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The Role Of Artificial Intelligence And Education Research: Current Trends & Future Prospects

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Abstract:
Technology has become an integral part of our daily life and Artificial Intelligence (AI) is considered as an effective tool and application of modern technology. Artificial Intelligence holds the great promise and it has the potential to bring transformative changes. Artificial Intelligence (AI) in Education is not merely a technological advancement; rather, it represents a revolutionary approach to teaching and learning process, redefining the educational landscape. With the help of AI, educators can personalise learning experiences and all new future possibilities in Education. The aim of this paper is to explore the applications and future prospects of Artificial Intelligence in Education. The exploration in the paper, is presented theoretically with the help of qualitative method of research. The paper has analysed various research findings from journal articles, books, periodicals and webpages available online. The findings have presented along with the discussion of concept, application, current use and future prospects of artificial intelligence in Education. AI in education has the potential to completely transform how we teach and learn in the future. AI can produce more effective and efficient educational experiences because of its active involvement in data analytics, virtual classrooms, adaptive assessments, and personalized learning. In the end, utilizing the AI in education will require cooperation between developers, educators, and legislators in order to fully realize the technology's promise for improving education around the world.

Keyword: *Artificial Intelligence, AI, Education, Applications, Future Prospects.*

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I. Introduction:

Artificial Intelligence, also known as AI, may be defined as ‘man-made thinking power’, in which, artificial means ‘man-made’ and intelligence means ‘thinking power’ (Choudhury, 2022). Artificial is defined as created or manufactured by humans, frequently as an opposite of natural occurring things and Intelligence refers to the ability to acquire and apply knowledge, solve real life problems and adopt to new situation and learn from experience (Legg & Hutter, 2007). An area of computer science is known as artificial intelligence which allows us to build intelligent computers with human-like behaviour, thought processes, and decision-making abilities (Pannu, 2015). Based on capabilities, artificial intelligence can be divided into three categories: Artificial General Intelligence (AGI), Artificial Super Intelligence (ASI), and Artificial Narrow Intelligence (ANI). ANI is made to carry out a particular task or a group of related tasks. (Kuusi & Heinonen, 2022). A couple of examples of ANI are Google assistant and Apple's Siri virtual assistant. Based on prior experiences and domain expertise, AGI is expected to make well-informed decisions. This kind of AI is still in its early stages of development. ASI is an acronym for exceeding human potential in creative, analytical, and task-completion abilities (Barney & Wigmore, 2023).

Artificial intelligence helps students in various ways in education. It plays an important role in helping students to collect information, real-life decisions, and solve life-related problems, improve their skills in various subject areas (Chen, Jensen, Albert, Gupta & Lee, 2023). AI fills gaps in classroom and assists teachers and students in teaching-learning process (Hooda, Rana, Dahiya, Rizwan & Hossain, 2022). Artificial Intelligence enhances learner’s interest and skills in the field of Education. AI is used by teachers, students, librarians, and other members of in institute. As a result of Artificial Intelligence students have the opportunity to learn 24x7 hours (de Oliveira Fornasier,2021).

The future of artificial intelligence will provide a truly personalized experience to each and every learner and thus empower students in creating more enriching content and engaging environment in educational fields (Tedre, Toivonen, Kahila, Vartiainen, Valtonen, Jormanainen & Pears, 2021). The use of artificial

intelligence is increasing at present and will continue to increase in the future of education. In the future, the impact of personalized education will increase significantly. One of the key roles of AI in education is its ability to enhance personalized learning.

Global investments in artificial intelligence reached a whopping $ 4.5 billion in 2021, with an anticipated compound annual growth rate of 45% up to 2025.

Historical background: The originator of the term artificial intelligence was John McCarthy. He is known the father of artificial intelligence. He is credited, along with Alan Turing, Herbert A., Marvin Minsky, Allen Newell, and others, as one of the founders of artificial intelligence (Elliot & Onuodu, 2019).

¬ Artificial intelligence has come step by step first 1941, the concept of artificial intelligence as we know it today had not yet been formally defined. During this time Renowned mathematician and logician Alan Turing played important role with his concept of a theoretical computing machine, known as the Turing machine, in his 1936 paper (Steel & Brooks, 2018).

¬ In 1943, the term artificial intelligence had not yet been coined. This era laid the groundwork for later development in artificial intelligence (Fleck, 2018).

In 1949, Donald Hebb proposed a theory known as Hebbian learning, which is suggested that neural pathways are strengthened when neurons are activated together (Kuriscak, Marsalek, Stroffek & Toth, 2015).

¬ In the 1950, the field of artificial intelligence emerged. Alan Turing and John McCarthy laid the foundation for the development of machines that could simulate human intelligence (Amudha, 2021).

¬ In 1952, Authur Samuel, a computer scientist developed a program to play the checkers, which was the first time.

¬ In 1955, John McCarthy organized a workshop an artificial intelligence at Dartmouth, UK, which as the firstly used the term.

¬ In 1966, Joseph Weizenbaum created ELIZA, an early natural language processing computer programme. ELIZA simulated conversation by processing user input and providing responses based on pattern-matching technique (Singh & Thakur, 2020).

¬ In 1972, the development of the Stanford cart marked a notable event in the history of artificial intelligence (Stone, 2018).

¬ In the 1980, Expert systems gained popularity during this period, focusing on knowledge representation and rule-based reasoning.

¬ In 1997, IBMs Deep Blue defeated world chess champion Garry Kasparov in a historical match, showcasing the capabilities of artificial intelligence in a Strategic game. This marked a significant milestone in artificial intelligence (Pfeifer & Scheier, 2001).

¬ In 2002, the field of artificial intelligence experienced growing interest in machines learning and data-driven approaches (Wong & Wang, 2003).

¬ In 2006, Geoffrey Hinton and his team published groundbreaking research on deep learning (Minar & Naher, 2018).

