Artificial Intelligence Awareness Levels of Students

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Abstract—The aim of this study is to determine the artificial intelligence awareness levels of students. The research was carried out in the fall semester of 2021–2022. The research was designed in accordance with the qualitative research design for the detailed analysis of the data. The research consists of students studying at the engineering faculties of the university. In the research sample, there are 98 students determined by the purposeful sampling method. The data were collected with artificial intelligence awareness research questions prepared by the researcher. Content analysis was carried out for the detailed analysis of the research data. The findings showed that the artificial intelligence awareness levels of the students within the scope of the research were at a good level. According to the results of the research, it was concluded that the students' knowledge about the concept of mind and intelligence was insufficient. From the opinions of university students, it was concluded that the use of technology in education is important. It can be said that there are concerns arising from the findings of the advantages and disadvantages of artificial intelligence, as it is a new technological product. It has emerged that artificial intelligence will take away human jobs. As an advantage, it has been concluded that artificial intelligence tools facilitate every field, as well as their use in education will facilitate teaching.

Keywords—artificial intelligence, university students, education, training, technology

1 Introduction

The communication process, which started with a letter, developed with the discovery of radio and television and communication with wider masses was established, and today it has developed with blogs, wikis and social sharing. Artificial intelligence technologies have now taken place in technology. The concept of artificial intelligence is a programme that provides services through various devices and applications. Artificial intelligence technology has become an integral part of our daily life and is available on all platforms. Smart home, smartphone applications and autonomous cars are the best examples of artificial intelligence [3] [5].

The concept of artificial intelligence was first presented at the Dortmund Conference in 1956 by John McCarthy, Marvin. It is mentioned in a letter of recommendation from L. Minsky, Nathaniel Rochester and Claude Shan-non. However, it was John McCarthy who invented this concept [12]. Researcher defines intelligence as 'the computational part of the ability to achieve goals in the world'. Different types and degrees of intelligence are found in humans, many animals and some machines. Artificial intelligence is defined as 'human-like intelligent machines, especially intelligent computer programmes' [1]. It is possible to expose this definition as follows: 'The humanoid abilities of a computer such as reasoning, problem-solving and generalisation can be defined as behaviours and the use of high-level cognitive skills as artificial intelligence'. As mentioned earlier, the concept has led to different definitions as it is relatively new for various disciplines and fields [6] [7] [8] [10].

Artificial intelligence, defined as the ability of an intelligent machine to imitate human behaviour, is a rapidly developing field of computer science that generally requires human intelligence, using computers to simulate human memory, ability, learning, analysis and even innovation [13] [14]. In a study conducted by Friederike and Frank [13], the effect of gender manipulation on the faces of robots with artificial intelligence on gender assignment and how this manipulation is related to the tasks of human gender stereotypes were investigated. The manipulation method used in this experimental study was hair length. A female robot was made by adding short hair (male robot) on the robot's face and long hair of the robot [11]. In this German-made experiment, the participants (30 women and 30 men) were told that both robots would be operated on the computer screen. The photos were shown and then shown in the context of the robot's personality traits and male–female tasks. Evaluations were also requested. As predicted in the study, the participants rated the short-haired robot as male and the long-haired robot as female. Short-haired robot was rated as more dominant and social and the long-haired robot was rated as more docile and introverted. The participants found that the short-haired robot was better suited for typical male tasks and the long-haired robot was more suited to typical female tasks, which concluded that stereotypes are so deeply rooted that they can even be applied to machines that look male or female [2].

The materials and software used in the education process are equipped with artificial intelligence, having skills such as thinking like intelligent beings, abstract, learning, adapting to new situations and interacting. By using these features of artificial intelligence and other learning, especially active learning methods, it has found a place in the field of education. Studies in which artificial intelligence is used in education are increasing rapidly [4] [22].

Today, we live in the age of big data and this situation can easily create many different applications, such as artificial intelligence [35]. Artificial intelligence applications can be used effectively, especially in the fields of banking, technology and entertainment [17] [33]. These are personal assistants like Siri, self-driving cars, instant language translations and smart education, which we often hear in our lives today. Many applications such as management systems; virtual classrooms; patient follow-up systems; game theory and strategic planning; hand, speech, face and pattern recognition; automation; and robotics are the products of artificial intelligence [34].

