



Influence of COVID and AI on Teaching and Learning

Vipin Balyan^(✉) 

Department of Electrical, Electronics and Computer Engineering, Cape Peninsula University of
Technology, Cape Town, South Africa
vipin.balyan@rediffmail.com

Abstract. The evolution of COVID resulted in lockdown, which led to utilization of Artificial Intelligence (AI) for education. Before, COVID's use of AI was limited and people were skeptical, COVID opened the debate again for the inclusion of AI in education. In this paper, the potential benefits and demerits of AI are discussed. A survey is also conducted on a group of students to determine whether the utilization of AI is better or physical (face-to-face) learning approach is more efficient. The survey is conducted on a group of engineering students for understanding concepts of Communication Engineering. The survey included students' performance, their understanding, working or non-working, improvement in understanding with the help of graphics, improvement in writing skills, test preparation, assessment, and feedback on demerits.

Keywords: AI · COVID · Learning

1 Introduction

In ideal conditions, students were formulating ideas and providing explanations which have scientific merits, due to the emergence of COVID in 2019, due to limited access to the classes and laboratories it is quite impossible. In absence of COVID too, significant limitations were there for access to the availability of labs [1]. The force is on educators to plan and design the teaching and learning environment in way that student understands it more clearly and they have better opportunities to understand the logic behind everything [2]. Research has been conducted which proposes that lab work and class activities creates effectual learning environment for better achievement in engineering education and influences students to think positively towards engineering when designed properly [3].

Emerging technologies transformed the way of teaching, everyone was skeptical earlier to implement them thanks to COVID that people were forced to use them. Due to this AI technology is expanding application in education, it has potential to provide customized learning, easy facilitation of purposeful interaction in mobile, online or a combination learning experiences. Scholars [4] in their work proposed use of robots controlled by AI in some roles to meet the teachers demand in USA. Most of the research in AI is limited to Science, technology, engineering, and mathematics (**STEM**) fields,

in order for AI to find its feet in education, AI in education requires interdisciplinary methods [5]. AIED research suffers shortfall in educational viewpoint, recent literature reviews clearly highlight it [6–8]. Additionally, AI-enabled research conducted in last ten years lacks educational models and theories researchers [9]. It is clearly evident that AIED innovations is still at early stage and collaborations are very few in AI enabled fields[10] which results in gap between capability and utilization of AIED [10, 11]. Data acquisition system can be used to analyse the information [12]. At large, AIED can be utilized in following areas in institutional academic and administrative services: assessments and evaluations, profiling and prediction, personalization and intelligent tutoring. AI technology already started changing educational tools and institutions. Usually in education system, the physical presence of educator is considered vital, the advent of AI modified their presence, AI can be intelligently use for better performance and delivery to students. With the help of AI, the progress of an individual student can be monitored using deep learning, machine learning and advanced analysis. With the growth of AIED gaps in teaching and learning ability of educators and students can be identified easily which will increase education proficiency. Due to the AI ability to streamline administrative tasks, improved efficiency and personalization of profiles the educators will have more time and liberty to enhance adaptive understanding. This combination of AI and educators can bring best out from the students.

2 Effect of AI on Education

AI is going to affect almost every aspect of human's life in future and education sector will not be untouched, as teaching and learning plays an important role in human's life and lot of changes are required/possible in teaching and learning. The education system was not as flexible as it is today before COVID and with the growing fear of possible another pandemic, the steps must be taken at this stage to plan and deploy it in a flexible mode. The educators which are most important pillar of current education systems are not scalable and require priced salaries. The educators in certain countries of the world are under burden of heavy paper work and underrated too. AI can be used to reduce their load and giving them load which is relevant to their skills and interests.

3 Benefits of AI on Education

In todays, world larger population is using smartphones, tablets, laptops etc., which enable them to have quick access to documents, lectures, assignments using internet connectivity, which allows them to use their free time while travelling, waiting for someone in market, restaurant they will have opportunity to study for 10–15 min or more using AI. Gesture recognition facility available in AI can be used to read the attitude of students towards lecture(s) presented to them. With the advancement in AI, facial expression or gestures of students can be used to predict the understanding can be Since AI becomes more sophisticated the machine reads the facial expressions or gestures of the student can be used appreciate and comprehend the lecture type, which can be replaced or improved for better understanding. AI machines can be used to personalise academic curriculum. AI tools can fulfil the dream of global classrooms by changing

it to different languages and people with disability of hearing and visually impaired subtitles or sound effects can be used as required by individual. One of the example of it is Google Translator, which is used by people to translate and hear in their preferred language. Other interactive technologies are also available for this purpose gamification and virtual reality (VR). Students absent due to sickness or some other reason can also access the lecture live or later online. Using AI tools, educators will be able to mark assignment, tasks or tests automatically for all students when a solution or memo is provided, which otherwise would have taken lot of time. It also looks at the gaps in learning and suggests the way to overcome them.