¬ Then 2011, Watson demonstrated the ability to understand and respond to complex questions in natural language, marking a significant achievement in the practical application artificial intelligence (Ferrucci, 2012).

¬ In 2016, AlphaGo, artificial intelligence program developed by deep mind and defeated the world Go player Lee Sedol (Halina, 2021).

¬ In 2018, artificial intelligence continued to impact various industries. This time artificial intelligence development of chatbots and virtual assistants.

¬ Artificial intelligence development trends that will have a big impact in 2023. Latest artificial intelligence development in 2023 is Automated Machines learning (Auto ML), Generative AI, Natural language processing (NLP), Ethical AI, Accessible artificial intelligence to all.

Objectives

The following objectives were planned for the study:

1. To explore applications of Artificial Intelligence in Education.
2. To explore the future prospects of Artificial Intelligence in Education.

Methodology: This study used a survey approach. The questionnaire was created using Google forms and included multiple choice questions to gather structured responses and free-text questions to allow for more open-ended responses. It covered various aspects of AI in education, including the perceived benefits and challenges, the level of comfort with using AI tools, and the perceived impact of AI on teaching and learning.

The voluntary nature of participation, and the confidentiality of responses. No identifiable data was collected and in addition to the questionnaire responses, demographic data were collected from participants. This included information such as age, sex, academic discipline, and level of familiarity with AI. This study was

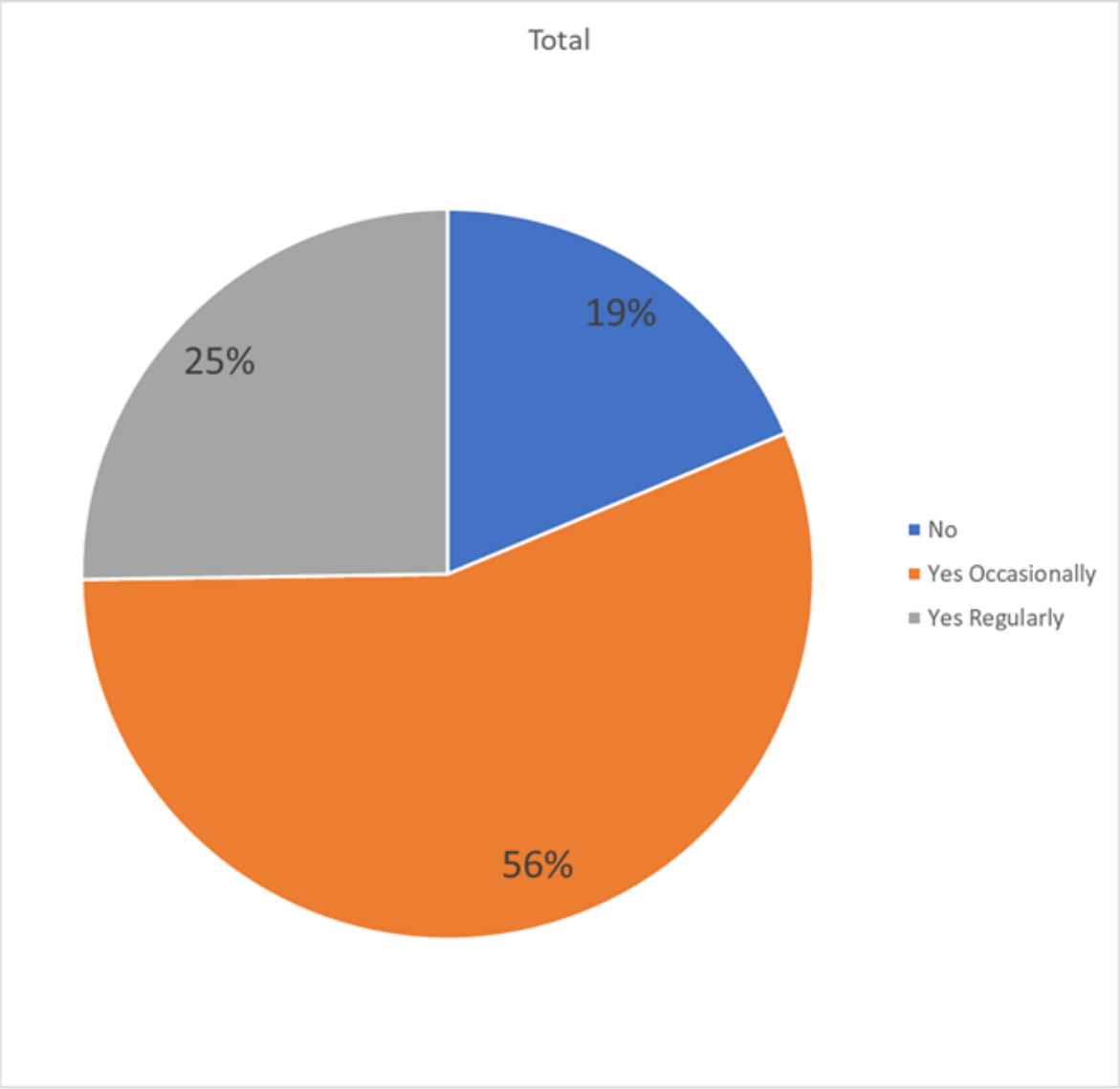
conducted in accordance with institutional ethical guidelines for research involving human participants and was approved by the Local Ethics Review Co-ordinator.