Vorst and Jelicic [15] have a long tradition of using technology in education systems. Office accountants started using classrooms in the 1980s and later noted that today's technology, Education 4.0 and Industry 4.0, has had a profound impact on the use of technology in education. In the same study, Vorst and Jelicic evaluated artificial intelligence from Industry 4.0 tools. They concluded that artificial intelligence is leading education systems to radical change. He argued that Industry 4.0 and Education 4.0 actually complement each other. This result means that education and artificial intelligence are intertwined as a whole [15].

Artificial intelligence is a technological field that changes and develops social interaction areas in every aspect. Education in the fields of social interaction is affected by this change. The field of use of artificial intelligence in education has brought with it new teaching and learning approaches that are being tested in different contexts. The most common examples of artificial intelligence applications in education can be shown as intelligent and intelligent teaching systems, also called adaptive learning management systems. Intelligence teaching systems facilitate learning by providing better support for the learner. Artificial intelligence techniques are used as models by the teacher in order to facilitate teaching [16]. Suggestion systems are software tools based on machine learning and information retrieval techniques that provide suggestions for useful items that may be of interest to someone [18]. Adaptive learning environments provide an individualised learning environment suitable for their needs by creating a model from various characteristics of learners [19]. Halili [21] stated in his study that technological developments exist in education and explained the importance of using dimensions in learning and teaching processes. Technological products used in education directly affect productivity and creativity, such as Industry 4.0 technology, artificial intelligence, augmented reality, cloud computing and hologram. The use of developments such as technology in every field of education will increase success and learning.

We can see some of the concepts of artificial intelligence below.

Learning (intelligent) robots: According to Banger [25], learning (intelligent, autonomous) robots have embedded processors. Processors are created to allow the robot to make decisions and take action based on those decisions. According to artificial intelligence, they are advanced machines that can learn through sensors that allow them to communicate with their environment. Stated that if robots benefit from their experiences like humans, these robots will not be classically programmed robots, but will be learning robots.

3D printer: There are programmes specially developed for 3D printers and computer design. 3D drawings or models created or scanned are faster than traditional manufacturing methods. It is an additive manufacturing technology that can produce flawlessly. In today's world, this technology is the one that increase creativity in all areas of our lives such as accessories, jewellery, industrial design, automotive, military, aviation, health and education [20].

Universities, which aim to train qualified people in particular, are the last institutions that will do their part to deal with education and technology as a whole. Universities have to provide the young generations with the competencies required for the day and age. It will shed light on determining the interests of future generations in

terms of whether university students acquire the competencies in artificial intelligence, one of the Web 4.0 tools, up to date and properly.

1.1 Purpose of the research

The opinions of the students of the engineering department of the university about artificial intelligence are very important. We are in the age of technology and rapidly developing technologies have combined the concepts of mind and intelligence, and the emerging technological products and artificial intelligence materials have spread in all areas. In the field of artificial intelligence, it is very important to determine the opinions of future engineers. Within the scope of this general purpose, answers were sought for the following sub-objectives:

1. Are the concepts of mind and intelligence different?
2. What are your views on technology-supported education (Web 4.0)?
3. What are the advantages of using artificial intelligence?
4. What are the disadvantages of using artificial intelligence?

2 Method

The aim of this research is to determine the opinions of the students of the engineering faculty of the university on artificial intelligence materials. For this purpose, the qualitative research method was used to examine the students' views in depth. In the research, the phenomenological design from the qualitative research method was used. The phenomenological design is a qualitative research design that aims to identify and highlight the perceptions and thoughts of individuals according to their own perspectives [9] [26].

2.1 Study group of the research

In order to reach the research findings, engineering department students studying at the university were selected. Maximum diversity sampling, one of the purposive sampling types, was chosen as the sample selection in the selection of the study group of the research. The purpose of choosing this method is to ensure that the diversity of individuals who may be a party to the problem is reflected at the highest level in a small sample group [8]. The study group of the research consists of 98 engineering faculty students studying at the university chosen on a voluntary basis.

Personal information of the participants participating in the research is given in Table 1.

Table 1. Demographic information

Variable	Group	F
Gender		
	Female	32
	Male	66
University		
	U1	41
	U2	33
	U3	24

2.2 Collection of research data and analysis of data

Ethics committee approval was obtained from the universities to be studied in this study. The data were prepared by the researchers by taking expert opinions. A semi-structured interview was prepared for the research data. The final form of the research questions was given by taking the opinions of the experts. The experts consulted for their opinions were three faculty members who had completed their doctorate in computer science and two faculty members who completed their doctorate in software engineering. A pilot study was conducted to measure the clarity of the questions. As a result of the interviews, the form was given its final shape and four questions were included as research questions. At the end of the interview, the answers were approved by the students participating in the research. The research findings are explained in detail with the content analysis method.