The author himself taking sessional online using Blackboard using questions format like multiple choice/multiple answers or multiple choice/single answer type, fill in the blanks which can be graded with the help AI tools, where a solution or memo is feed at the time of paper setting. The work is in progress in AI where essay type, paragraph type or statement type answers can also be graded automatically. This will make the life of educator easier and will save time.

AI can also be used for Admission, registration and enrolment processes, the process can be further made easy as the research will grow in AIED, when used at full potential. AI can be used as a helping tools by students, it can assist students in their homework, test preparation and as its basically personalized service, can suggest ways to improve performance of a particular student. Current situation suggests that AI will be an answer to many problems related to teaching and learning. Due to the inclusion of AI, studying and tutoring methods are becoming better day by day.

AI can create and manage the groups among students with respect to their capability and performance. This kind of management is adaptive group formation. With AI, the student's tests, comprehension etc., can be marked just after the submission and their performances can also be compared with previous performances available in database. AIED is computer based technology which yields customized, adaptable and insightful teaching. The main components of AIED is Domain Knowledge model which provides the system capability to finish the assignment which makes the students responsible for the contributing to the students. A student model that represents a student with respect to gained knowledge and development of skills. The pedagogical model is a module which represents the educational potential of the AI an at last a module which interface which provides a channel for the learner to communicate with the system.

Another important feature of AI which is very useful in education is the voice assistant feature. This is one of the most important development application of AI. Some examples are Google Assistant, Amazon's Alexa, Apple's Siri, and Microsoft's Cortana. All these voice or language assistants will assist students in having direct conversations with contents and materials and installed devices available on the Internet without teacher intervention. Traditional learning methods are outdated and are being gradually abandoned by several educational institutions and universities. The students enrolled in these institutions and universities already starting getting voice assistance with printed study materials. The voice assistance feature can be accessed at home or other locations in order to access information for learning. Voice Assistants main objective is to provide

Table 1. Advantages of AI in education and challenges

AI in Education	Advantages in Teaching and Learning
Expert systems	→ Instructional planning → Learning management systems uses → Improved Interactions → Leveraging full potential of Learning management system
Intelligent Tutors/agent	→ Tailored and well timed materials → Timely guidance → Prompt Feedback → Customized resources based on requirements, prior knowledge and preferences
Chatbots	→ Invigorating conversations → Improved learner's engagement and interest
Machine Learning	→ Interpret large volume of student's data → Predictive models → Preventive and adaptive interventions
Visualization and virtual learning Environments	→ Collaborative engagement, visual feedback with learning → Envisaging information
Personalized learnings systems	→ Easing interactions → Improved learning → Customized resources for tailored learning
Challenges	
→ Lack of Experience of Educators in using AI tools → Cost of training, scalability of tools and updates → Privacy, security and ethics → Guidelines or rules to be followed for teaching and learning	

information regarding institute or university, answers to most commonly asked questions, schedules and timetables of students and educators which will cut the printing cost (Table 1).

4 Problems Associated with AI in Education

AI offers great potential, still there are problems associated with access use of AI. AI has been used recently by institutes and universities due to COVID, for teaching and learning. Even labs were conducted on online platforms. There might be possibility that institutes or universities might plan to replace face to face education with profitable online education system. This will reduce face to face interactions, students will get more involved in devices and technology, which will hurt them in many ways. The students will have less human interaction; they might get depression due to excessive use of devices. Increasing the use of AI in education can reduce face-to-face interactions,

engross students in technology, and hurt them instead of helping them. Faculty, research advisors, teaching assistants, and administrative staff may be afraid that AI applications, intelligent tutor systems, may replace them. AI systems require vast amounts of data, including student and staff information. This is sensitive information and leads to serious privacy issues. AI is very expensive compared to the cost of installation, maintenance and repair. Only well-funded educational institutions can enjoy these cutting-edge technologies. Excessive reliance on this technology can lead to a lack of personal connection and can hurt users in this regard. It is not possible to know how much data will be lost if a natural disaster or accident occurs and the AI needs to be corrected.