II. Data Interpretation & Results

Use of AI within role

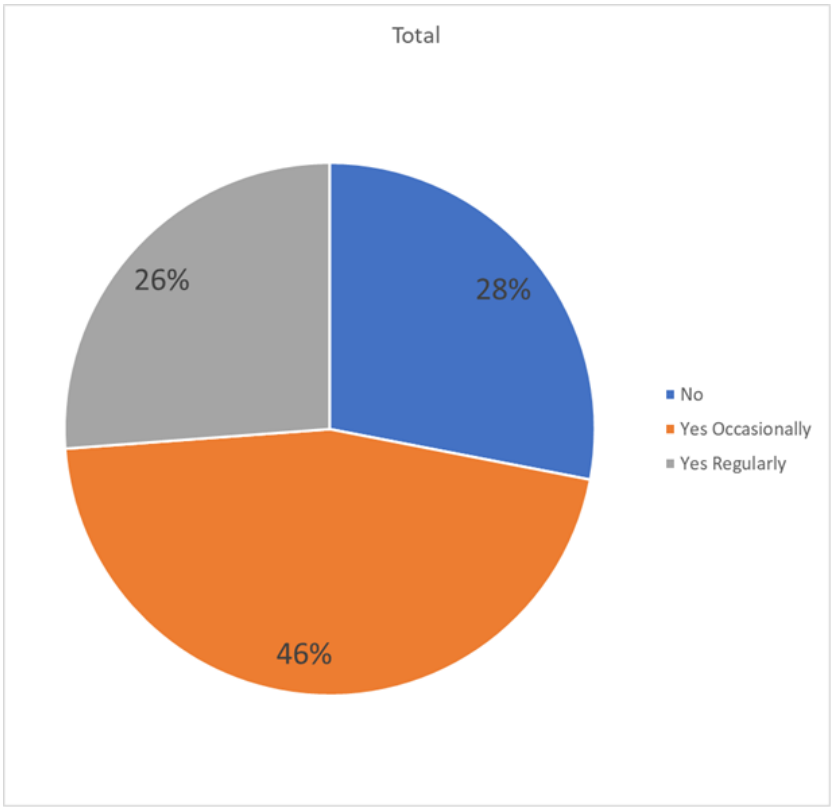
Q.1 How you ever used AI technologies (like chatbots, recommendation engines, voice assistants) in your work?

Row Labels	Count of How you ever used AI technologies (like chatbots, recommendation engines, voice assistants) in your work?
No	20
Yes Occasionally	60
Yes Regularly	27
Grand Total	107



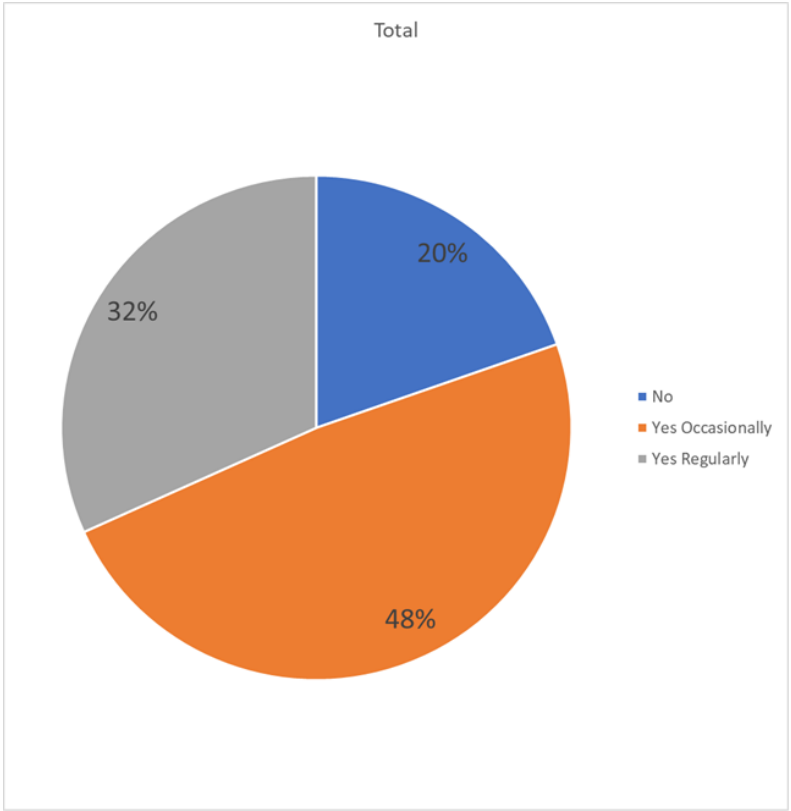
Q.2 Have you Used AI for Research related tasks?

Row Labels	Count of Have you Used AI for Research related tasks
No	30
Yes Occasionally	49
Yes Regularly	28
Grand Total	107



