology in the learning context. These observations may include direct classroom monitoring, evaluation of hardware and software usage, and recording situations that arise during the learning process with technology. The data obtained from these observations will provide direct insight into how students interact with technology during the learning process (Lynch dkk., 2021; Wicki & Hansen, 2019). After the observation period, in-depth interviews will be conducted with each respondent. These interviews will provide an opportunity for students to describe their experiences in more detail, explore their views on the impact of technology in learning, and provide further context regarding their responses to the changes. The in-depth interviews will be recorded and then transcribed verbatim to facilitate analysis.

Data processing begins with the transcription of the interviews, which will provide text that can be analysed in more depth. Next, the data will be categorised into themes that naturally emerge during the analysis. This approach will facilitate the identification of patterns and trends that may emerge in students' experiences and views towards the use of technology in learning (Tarke dkk., 2021; Tucker dkk., 2020).

In an effort to increase the reliability of the analysis, a triangulation approach will be applied. Triangulation involves using more than one data collection method and involving more than one researcher in the analysis process (Campbell dkk., 2020; Jang & Kim, 2019). This aims to ensure that the research results accurately reflect the reality observed and expressed by the respondents.

Internal validity is also a major concern, by ensuring that the data collected truly reflects the views, experiences and perceptions expressed by education students (Sundbom dkk., 2021). The right to privacy and security of respondents' information will be fully safeguarded, and each respondent will provide informed consent prior to engaging in the study. This research takes a holistic approach in understanding the impact of technological revolution in learning by involving the perceptions and experiences of education students (Aristovnik dkk., 2020). By combining preliminary questionnaires, direct observation, and in-depth interviews, it is hoped that this research can provide a deep understanding of how technology is shaping the future of education and how students are responding to these changes.

RESULT AND DISCUSSION

The results of this research discussion reveal the understanding and experience of education students related to the use of technology in their learning process. The first question in the survey was, "How often do you use technology in your learning process?" with answer options a) Every day, b) Several times a week, c) Once a week, d) Rarely, and e) Never.

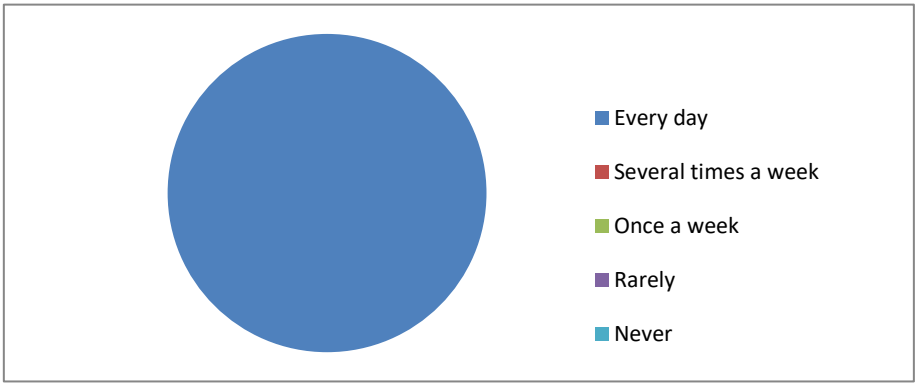

Figure 1. Respondents' results on the use of technology in the learning process

From the survey results, it was found that the majority of respondents, namely all 15 students, chose the answer option a) Every day. This shows that the use of technology in learning has become a daily habit for the education students involved in this study. This result indicates that the technological revolution has significantly influenced the way students engage in their learning process.

The answer choice "Every day" reflects the high level of integration of technology in the daily activities of education students. In other words, technology is not only considered as a tool, but has become an integral part of their learning experience. Daily use of technology may include the use of learning software, online resources, e-learning platforms, or other interactive tools that enrich the learning experience (Liaskos dkk., 2022).

In this context, the technological revolution in learning seems to have created a significant transformation in the way students understand and access knowledge. Their consistent engagement with technology also reflects a positive adoption of the latest developments in digital education. This is in line with the goal of more effective and innovative learning, where technology becomes a means to improve accessibility, engagement and efficiency of learning (Bergdahl dkk., 2020; Dunn & Kennedy, 2019).

Analysis of the results of the second question, "Do you believe that the use of technology in learning can increase student motivation?" shows a positive trend and broad acceptance of the role of technology in increasing student motivation among respondents.