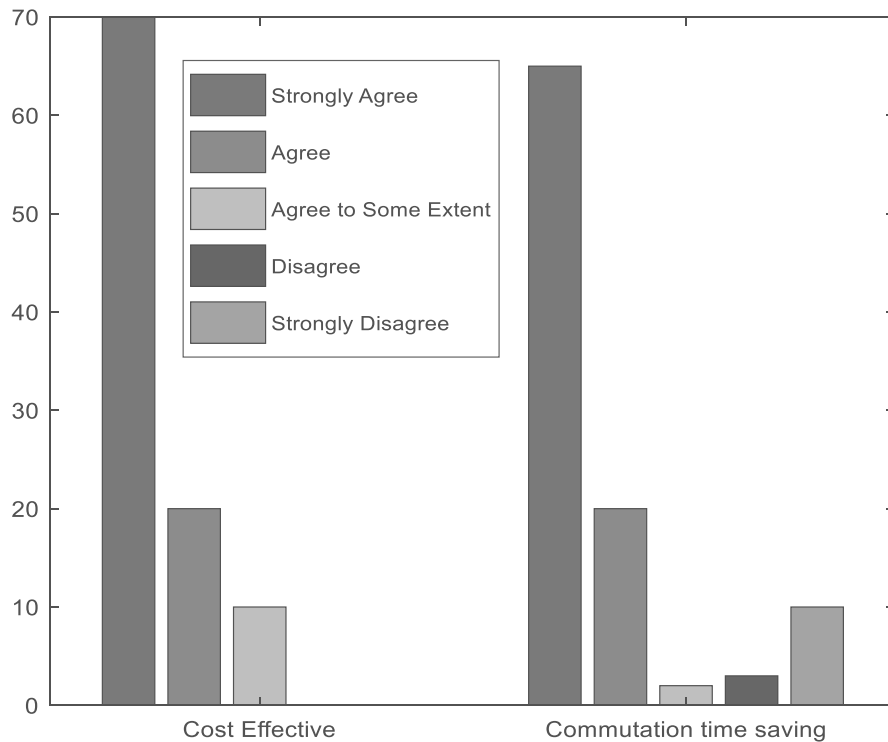


Fig. 1. Feedback on Cost Effective and Commutation time saving.

5 Feedback

A survey has been conducted by the author to get an idea about student's point of view with respect to AIED.

In Fig. 1. Feedback on Cost Effective and Commutation time saving has been taken. 90% of the students agreed that it is cost effective, as they don't have to commute to the campus for lectures and 85% agreed that commutation time is saved, none of the students disagreed that AIED is cost effective.