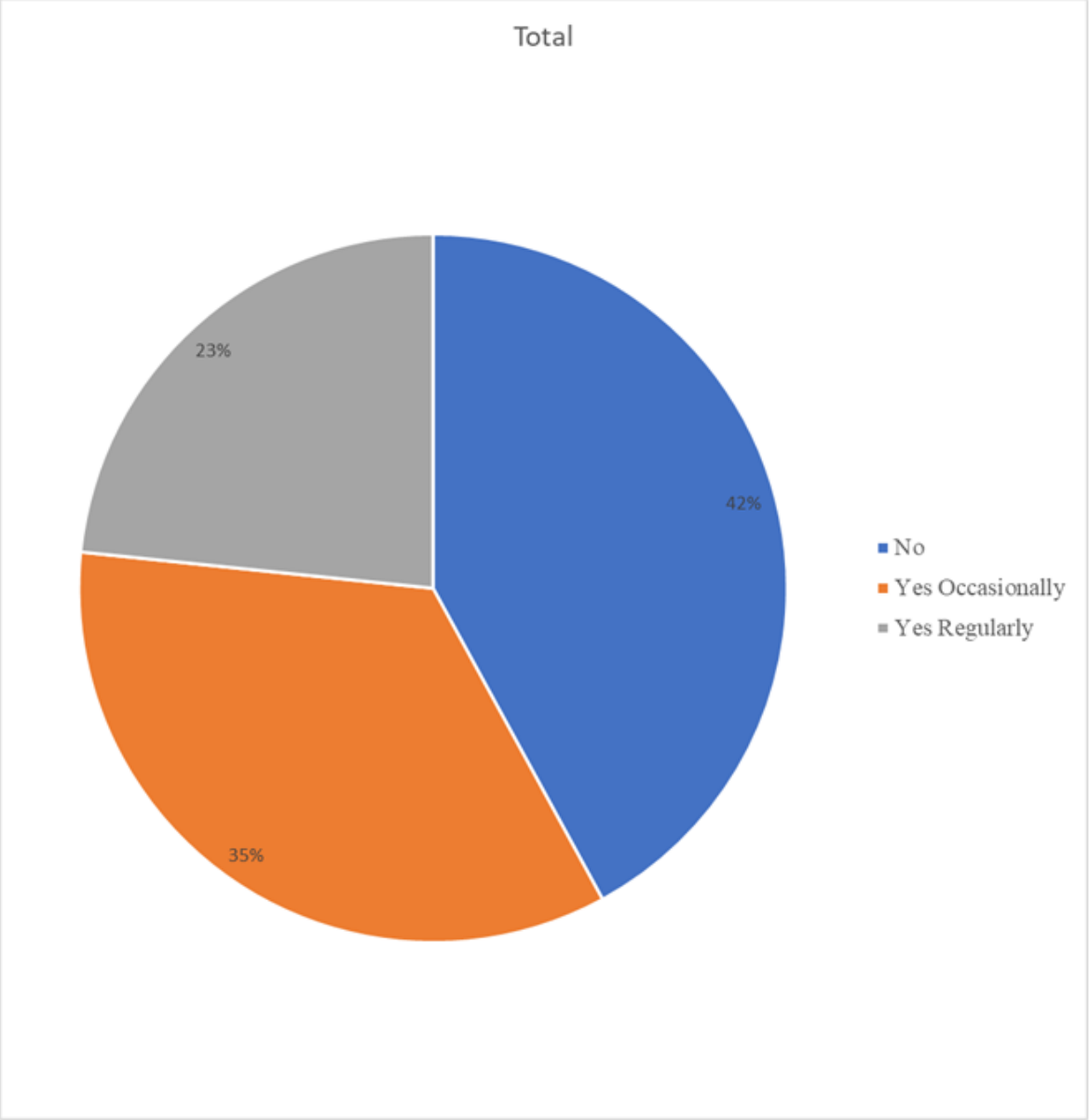
Q.3 Have you Used AI for teaching related tasks?

Row Labels	Count of Have you Used AI for teaching related tasks
No	21
Yes Occasionally	52
Yes Regularly	34
Grand Total	107



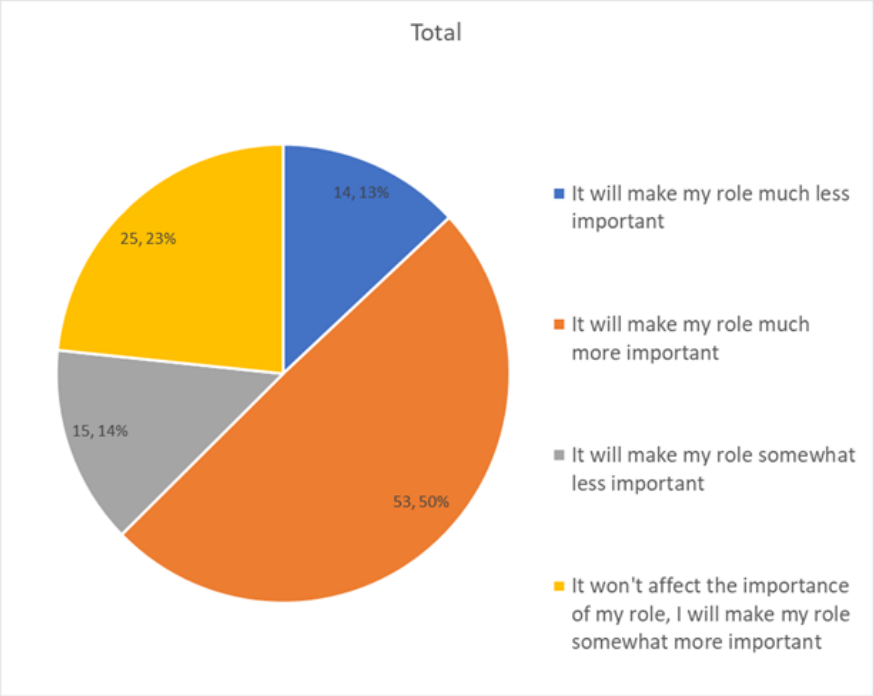
Q.4 Have you Used AI for Admin related tasks?

Row Labels	Count of Have you Used AI for Admin related tasks?
No	45
Yes Occasionally	37
Yes Regularly	25
Grand Total	107



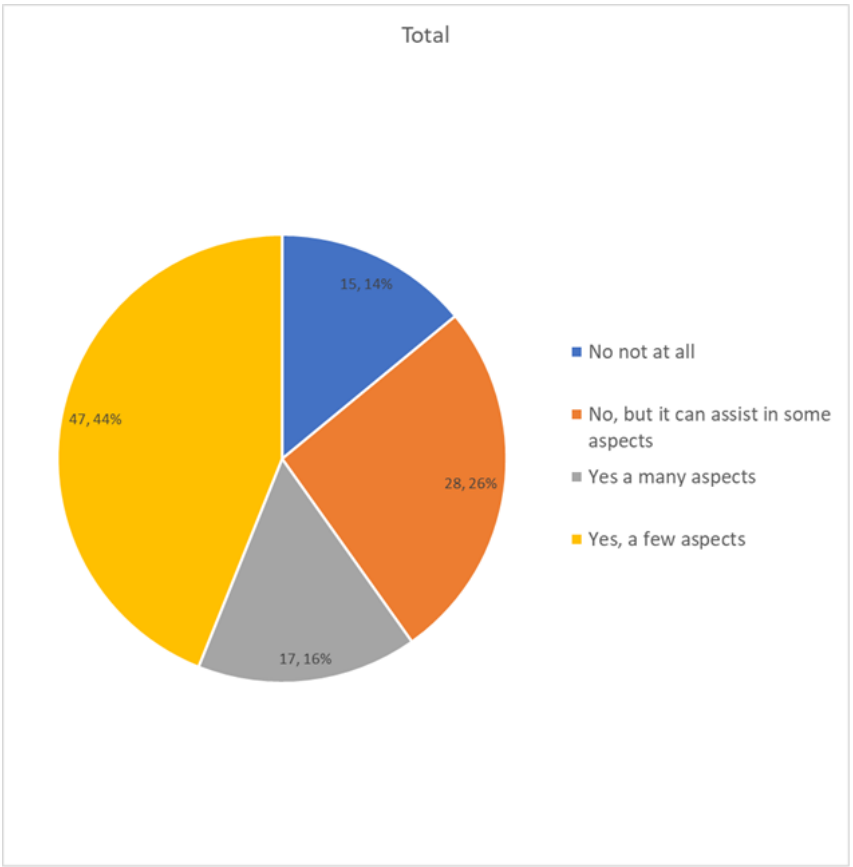
Q.5 How do you believe AI will impact the future of your role as an educator?