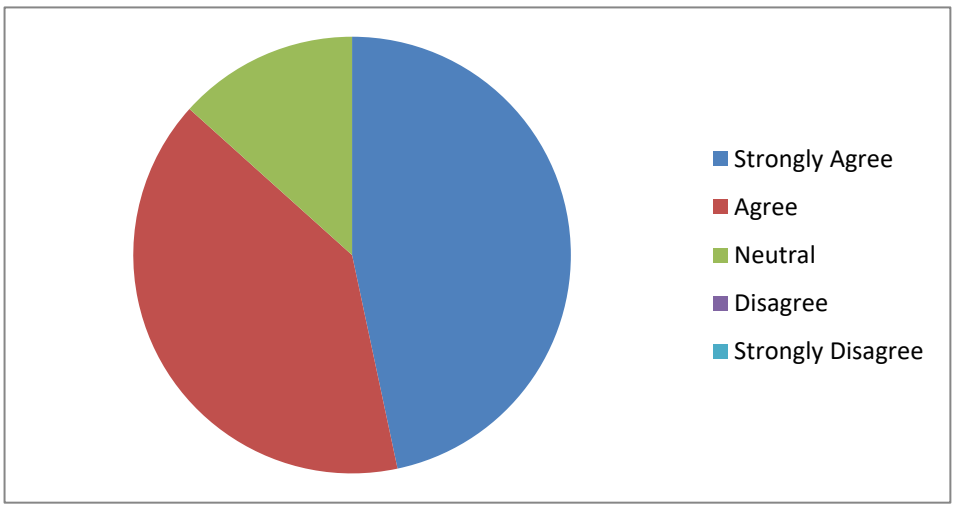

Figure 2. Respondents' results on the use of technology in learning can increase student motivation

Out of a total of 15 respondents, most, namely 7 people, expressed high confidence by choosing the answer option a) Strongly Agree. This number reflects the high level of agreement with the idea that the use of technology can contribute positively to student motivation. This result reflects a positive attitude and optimistic outlook towards the impact of technology on motivational aspects in the learning context.

In addition, 6 respondents agreed (b), indicating that although they do not have as strong a belief as respondents who strongly agreed, they still recognise and support the positive potential of technology in improving student motivation. This suggests that most respondents generally view technology as a tool that can provide an additional boost to students' enthusiasm for learning.

In contrast, there were 2 respondents who expressed neutral (c), indicating that they did not have a definite view or could not decide to what extent the use of technology could affect students' motivation. This neutrality could be due to a variety of factors, including mixed personal experiences with technology or a lack of in-depth information about its impact on student motivation.

Interestingly, no respondents answered disagree (d) or strongly disagree (e). This illustrates the lack of resistance to the idea that technology can enhance student motivation among respondents. This fact can be interpreted as an indication that, in this sample of respondents, most education students see positively the potential role of technology in supporting students' learning motivation.

Overall, the results of this survey imply that the majority of education students hold positive beliefs regarding the contribution of technology to student motivation. This finding may provide a strong basis for designing and implementing more innovative learning strategies, utilising technology as an effective support tool. The implications in an educational context are important, given that student motivation is a key factor in successful learning and personal development.

The survey results related to the third question, "To what extent do you believe that technology can help personalise learning to meet students' individual needs?" indicated variations in the level of belief among respondents. The data shows that the majority of respondents have a positive level of belief in the potential of technology to personalise learning.

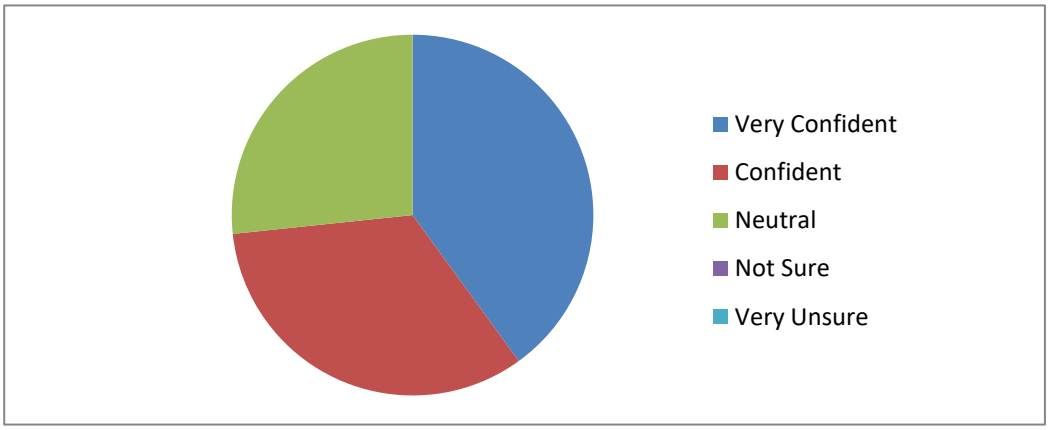

Figure 3. Respondents' results on the potential of technology to personalise learning

Out of a total of 15 respondents, 6 were very confident (a), indicating a strong belief in the ability of technology to be tailored to the individual needs of students. The high number of highly confident respondents illustrates a positive perception of technology's ability to provide a more customised and focused approach to learning for each student's unique needs.