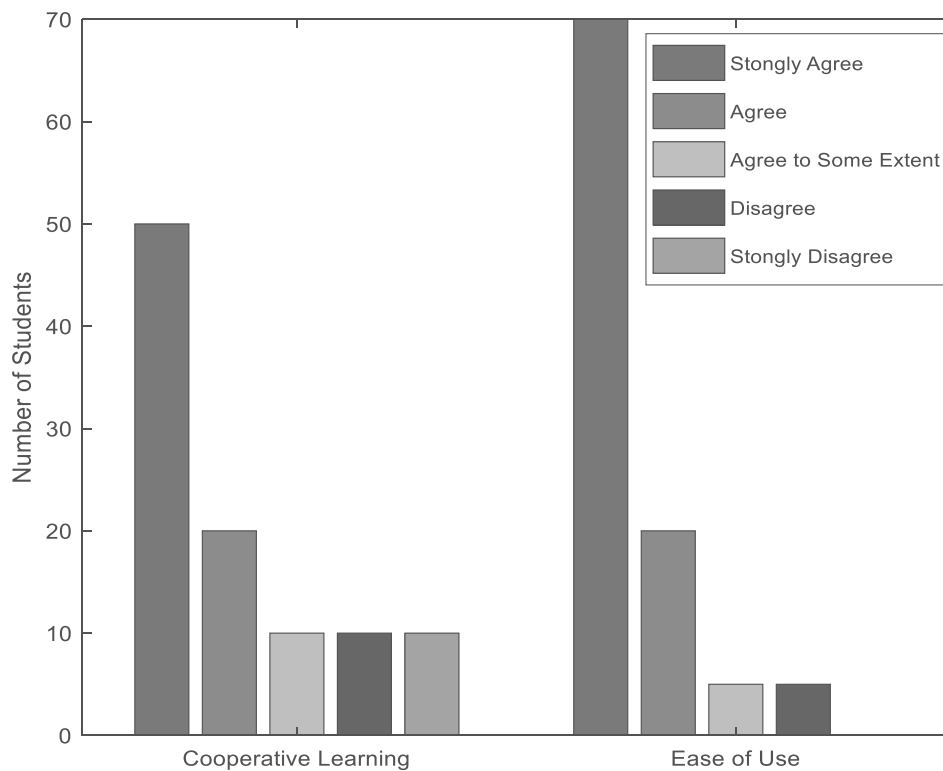


Fig. 2. Feedback on Cooperative Learning and Ease of Use.

In Fig. 2. Feedback on Cooperative Learning and Ease of Use as been taken. 80% of the students agreed that AIED is a good example of Cooperative Learning and 90% strongly agreed that AIED has an advantage in the form of ease of use. The students can access the contents of the course anytime, anywhere while waiting for bus, train, etc. The content can be accessed again and also can be paused when required.

In Fig. 3. Feedback on Personalized T&L and Development of Skill has been taken. AIED provides personalized T&L and develop skills around 70% of the students agreed to it. The percentage of the students which disagree on these two components are very limited.

In Fig. 4. Feedback on Lecturers Accessibility and Ability to Handle AI has been taken. Feedback has been taken on the accessibility of Lecturers when AIED is used for Teaching and learning and how a lecturer manages use of AIED. The feedback on these two components is mixed around 20% students disagreed that lecturers are accessible and 10% disagreed that lecturers are able to handle AI in education properly.

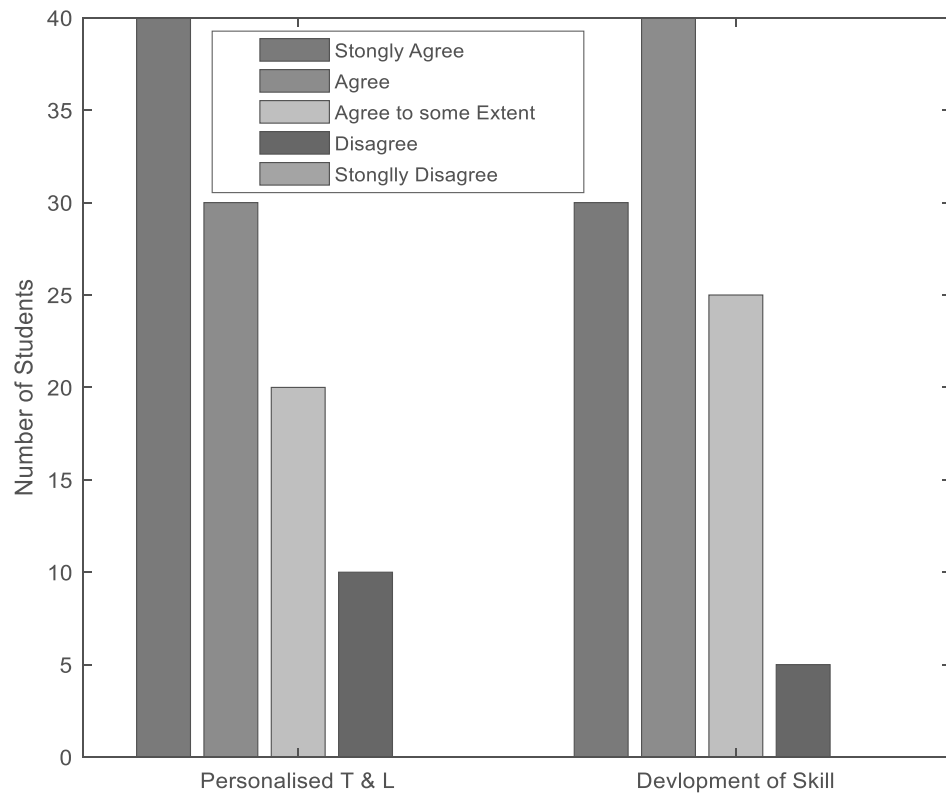


Fig. 3. Feedback on Personalized T&L and Development of Skill.