3 Findings

3.1 Are mind and intelligence different?

Table 2. Are mind and intelligence different?

Theme	f
YES	55
People are smart, not intelligent.	29
Intelligence is innate, intelligence is acquired later.	12
The mind is the state of using intelligence	10
Intelligence is acquired from birth, intelligence is acquired later	8
No	23
No idea	20

In order to determine the opinions of 98 students studying in the engineering department at the university, their knowledge about the concepts of intelligence and mind was first tested. In the answers given by the students, it was found that they did not fully know the concept of mind and intelligence. Although 55 students defined the concept of

intelligence and mind as different, they could not give a full answer when asked about the reasons. 23 students said that mind and intelligence are not different and that they have the same meaning. 20 students did not want to make a comment.

Below are the opinions of some of the university students:

'Mind and intelligence are different concepts. Intellect is superior to intelligence. In other words, the mind is innate and the intelligence can win later on'.

'Mind and intelligence are separate concepts. Every human being is intelligent by nature, but not intelligent. From this, we can say that reason and intelligence are different concepts'.

'I think intelligence is innate. Intelligence is developed after intelligence. Intelligence guides the mind'.

'I think it's the same concepts. Every smart person has intelligence. There is no difference'

3.2 Views on technology-supported education (Web 4.0)

Table 3. Views on technology-supported education (Web 4.0)

Theme	f
Incorporating the latest technology into education	55
Keep up with the times	29
Providing high-level education	12
Making learning easier	10
Making learning permanent and fun	8

When the students' views on the use of technology in education were examined, all students gave positive responses. It has been found that students understand the importance of Web 4.0 tools, one of the new generation technologies, in education.

Some of the students' views on the importance of Web 4.0 tools in education are as follows:

'Technology is being renewed day by day. It is very important that the technological tools we use in every field are also used in the most important sector field, education. Education is a place where individuals develop themselves. An important concept in learning in this field is to provide permanent learning in learning with the support of technological tools.

'The purpose of teachers is to enable learning. In order to achieve this aim in the best way, it is very important to use technological tools in education. It is necessary to keep up with the developing age. Learning should be provided in a fun way'.

'Web 4.0 tools, one of the technological tools, make the information permanent and entertaining and present it to the students. It aims that students evaluate themselves, not get bored, and learn while having fun'.

3.3 Advantages of using artificial intelligence

Table 4. Advantages of using artificial intelligence

Theme	f
Gamification	55
Virtual reality	12
Senior acquisition	10
Creative thinking	8

It has been found that university students have adopted the view that artificial intelligence has a great importance in education because it offers gamification. Since artificial intelligence applications are used in educational processes to develop virtual reality, high-level acquisition and creative thinking, it has been found that the use of these tools in education is very important.

Below are the opinions of some of the university students:

> 'When we look at the technologies used in education, these tools should be equivalent to the developing technologies. Artificial intelligence is the last of the latest technological products. It is the material used in the field of artificial intelligence gamification. It makes learning enjoyable for learners'.
>
> 'Virtual reality is the closest environment to the real environment. It is an effective method for transforming virtual reality into concrete in abstract concepts in education'.
>
> 'Augmented reality is the best advantage of artificial intelligence. Learning is permanent and fun'.

3.4 Disadvantages of artificial intelligence

Table 5. Disadvantages of artificial intelligence

Theme	f
Uncertainty about artificial intelligence	45
Lack of communication interaction	29
The replacement of professions	22

When looking at the opinions of university engineering faculty students about the disadvantages of artificial intelligence, most students stated that the uncertainty brought about by artificial intelligence is a big problem. Moreover, the lack of communication and interaction in vehicles with artificial intelligence was seen as a disadvantage. With the increase in artificial intelligence applications, the need for manpower in professions will decrease, which is seen as a disadvantage for individuals to have a profession.