Furthermore, 5 respondents expressed some confidence (b), indicating a level of confidence that remains positive, although not as strong as that of the very confident respondents. This suggests that most respondents still see technology as an effective tool to personalise learning, although there may be some concerns or considerations that make them less confident than the previous group.

On the other hand, 4 respondents expressed neutral (c), indicating that they have no definite view or cannot decide to what extent technology can help personalise learning. This neutrality could be due to uncertainty or lack of sufficient personal experience with learning technology solutions that support personalisation.

Overall, the results of this survey indicate that the majority of respondents have positive beliefs regarding the potential of technology to personalise learning. This level of belief can create a solid basis for expanding the application of technology in the context of personalised learning, creating an environment where students' individual needs can be accommodated more effectively.

It is worth noting that no respondents expressed either unsure (d) or very unsure (e), indicating that, within this sample of respondents, there is no resistance to the idea that technology can help personalise learning. These findings provide positive implications related to the adoption of technology to create a more responsive and relevant learning experience for each student.

The survey results related to the fourth question, "How do you view the role of teachers in integrating technology in their teaching?" reflect the views of the majority of respondents towards teachers' involvement in adopting technology. The data shows that the majority of respondents have a positive attitude towards the role of teachers in integrating technology in their teaching.

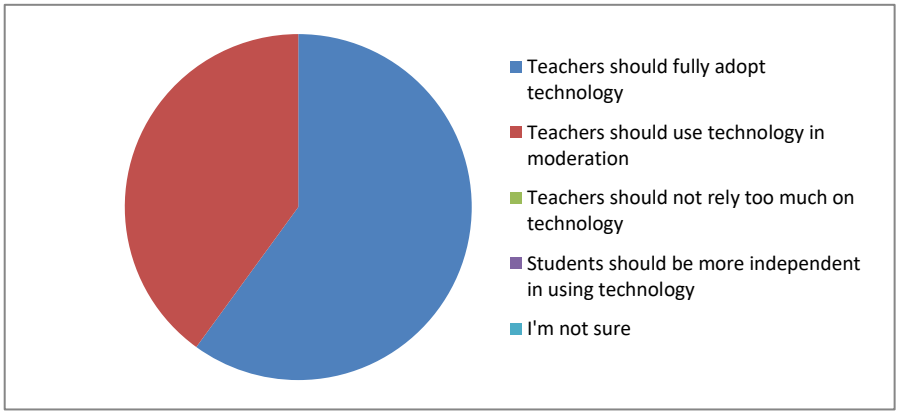

Figure 4. Respondents' results regarding the role of teachers in integrating technology in their teaching.

Out of a total of 15 respondents, 9 stated that teachers should fully adopt technology (a). This result reflects a strong belief that teachers have an important role to play in utilising technology to enhance students' learning experience. This attitude reflects the view that greater integration of technology can open up new opportunities for more dynamic and effective teaching.

Meanwhile, 6 respondents stated that teachers should use technology sparingly (b). While this option represents a slightly lower level of support compared to the group that stated that teachers should fully adopt technology, it still shows that most respondents still recognise the importance of teachers' role in integrating technology in their teaching, albeit with a more moderate level of involvement.

No respondents selected the answer options c) Teachers should not rely too much on technology, d) Students should be more independent in using technology, or e) I am not sure. The absence of these answers suggests that, in this sample of respondents, the majority have a positive view of the role of teachers in using technology as an integral part of teaching.

This understanding can create a strong foundation to support teachers in developing the technology skills and expertise needed to create an innovating learning environment. It is important to recognise that resources, training and institutional support may be needed to support teachers in harnessing the full potential of technology in their teaching.

Given the majority of respondents' preference for teachers' use of technology, this approach has the potential to create a more dynamic and relevant learning environment. Support for the integration of technology by teachers also reflects an awareness of the important role that educators play in guiding students through technological changes and developments in the modern educational context.

The fifth question, "Do you think the technology revolution can create a more inclusive learning experience?" reflects the perception of the majority of respondents regarding the potential inclusiveness of technology in learning contexts.