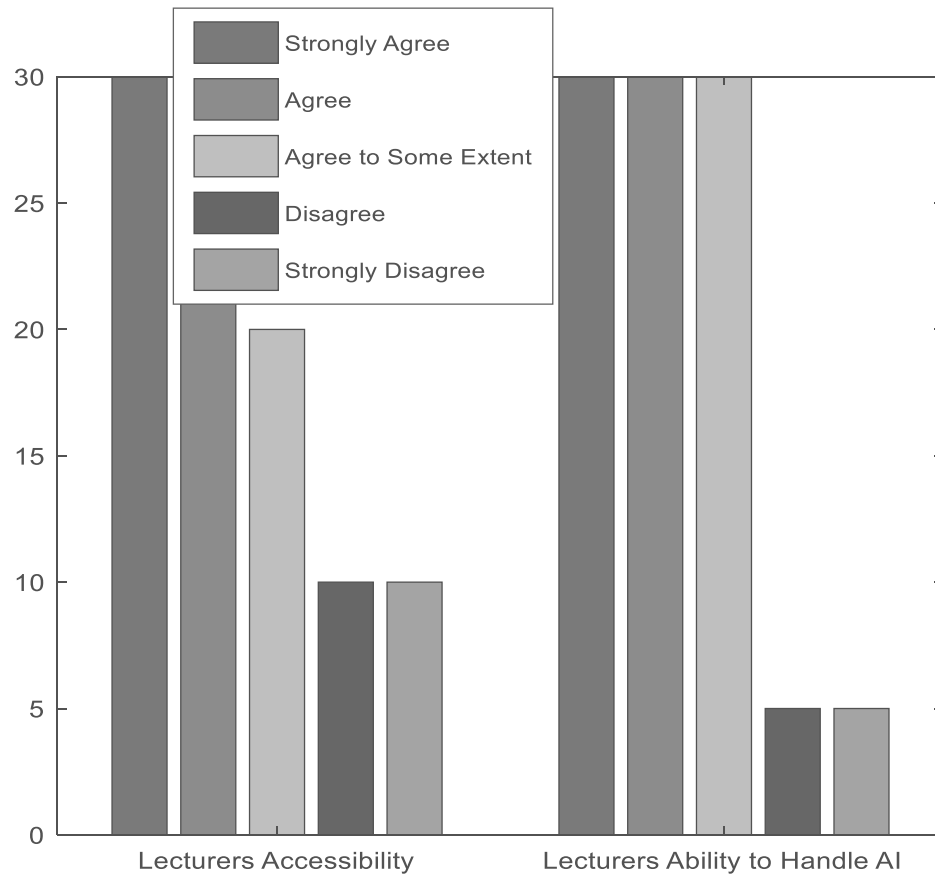


Fig. 4. Feedback on Lecturers Accessibility and Ability to Handle AI.