Row Labels	Count of How do you believe AI will impact the future of your role as an educator?
It will make my role much less important	14
It will make my role much more important	53
It will make my role somewhat less important	15
It won't affect the importance of my role, I will make my role somewhat more important	25
Grand Total	107



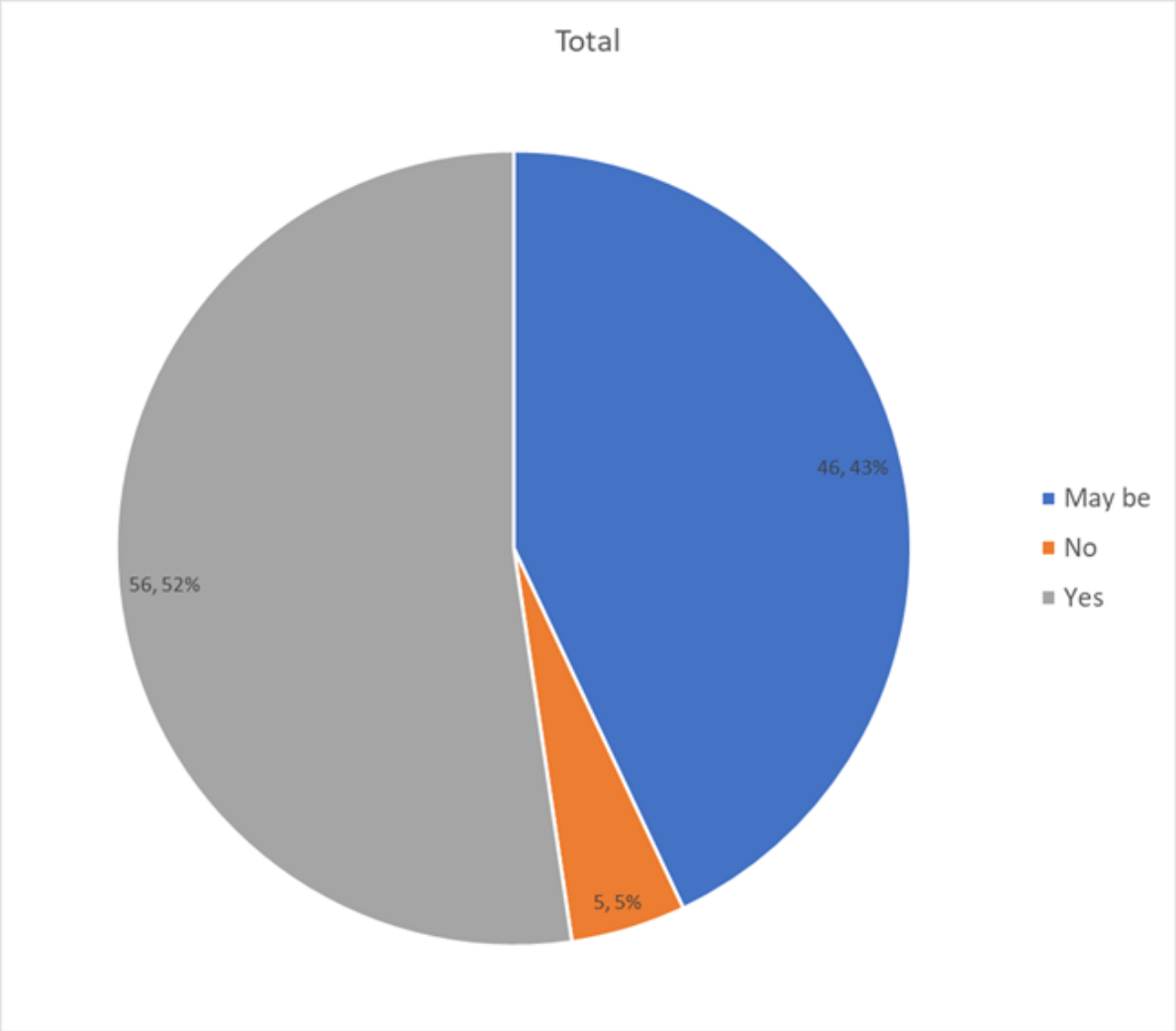
Q.6 Do you believe AI has the potential to replace certain aspects of your role as an educator?