Below are the opinions of some of the university students:

> 'The human characteristics of machines have not yet been made. No matter how advanced the machines are, communication and Insufficient to interact. The most important process in education is communication and interaction. In this

case, the use of machines, which are the products of artificial intelligence, alone in education is lacking in communication and interaction. Many students take teachers as role models. This process can start from kindergarten and continue until university. How accurate would it be for machines to replace teachers who will be role models?'

'Due to the nature of the teaching profession, it is not only in the role of a teacher. Communication and closeness with the student are important. How close can you be to the student? It is not known how man-made machines will behave towards students with special needs or if there are cultural differences in the classroom'.

'The increase in artificial intelligence is an inevitable reality. But it seems that it is not possible for these machines to always know where and how they will behave. By nature, human beings have feelings and the ability to find different solutions. Will artificial intelligence products be able to act like humans when there is a problem or problem?'

'I have a fear that artificial intelligence products will replace jobs. Then what will people do, what will their professions be? For this reason, I have concerns about the introduction of artificial intelligence into our lives'.

4 Conclusion, discussion and suggestions

In order to determine the opinions of 98 students studying in the engineering department at the university, their knowledge about the concepts of intelligence and mind was first tested. As a result of the findings of the students regarding the concept of intelligence and mind, it was concluded that they did not know these two concepts exactly. Students' different opinions may indicate that they have insufficient knowledge in these two areas.

When the results of the students' findings regarding the use of technology in education are examined, it has been concluded that the technological materials to be used in education contribute to education. It is concluded that students understand the importance of Web 4.0 tools, which is one of the new generation technologies, in education. It can be said that technology provides effective and permanent learning with its inclusion in every sector and its use in education. The use of technology in education is very important. It is also supported by the studies carried out. Thanks to various technological tools, users feel like they are in a virtual world and learning is provided by making it fun. Virtual reality applications in education and training are real. Gaining experiences in life that are dangerous or financially impossible to acquire enables learning by doing and experiencing. [24] Therefore, virtual reality innovation is of great importance for the educational environment [31] [32].

When the findings of the engineering faculty students studying at the university regarding the advantages of artificial intelligence are examined, it can be concluded that artificial intelligence products have a great importance in education because they offer gamification advantages. While teaching education, boring, monotonous old methods may cause problems in the learning of new generation individuals. Transferring the content of the information to be taught to the students through gamification is of great

importance in ensuring learning. It has been determined that the use of these tools in education is very important because artificial intelligence applications used in education processes improve virtual reality, high-level learning and creative thinking. The result of the finding of this study is similar to other studies. In researches on experimental artificial intelligence, both participant views and related studies show the use of artificial intelligence together with the teacher and the use of artificial intelligence in all processes in the classroom more effective in classroom management. It points out that learning will be enjoyable and innovative education will be included [23] [29] [30].

When the results of the findings of the university engineering faculty students regarding the disadvantages of artificial intelligence are examined, it can be said that they are worried about the lack of knowledge about artificial intelligence. Most students stated that the uncertainty brought about by artificial intelligence is a big problem. When the concept of uncertainty is opened, it can be said that although artificial intelligence products, one of the new generation technology products, provide advantages in many ways, it is not known how to behave in every situation. there may be a problem in devices or software due to the fact that the product is a technological product, so there is little sense of trust. Again, it has been concluded that the lack of communication and interaction in vehicles with artificial intelligence is also seen as a disadvantage. With the increase in artificial intelligence applications, the need for manpower in professions will decrease and this is seen as a disadvantage for individuals to have a profession. People choose a profession to come to a certain place. The replacement of humans by artificial intelligence will reduce human tasks and reduce the need workforce. In this case, it is concluded that it raises a concern. Human intelligence has limits and its development has been passed down from generation to generation. Knowledge production requires constant effort and investment. Considering the extraordinary growth gap between artificial intelligence and human intelligence, it is alarming to think that artificial intelligence will surpass human intelligence [27]. Likewise, another concern is that artificial intelligence is increasing day by day in some areas. It is feared that it will take its place [28].

5 References

[1] Budiman, R. (2013). Utilizing Skype for providing learning support for Indonesian distance learning students: A lesson learnt. *Procedia – Social and Behavioral Sciences*, 83, 5–10. https://doi.org/10.1016/j.sbspro.2013.06.002

[2] Chandrasena Premawardhena, N., ICT in the foreign language classroom in Sri Lanka: A journey through a decade. 10th World Conference on Computers in Education (WCCE 2013), Nicolaus Copernicus University, July 2–5 2013, Torun, Poland. pp 223–224.