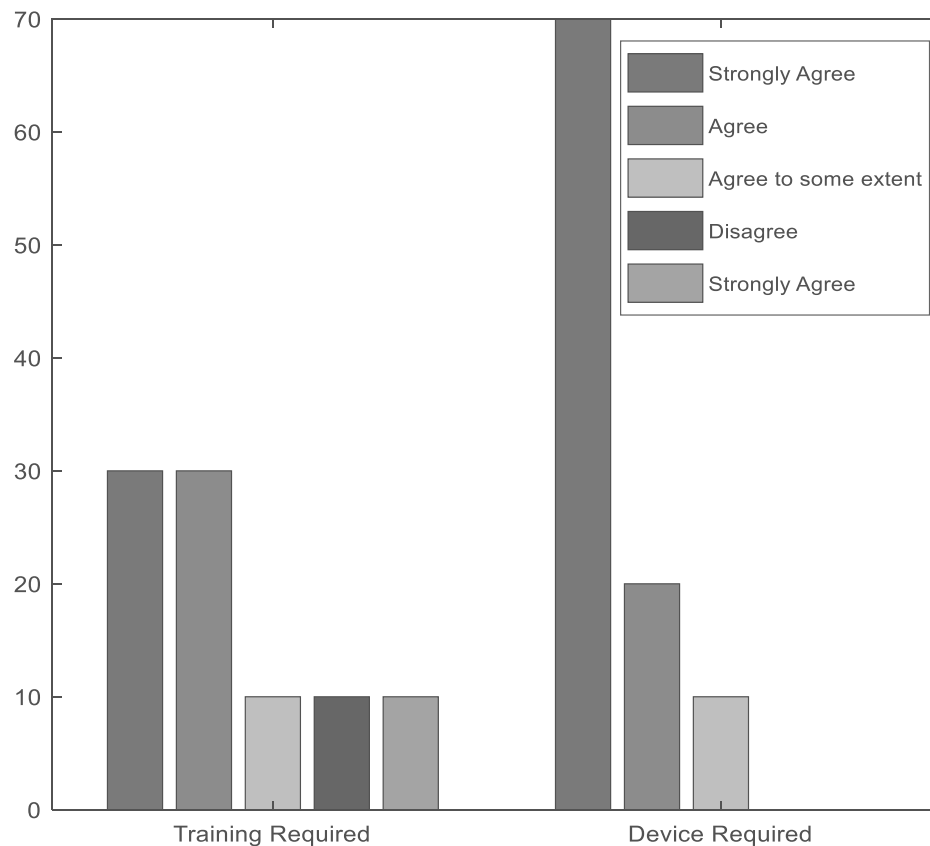


Fig. 5. Feedback on Training Required and Device Required.

In Fig. 5. Feedback on Training Required and Device Required has been taken. Most of the students believed that training is required to handle AIED, without proper training they will not be able to utilize full potential of it and students from poor background believe requirement of a device to access AIED is sometime beneficial to students from well off family, as they limited devices at home and limited speed of internet and it's their main concern, either university or government must provide access to device and internet.

In Fig. 6. Feedback on Access to Others Work and Plagiarism Check Ease has been taken. Students doing research believe that AIED in higher education made their life easy as they have now easy access to articles of others for free or through university website for no cost. They can check plagiarism easily.