Row Labels	Count of Do you believe AI has the potential to replace certain aspects of your role as an educator?
No not at all	15
No, but it can assist in some aspects	28
Yes a many aspects	17
Yes, a few aspects	47
Grand Total	107



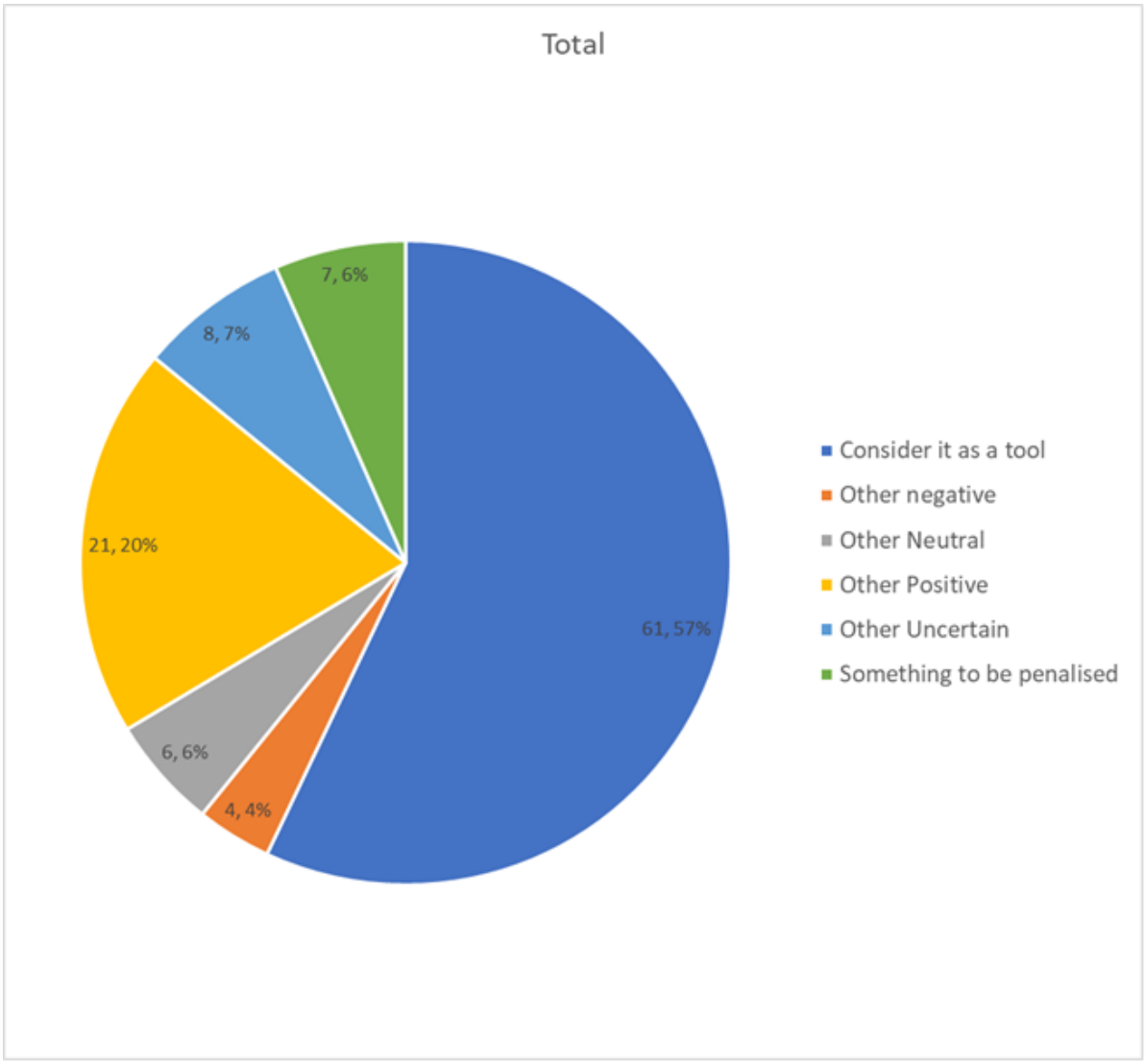
Q.7 Do you think we can train students to effectively use AI for academic purposes?

Row Labels	Count of Do you think we can train students to effectively use AI for academic purposes?
May be	46
No	5
Yes	56
Grand Total	107



Q.8 How should we deal with the use of AI?

Response	Count of How should we deal with the use of AI?
Consider it as a tool	61
Other negative	4
Other Neutral	6
Other Positive	21
Other Uncertain	8
Something to be penalised	7
Grand Total	107



III. Discussion

This research paper was carried out to assess the opinions of AI in education from academic staff. There is little literature regarding the opinions of academic staff on AI and these results provide a starting point for understanding these for the background to implementing AI successfully. We do, however, acknowledge the shortcomings of the survey approach used in this study. In distributing this voluntary and anonymous survey by the methods described, it resulted in a low response rate (approximately 10%). However, the topic can be a contentious one and the possibility that respondents are more likely than non-respondents to hold strong opinions or emotions on this issue is a real one and should be considered. As a further limitation, all respondents came from Leeds Beckett University, and opinions from staff at other types of institution may differ.

How are staff currently using AI? The study indicates that ChatGPT (ChatGPT, n.d.) is the most frequently used AI tool among those who have adopted AI for their work, especially for tasks related to teaching and research. ChatGPT's natural language processing capabilities make it well-suited for these functions. For instance, it can be used to automatically answer frequently asked questions from students, freeing up time for the teaching staff. In research, it can assist in text analysis or even help generate written content, making it a useful tool for academic writing or data interpretation. Use for these tasks may indicate that staff see AI as a complementary tool. The ease of use is a significant factor. ChatGPT is relatively straightforward to implement and doesn't require extensive technical skills. This is particularly appealing in an academic environment where not everyone might be tech-savvy. The less daunting a tool appears, the more likely staff are to try it out, even if they initially had reservations about using AI. The immediate benefits that ChatGPT offers can also make it an attractive option. If staff can quickly see positive results, like saved time or improved efficiency, they are more likely to continue using it and even become advocates for it. This can influence the wider staff community. If a respected colleague reports having a positive experience with ChatGPT, it serves as a strong endorsement and could encourage others who are on the fence about AI to give it a try. However, it's worth noting that the

specific choice of ChatGPT could also point to limitations in how AI is perceived. If ChatGPT is primarily used for communication and data analysis, it suggests that academic staff might not yet see AI as being applicable for more complex tasks. This could be because they are unaware of the capabilities, or it might reflect reservations about the effectiveness of AI.