[3] Çifci, B. S. (2020). *Yapay zeka konusunun toplumsal cinsiyet kapsamında incelenmesi* (Master's thesis, Lisansüstü Eğitim Enstitüsü). https://doi.org/10.35379/cusosbil.819510

[4] Britwum, F., Obed Amoah, S., Acheampong, H. Y., & Adjei, E. (2022). Self-esteem as a predictor of students' academic achievement in the colleges of education. *International Journal of Learning and Teaching*, *14*(1), 29–40. https://doi.org/10.18844/ijlt.v14i1.6302

[5] Schönberger, D. (2019). Artificial intelligence in healthcare: a critical analysis of the legal and ethical implications. *International Journal of Law and Information Technology*, *27*(2), 171–203.

[6] Arslan, K. (2020). Eğitimde yapay zekâ ve uygulamaları. *Batı Anadolu Eğitim Bilimleri Dergisi*, *11*(1), 71–88.
[7] Demirkaya, H., & Sarpel, E. (2018). Eğitim ve Geliştirme Uygulamalarinda Yeni Nesil Bilişim Teknolojilerinden Sanal Gerçeklik, Bulut Bilişim ve Yapay Zeka. *Karadeniz Uluslararası Bilimsel Dergi*, 40, 231–245. https://doi.org/10.17498/kdeniz.460145
[8] Xian, L. (2010, October). Artificial intelligence and modern sports education technology. In *2010 International Conference on Artificial Intelligence and Education (ICAIE)* (pp. 772–776). IEEE.
[9] Maldybaevna, A. A., Absatovna, A. M., Ivanovna, K. T., Bisenovna, A. R., Mentay, S., & Nesipbekovna, O. M. (2022). The development of the university's readers' culture. *Cypriot Journal of Educational Sciences*, *17*(3), 958–970. https://doi.org/10.18844/cjes.v17i3.6998
[10] Kandlhofer, M., Steinbauer, G., Hirschmugl-Gaisch, S., & Huber, P. (2016, October). Artificial intelligence and computer science in education: From kindergarten to university. In *2016 IEEE Frontiers in Education Conference (FIE)* (pp. 1–9). IEEE. https://doi.org/10.1109/FIE.2016.7757570
[11] Guan, C., Mou, J., & Jiang, Z. (2020). Artificial intelligence innovation in education: a twenty-year data-driven historical analysis. *International Journal of Innovation Studies*, *4*(4), 134–147. https://doi.org/10.1016/j.ijis.2020.09.001
[12] Alpaydın, E. (2013). Yapay öğrenme. İstanbul: Boğaziçi Üniversitesi Yayınevi.
[13] Russell, S. J. & Norvig, P. (2010). Artificial intelligence: a modern approach. New Jersey: Prentice Hall.
[14] Krittanawong, C., Zhang, H., Wang, Z., Aydar, M., & Kitai, T. (2017). Artificial intelligence in precision cardiovascular medicine. *Journal of the American College of Cardiology*, 69, 2657–2664. https://doi.org/10.1016/j.jacc.2017.03.571
[15] Van der Vorst, T ve Jelicic, N. (2019). Artificial ıntelligence in education: can AI bring the full potential of personalized learning to education? 30th European Regional ITS Conference, Helsinki 2019, International Telecommunications Society (ITS).
[16] Hasanov, A., Laine, T. H., & Chung, T. S. (2019). A survey of adaptive context-aware learning environments. *Journal of Ambient Intelligence and Smart Environments*, *11*(5), 403–428. https://doi.org/10.3233/AIS-190534
[17] Karaca, A. (2020). Innovative technologies and living spaces; Updated living standards according to the evolution of homo sapiens. *New Trends and Issues Proceedings on Advances in Pure and Applied Sciences*, 12, 91–108. https://doi.org/10.18844/gjpaas.v0i12.4990
[18] Syed, A. B. & Zoga, A. C. (2018). Artificial intelligence in radiology: current technology and future directions. *Seminars in Musculoskeletal Radiology*, 22, 540–545. https://doi.org/10.1055/s-0038-1673383
[19] Somyürek, S. (2009). Uyarlanabilir öğrenme ortamları: Eğitsel hiper ortam tasarımında yeni bir paradigma. *Bilişim Teknolojileri Dergisi*, *2*(1).
[20] Evlen, H., Erel, G., & Yılmaz, E. (2018). 3 boyutlu yazıcı tasarımı ve yazdırma doluluk oranının mekanik özellikler üzerine etkisinin incelenmesi. *International Journal of 3D Printing Technologies and Digital Industry*, *2*(1), 23–31. Retrieved from https://dergipark.org.tr/tr/pub/ij3dptdi/issue/36075/492786
[21] Halili, S. H. (2019). Technologıcal advancements ın educatıon 4.0. *The Online Journal of Distance Education and e-Learning*, *7*(1), 63–69. http://www.tojdel.net/journals/tojdel/articles/v07i01/v07i01-08.pdf
[22] Akgül, A., Akbaş, H. E., & Taşkin Gümüş, A. (2018). "A Survey of Students' Perceptions on Industry 4.0 in a Large Public University in Turkey", in: Current Debates In Busıness Studıes, Candan F.B., Kapucu, H., Eds., IJOPEC Publication Limited, Londra, pp.237–247, 2018.