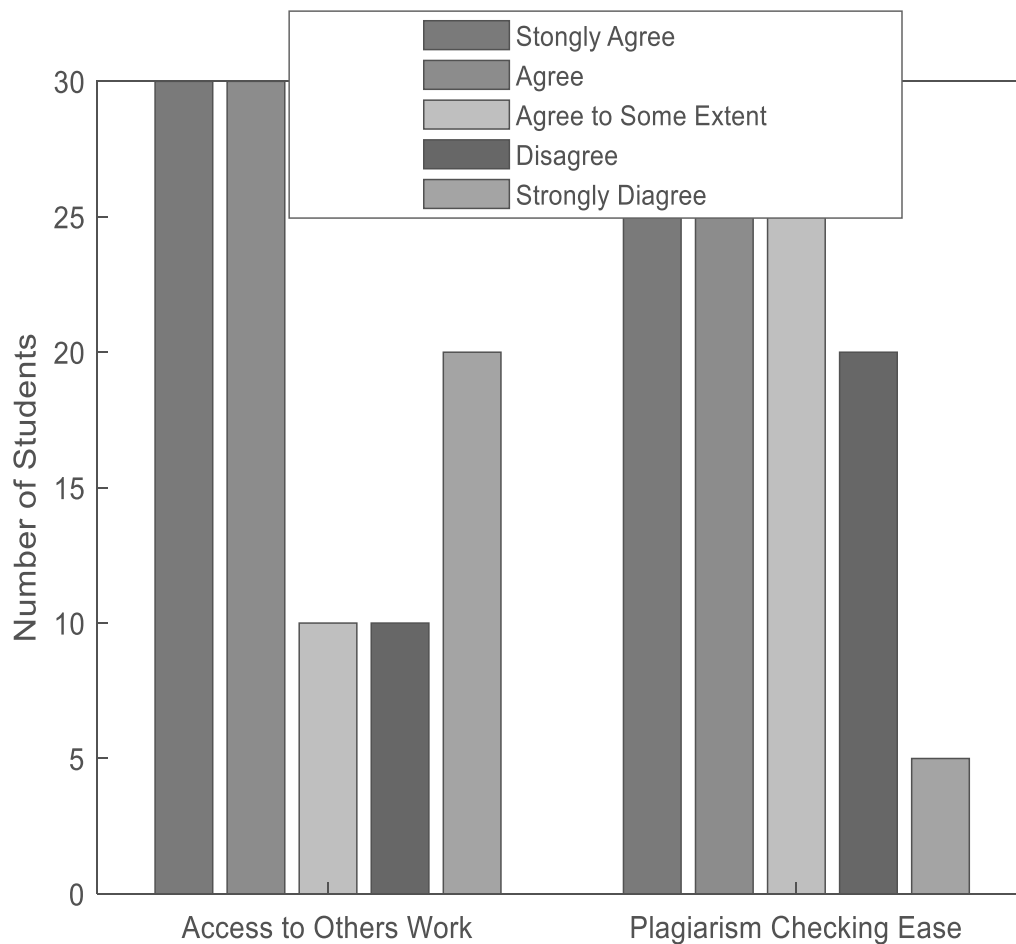


Fig. 6. Feedback on Access to Others Work and Plagiarism Check Ease

6 Conclusion

AI in education is a revolutionary change. The next level of use of AI in education has not yet been invented, according to a report from the Center for Integrated Research in Computers and Learning Sciences. Therefore, people working on AI applications need to inform educators and educational politicians in detail about AI applications. There are some drawbacks to using AI in education, excessive use of devices by anyone can lead to stress, anxiety and loneliness, people will be more confined to their living rooms or working place but because our future is in AI, the education system needs to start exposing students to this type of technology, which has begun to use AI a bit. The effects of AI are initially seen at the lowest level of education and gradually increase towards higher education. The feedback taken in this paper is limited to advantages associated with AIED, in future work can be extended to take feedback on the limitation brought by AI and problems associated with it.

References

1. Marshall, J.A., Young, E.S.: Preservice teachers' theory development in physical and simulated environments. *J. Res. Sci. Teach.* **43**(9), 907–937 (2006)

2. Vosniadou, S., Ioannides, C., Dimitrakopoulou, A., Papademetriou, E.: Designing learning environments to promote conceptual change in science. *Learn. Instr.* **11**(5), 381–419 (2001)
3. Adesoji, F., Raimi, A.: Effects of Enhanced Laboratory Instructional Technique on Senior Secondary Students' Attitude Toward Chemistry in Oyo Township, Oyo State Nigeria. *J. Sci. Educ. Technol.* **13**(3), 377–385 (2004)
4. Edwards, B.I., Cheok, A.D.: Why not robot teachers: artificial intelligence for addressing teacher shortage. *Appl. Artif. Intell.* **32**(4), 345–360 (2018)
5. Richter, O.Z., Marín, V.I., Bond, M., Gouverneur, F.: Systematic review of research on artificial intelligence applications in higher education – where are the educators? *Int. J. Educ. Technol. High. Educ.* **16**, 39 (2019)
6. Chen, X., Xie, H., Zou, D., Hwang, G.J.: Application and theory gaps during the rise of artificial intelligence in education. *Computers and Education: Artificial Intelligence* **1**, 100002 (2020)
7. Lucena, I., Aznar-Díaz, I.A., Cáceres-Reche, M.P., Romero-Rodríguez, J.M.: Artificial intelligence in higher education: a bibliometric study on its impact in the scientific literature. *Educ. Sci.* **9**, 51 (2019)
8. Tang, K.Y., Chang, C.Y., Hwang, G.J.: Trends in artificial intelligence-supported e-learning: a systematic review and co-citation network analysis (1998–2019). *Interactive Learning Environments* (2021)
9. Kabudi, T., Pappas, I., Olsen, D.H.: AI-enabled adaptive learning systems: a systematic mapping of the literature. *Comput. Educ. Artif. Intell.* **2**, 100017 (2021)
10. Bates, T., Cobo, C., Mariño, O., Wheeler, S.: Can artificial intelligence transform higher education?. *Int. J. Edu. Technol. Higher Edu.* **17**, 42 (2020)
11. Losper, B., Balyan, V., Groenewald, B.: Development of Distributed Data Acquisition System. In: Vasant, P., Zelinka, I., Weber, G.-W. (eds.) *ICO 2021. LNNS*, vol. 371, pp. 867–878. Springer, Cham (2022). https://doi.org/10.1007/978-3-030-93247-3_82