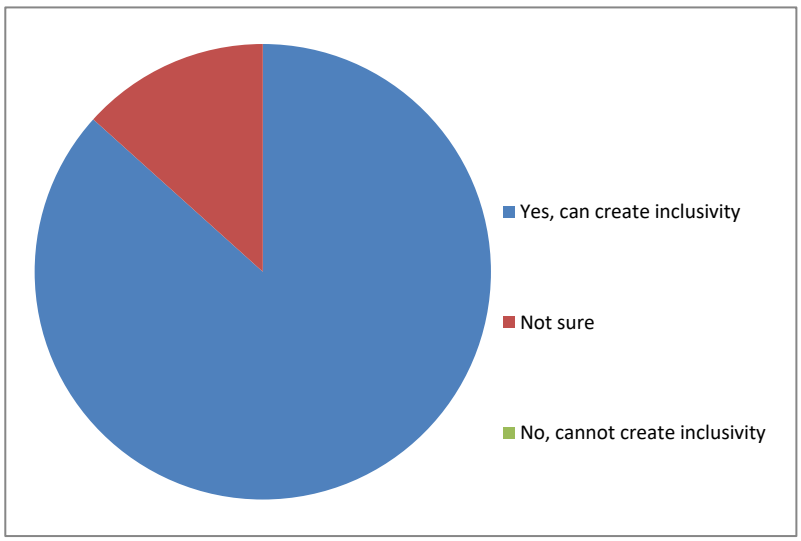

Figure 5. Respondents' results on how the technology revolution can create a more inclusive learning experience

Out of a total of 15 respondents, 13 stated that the technological revolution can create inclusivity (a). This answer reflects a strong belief that technological change can open up opportunities to create more inclusive learning experiences. This may involve wider access to learning materials, customisation for special needs, or the creation of learning environments that support diversity. In contrast, 2 respondents expressed uncertainty (b), indicating uncertainty or lack of confidence regarding the ability of technology to create inclusivity in learning contexts. This choice may reflect uncertainty about the effectiveness of implementing technology in an inclusive manner or concerns about the challenges that may arise.

No respondents selected answer option c) No, it cannot create inclusivity. This fact reflects that, in this sample of respondents, the majority see positive potential in the role of technology in creating a more inclusive learning experience. This positive view of the inclusiveness of technology in learning has significant implications for the development of inclusive education in the era of the technological revolution. The potential to design more open and universally accessible learning experiences can have a positive impact on students with special needs or in the wider context of diversity.

However, it is important to recognise that inclusive implementation of technology requires attention to accessibility, universal design and empowerment of all students, including those who may be outside the mainstream line of sight. With this understanding, education can effectively utilise the inclusive potential of technology to support student diversity and create more equitable learning experiences.

The survey results related to the question regarding responses to curriculum changes to reflect technological developments in education showed variations in respondents' views as follows:

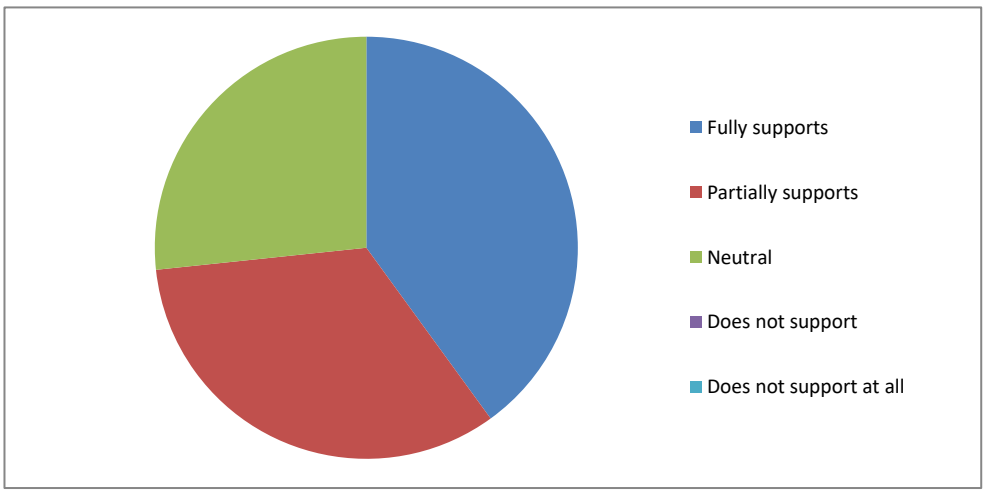

Figure 6. Respondents' results on curriculum changes that reflect technological developments in education

From a total of 15 respondents, 6 expressed full support (a), indicating strong belief and full support for the idea of curriculum changes that reflect technological developments in education. This view reflects an understanding of the importance of adjusting the curriculum to keep it relevant and responsive to technological developments. A further 5 were partially supportive (b), indicating that they supported the idea of curriculum change but perhaps with certain considerations or concerns. This view reflects a positive attitude but also implies the need to consider certain aspects of implementing such changes.