[23] Aktan, E. (2018). Büyük veri: uygulama alanları, analitiğive güvenlik boyutu. *Bilgi Yönetimi*, *1*(1), 1–22. https://doi.org/10.33721/by.403010
[24] Yıldız, A. (2018). Endüstri 4.0 ve akıllı fabrikalar. *Sakarya University Journal of Science*, *22*(2), 546–556. https://doi.org/10.16984/saufenbilder.321957
[25] Banger, G. (2018). Endüstri 4.0 Uygulama ve dönüşüm rehberi. Ankara: Dorlion Yayınları.
[26] Çarpar, M. C. (2020). Sosyolojide İki Niteliksel D: Fenomenoloji ve Etnografik Araştirm. *The Journal of Social Science*, *4*(8), 689–704. https://doi.org/10.30520/tjsosci.750923
[27] Spector, J. M., & ve Ma, S. (2019). Inquiry and critical thinking skills for the next generation: from artificial intelligence back to human intelligence. *Smart Learning Environments*, *6*(8). https://doi.org/10.1186/s40561-019-0088-z
[28] Fang, J., Su, H., & ve Xiao, Y. (2018). Will artificial intelligence surpass human intelligence? 1–9. https://doi.org/10.2139/ssrn.3173876
[29] Bryant, J., Heitz, C., Sanghvi, S., & Wagle, D. (2020). How artificial intelligence will impact K-12 teachers. https://www.mckinsey.com/industries/public-and-social-sector/ourinsights/how-artificial-intelligence-will-impact-k-12-teachers
[30] Zhao, Y., & Liu, G. (2018). How do teachers face educational changes in artificial intelligence era. *Advances in Social Science, Education and Humanities Research (ASSEHR)*, 300, 47–50.
[31] Başaran, F. (2010). Öğretmen adaylarının eğitimde sanal gerçeklik kullanımına ilişkin görüşleri: Sakarya üniversitesi BÖTE örneği. Yayımlanmamış Yüksek Lisans Tezi. Sakarya Üniversitesi, Sosyal Bilimler Enstitüsü, Sakarya.
[32] Zhao, S., Chen, S., Li, W., Li, D., Liu, Z., & Chen, J. (2020). The development of artificial intelligence education resources under the background of the internet of things. 2020 Chinese Control and Decision Conference (CCDC 2020). https://doi.org/10.1109/CCDC49329.2020.9164663
[33] Prahani, B. K., Amiruddin, M. Z. B., Jatmiko, B., Suprapto, N., & Amelia, T. (2022). Top 100 cited publications for the last thirty years in digital learning and mobile learning. *International Journal of Interactive Mobile Technologies (iJIM)*, *16*(08), 18–33. https://doi.org/10.3991/ijim.v16i08.29803
[34] Uzunboylu, H., Prokopyev, A. I., Kashina, S. G., Makarova, E. V., Chizh, N. V., & Sakhieva, R. G. (2022). Determining the opinions of university students on the education they receive with technology during the pandemic process. *International Journal of Engineering Pedagogy (iJEP)*, *12*(2), 48–61. https://doi.org/10.3991/ijep.v12i2.29329
[35] Yimer, S., & Gizachew, B. (2022). The development of a web-based application security testing framework in Addis Ababa, Ethiopia. *Global Journal of Computer Sciences: Theory and Research*, *12*(1), 12–22. https://doi.org/10.18844/gjcs.v12i1.6762

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