How do staff opinions influence AI adoption? The study shows that most respondents hold the positions of senior lecturers/lecturers. These roles generally come with a level of autonomy in teaching methods and often have sway over departmental decisions. Their opinions, therefore, have the potential to significantly influence the broader academic community within an institution. When staff have positive experiences with AI, it can create a ripple effect. Their endorsement can serve as a form of 'social proof,' making other staff more comfortable with the idea of adopting AI in their own roles. For instance, if a senior lecturer successfully integrates AI tools into their research methods or teaching approach and shares these positive outcomes with colleagues, it could encourage others to explore these tools (McConnell et al., 2020). This is particularly important for those who may be hesitant or lack the confidence to try out new technologies without some form of validation from trusted peers. However, the influence of this group can also act as a double-edged sword. If they express scepticism about AI, it can impede its broader adoption. This is especially true if these views are vocalised in formal settings like department meetings or even informally during discussions among colleagues. The influence of such staff extends beyond their immediate colleagues. They often sit on committees within the institution, thereby having the ability to influence policy and resource allocation. Their views could thus shape not just departmental but institutional approaches to AI, either opening doors for investment in new technologies or keeping the status quo. In addition, these staff members are often deeply involved in student education and mentorship. Their adoption or rejection of AI tools could directly impact the next generation of professionals, affecting not just current but also future attitudes towards technology in academia.

Application of Artificial Intelligence in Education: The role of artificial intelligence in education is very important. Present day the use of artificial intelligence in education is very high. Artificial intelligence makes learning more fascinating and engaging. Artificial intelligence can dynamically alter course content, and provide instant feedback, and student involvement (Anis, 2023). Personalized learning gaining popularity for motivating and engaging students, is one of the primary benefits of artificial intelligence in education (Aldhaen, 2022).

The field of education is changing because to artificial intelligence. Artificial intelligence very important for personalized learning. It provides real time feedback to enhance student performance and automates administrative tasks.

Artificial intelligence helps in education field in various ways as few examples, like smart content, chatbot, adaptive learning, personalized learning, learning management system, administrative task, real-time feedback, learning more interesting etc (Pokrivcakova, 2019).

Smart content refers to digital content that is dynamic, personalized, and tailored to individual user based on their preference, behaviour, or demographics. It often involves the use of advanced technologies like artificial intelligence. Artificial intelligence very important for chatbot. A chatbot is a computer program designed to simulate conversation with human users, often power by artificial intelligence (Singh & Thakur, 2020). Chatbot is very important in education sector. Benefits of Artificial intelligence in education is its potential to enhance personalized learning. Personalized learning with artificial intelligence involves tailoring educational experience to the individual need, preferences, and progress of each learner. This approach aims to optimized learning outcomes by adapting the pace, difficulty, and format of educational materials to suit each learner. Personalized learning artificial intelligence can be implemented in various educational setting, from traditional classroom to online platforms, fostering a more engaging and effective learning experience.

Artificial intelligence plays an important role for learning management system. A learning management system is software application that used to plan, implement and assess a specific learning progress. Artificial intelligence in learning management system can also automate administrative tasks, and improve overall efficiency in educational settings. In adaptive learning, artificial intelligence plays a crucial role in tailoring educational experience (Pedro, Subosa, Ravas, & Valverde, 2019).

Artificial intelligence in adaptive learning systems aims to create individualized educational experience, enhancing the overall efficiency and impact of the learning process. It can dynamically adjust content, difficulty levels, and learning paths to suit individual needs, promoting more effective and tailored learning journeys. Artificial intelligence helps educational institutions optimize resource allocation by predicting trends, managing budgets, and identifying areas for improvement, leading to more effective utilization of resources. Artificial intelligence supports in their professional development by offering personalized learning. Artificial intelligence always updated on the latest teaching methodologies and technology.

Artificial intelligence is not only in India but all over the world, the important of artificial intelligence has spread in the field of education. Artificial intelligence fosters connectivity and collaboration among students

and educators worldwide, breaking down geographical barriers and creating opportunities for diverse perspectives and cultural exchange. Artificial intelligence powered educational platforms offer anytime, anywhere access to educational resources, enabling students to engage with educational content at their own pace and convenience (Sharma, 2023). Interactive virtual assistants and tutorials can be made with AI. Artificial intelligence in virtual assistants involves the use of advanced algorithms and natural language processing to enable machines to understand and respond to user command or queries. Virtual Assistants systems often utilize machines learning to improve their performance over time. So artificial intelligence very important for virtual Assistant in education.

Current use of Artificial Intelligence in Education:
1) Artificial intelligence is recently being used to teach knowledge and skills by merely assessing their present skill level and creating a guided instruction to them for becoming proficient.
2) Artificial intelligence is currently being used to manage classroom audio-visual device.
3) AI is currently being used to help student s to learn another language. As a matter of fact, there are hundreds of languages powered by artificial intelligence.
4) Artificial intelligence is very important for preparing lesson planning. Lesson plan communicate to learners what they will learn and how they will be assessed.
5) Artificial intelligence is currently being used to chatbots for student support.
6) Artificial intelligence currently being used to teach students to code.
7) AI is currently being used to facilitate and manage educational games.
8) Artificial intelligence currently being used to power interactive games that teach children basic needs.

Future Prospects of Artificial Intelligence in Education: The significance of outlining potential futures for education is further highlighted by the current situation. The future of education is significantly impacted by the present acceleration of technological advancements, particularly in the area of artificial intelligence (AI) and its widespread application in education. Most people think artificial intelligence (AI) has the ability to drastically change. The future prospects of artificial intelligence in the education sector are promising. In the future, artificial intelligence will become a huge part of our daily life. The impact of artificial intelligence in the field of education will be more massive (Sharma Tomar, Bhardwaj, Sakalle, 2021). Artificial intelligence can personalize learning experience, adapt to individual student need and provide real-time feedback. It aids in automating administrative tasks, allowing educators to focus more on teaching. This bespoke method has demonstrated enhance learning results and heightened student engagement.