In addition, 4 people expressed a neutral stance (c), indicating that they did not have a definitive view or had not yet decided on the extent to which they supported curriculum changes related to technological developments. This neutrality may reflect uncertainty or the need to obtain more information before forming a definitive view. No one expressed no support (d) or no support at all (e), indicating that in this sample of respondents, the majority still look favourably on the idea of curriculum change to reflect technological developments in education.

Overall, the survey results reflect a spectrum of views from full support to neutral towards curriculum change to reflect technological developments in education. The implication is that education policies considering the integration of technology in the curriculum need to understand and respond to the variation in views among education stakeholders. The survey results related to the question of whether respondents believe that the technological revolution can create new opportunities for innovation in teaching methods show that the majority of respondents have a positive view of the potential for innovation in the educational context, as in the following chart:

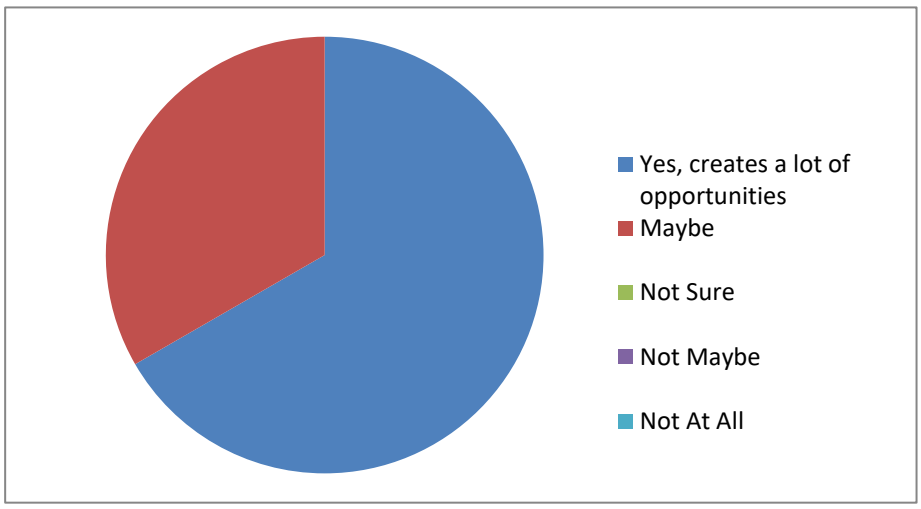

Figure 7. Respondents' results on the belief that the technological revolution can create new opportunities for innovation in teaching methods

Out of a total of 15 respondents, 10 chose option a) "Yes, it creates many opportunities." This result reflects the high belief that the technological revolution provides great potential for creating innovations in teaching methods. This view reflects an understanding of the power of technology as a tool to open new doors and develop more effective and creative approaches to learning.

Meanwhile, 5 respondents chose option b) "Maybe." This option indicates a more moderate view, where respondents see the possibility of innovation but may have some concerns or uncertainties regarding its implementation. No respondents chose options c) "Not Sure," d) "Not Likely," or e) "Not at All," indicating that, in this sample of respondents, the majority have confidence or at least see a high likelihood that the technological revolution will open up new opportunities for innovation in teaching methods.

This positive outlook has important implications for the development of educational policies that support the integration of technology in teaching methods. By understanding the innovative potential of technology, educational institutions can better prepare themselves to adopt and integrate technological solutions that can improve student learning experiences and outcomes.

CONCLUSION

The research revealed that the use of technology has become a daily habit for education students, reflecting the significant integration of technology in their learning experience. The majority of respondents believe that technology can increase student motivation and have positive beliefs regarding the potential to personalise learning to students' individual needs. In addition, support for curriculum changes that reflect technological developments and the role of teachers in integrating technology in teaching also dominated respondents' views. In conclusion, the technological revolution in education can create inclusive learning experiences and open up opportunities for innovation. Therefore, education needs to continue to support the development of teachers' technological skills, expand the integration of technology in the curriculum and empower students through the use of technology to enhance motivation and learning experiences. With a thoughtful approach, the technology revolution in education can be the key to preparing students for a dynamic future that is responsive to technological change.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

Author 4: Formal analysis; Methodology; Writing - original draft.

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