The future of artificial intelligence in education:
1) High quality online lecture videos
2) Use several online learning websites and apps
3) Gamification will lead to Experiential learning
4) Artificial intelligence Improve teaching techniques
5) More acceptance at workplaces
6) Learning experience comparable to traditional classroom
7) Unlikely to replace traditional learning
8) Mixed mode courses becoming popular
9) Lot of potential for augmenting ground courses

Artificial intelligence is expected personalized learning experiences through adaptive learning and creating individual student needs. The future of artificial intelligence in education is expected to witness several Advancement: personalized learning, adaptive learning platforms, robotics in education, predictive analytics, blockchain for credentials, smart content creation (Daniel, Godwin, & Joseph).

In the future, another game changing aspects of artificial intelligence in education is the implementation of intelligent tutoring systems. These systems use artificial intelligence to provide personalized instruction and feedback to students, identifying knowledge gaps and offering targeted support to help them achieve their learning goals. For example, platforms like MATHia by Carnegie learning use artificial intelligence to analyze student performance and provide customized hints, feedback, and explanation to each individual Needs (Boser, 2021).

Artificial intelligence algorithms will tailor educational content to individual student need, optimizing learning paths based on strength and weaknesses. In future, Artificial intelligence is very important for Robotics in education. The future of robotics in education holds several exciting possibilities:

Assistive learning is very crucial role for robotics in education. Robots can assist teachers by providing one on one support to student, helping with tasks, and reinforcing learning concept in a personalized manner. Educational robots can be used to teach and coding and STEM (Science, technology, engineering and

mathematics) concepts, making this Subjects more interactive and engaging for students. Robots very helpful for future generation in education sector. Robots can help with physical tasks in educational setting, such as distributing materials, organizing classroom, or assisting students with special needs. Robots can facilitate collaboration learning task and Hand on experience. Educational robots can provide hand on experiences in subject like science and engineering, allowing student to experiment and learn in a tangible way. Robots can be employed to enhance remote learning experience by providing interactive lessons, conducting experiments, or facilitating discussions through virtual platforms. Robots can contribute to inclusive education by providing additional support to students with diverse learning needs, ensuring that educational resources are accessible to all (Pedro, Subosa, Rivas, & Valverde, 2019).

Artificial intelligence also helps student to enhance content development. Artificial intelligence technology can also help educators develop more engaging and effective content for their students. Artificial intelligence very important for future generation is dream box learning in education platform. This adaptive online math program uses artificial intelligence to adjust lessons based on each students' strengths and weaknesses ensuring truly personalized learning experience.

Implications: - The staff opinions gathered in this study carry several significant implications for the future adoption of AI in academic settings. First and foremost, the notable gap between the number of staff willing to use AI and those who have done so suggests that mere openness to the technology isn't enough to guarantee its adoption. This disparity indicates that even if staff are willing, there may be various barriers, such as lack of resources or training, preventing them from using AI. The preference for specific AI tools like ChatGPT also suggests that staff may currently see AI as beneficial for particular tasks, perhaps due to a limited understanding of the technology's broader capabilities.

The reported increase in productivity among AI users is promising and implies that when AI is adopted, it tends to be used successfully, at least in the short term. However, the low number of reported negative impacts warrants caution. It raises the question of whether staff are sufficiently considering the longer-term and more complex challenges that come with AI integration. One possibility is that the short-term gains in productivity are overshadowing potential long-term issues. For instance, while automating routine tasks might improve efficiency now, there could be future concerns about job displacement as AI capabilities expand. The initial boost in productivity might also lead to higher workloads and expectations, ultimately affecting staff well-being in the long run.

Ethical considerations are another critical aspect that seems to be missing from the reported experiences. For instance, the use of AI in data analysis or student evaluations brings up important questions about data privacy. How is student or research data being stored and used, and who has access to it? There's also the issue of algorithmic bias, which could inadvertently introduce discrimination into research findings or student assessments. The low number of negative reports might also be due to a honeymoon period with the technology, where the novelty and immediate benefits have not yet given way to a more nuanced understanding of long-term implications. Alternatively, it could reflect reporting bias where staff are less likely to report challenges or failures, either due to the stigma associated with it or because they haven't yet encountered these issues.

IV. Conclusion:

Artificial Intelligence (AI) holds great promises and has the potential to bring the transformative changes in Education. The Artificial Intelligence is making the impacts in various ways such as, in Personalized Learning, Adaptive Learning Platforms, Tutoring and Homework Assistance, Automated Grading, Early Intervention, Virtual Classrooms and Remote Learning, Language Learning, Educational Content Creation, etc.

Here's a breakdown of the responses to the question **"Do you believe AI has the potential to replace certain aspects of your role as an educator?"** based on the survey data:

- **Yes, a few aspects:** 47 respondents (43.93%)
- **No, but it can assist in some aspects:** 28 respondents (26.17%)
- **Yes, many aspects:** 17 respondents (15.89%)
- **No, not at all:** 15 respondents (14.02%)

Summary:

A majority of respondents (around 60%) believe that **AI can replace at least a few or many aspects** of their role. However, **about 40% see AI more as a supportive tool or not a threat at all**, indicating a generally cautious but open attitude toward AI in education.

Would you like help creating a chart or visual summary of these insights?

The future prospects of artificial intelligence in education is vast and promising. The future of artificial intelligence in education holds great promise, offering personalized learning experience and enhance

educational outcome. In the future, artificial intelligence collaboration to ensure a balanced and beneficial integration into the education system. Artificial intelligence is changing how we learn and teach. Artificial intelligence is creating an exciting future for education. Future educators must embrace Artificial Intelligence as a Supplementary tool rather than as a substitute if they are to use it in the classroom.

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