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E-learning Technologies Opportunities on Students' Learning Motivation and Performance: A Descriptive Study

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Abstract: The effectiveness of e-learning significantly impacts the student learning process and the quality of the e-learning system. Literature highlights numerous technologies in e-learning that enhance online education quality. Students learning experience through the face-to-face approach may not be the same as e-learning with the emerging technology trends such as Artificial Intelligence (AI), Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR) and Extended Reality (XR). Thus, there is a need to understand how e-learning technologies such as AI, VR, AR, MR and XR will impact the student's learning motivation and performance. This study focuses on students' learning motivation and performance at one of the top ten universities in Malaysia. A descriptive study was applied, and the data from questionnaires were analysed using descriptive statistics. The results enlightened some opportunities for AI, VR, AR, MR, and XR that may enhance students' learning motivation and performance while promoting a humanising education.

Keywords: *E-learning, Learning motivations, Humanistic education*

1. Introduction

The The COVID-19 pandemic has halted sustainable development goal progress on quality education as it disrupts many learning progress due to education institutions' closure. Thus, to ensure learners get back on track, e-learning is seen as an initiative that provides platforms that allow access to education through a virtual environment. This has led to increased demand for e-learning innovations in online instructional methods. Many universities have used E-learning before the pandemic. However, the use of e-learning is not fully utilised since traditional face-to-face learning is taken place. Due to the COVID-19 pandemic lockdown, e-learning has been the only option for universities to continue delivering education to students. Thus, e-learning has become the leading online platform to facilitate student learning.

E-learning is an approach that uses digital devices and media to enhance education access and development [1]. To sustain students' education, e-learning must be fully utilised. Both instructors and students must identify necessary instructional methods and practice them to implement online learning successfully. The use of variety teaching techniques such as puzzles, mind maps, and quizzes intend to motivate learning and enriched the learning content [2]. E-learning needs to offer appealing and valuable learning materials and a productive learning process [3]. The use of technology such as Artificial Intelligence (AI), predictive learning analytics, cloud-based platforms, knowledge crowdsourcing, and virtual reality technologies are transforming e-learning [4].

The advanced development of Artificial Intelligence (AI) is bringing AR and VR on the rise. Many emerging

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technologies were utilised in e-learning to promote better online learning experiences, such as Artificial Intelligence (AI) [5], Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR) and Extended Reality (XR). VR is believed to provide a virtual learning experience to go beyond the boundary of the traditional classroom. Similarly, AR promotes 3D contents interaction with real world to enhance learning experiences. Furthermore, these technologies provide support such as personalised learning, and powering adaptive assessment [6]. However, there are health concerns about using wearable devices that offer simulations in a long run. Then come along the Extended Reality (XR) with the introduction of digital computing. [7]. However, the definition between MR and XR are likely the same, which both represent the combination between AR and VR. MR is an extended version of AR where user experience becomes more realistic through the accessibility of virtual information in the real world. While Marr [8] states that XR is a broad term that covers the mixture of VR, AR, and MR that also represents the future. Qualcomm produces XR platforms which are Snapdragon XR1 Platform and Snapdragon XR2 5G Platform. These platforms offer XR that revolutionises human activities. Furthermore, AI and 5G were integrated into the Snapdragon XR2 5G Platform to boost the XR world in true immersive user experience [9]. Table 1 represents descriptions for AR, VR, MR and XR based on the environment and required device for operation (Qualcomm [9], Marr [8], Microsoft [10], MetaQuest [11]).

Table 1. Descriptions for AR, VR, MR and XR

Technology	Environment	Device requirement
Augmented Reality (AR)	Overlay digital information on real environment.	Smartphone and tablet with camera, AR glasses
Virtual Reality (VR)	Use virtual artifacts to mimic objects from real world. Offer user's senses and immersive experience	VR devices such as Oculus Meta Quest 2, HTC Vive, surgical simulations
Mixed Reality (MR)	Mixed of AR and VR allow user interacts with virtual objects in a real world	Microsoft Windows 10 MR platform, Windows Mixed Reality Headset (gen 2), Microsoft HoloLens
Extended Reality (XR)	immersive user experience through a virtual device.	VR devices such as Meta Quest 2, Pico Neo 3, HTC Vive Focus 3, Oculus Quest Pro

Students learning behaviour towards online learning during the COVID-19 pandemic has become a concern. Students learning behaviour is influenced by the student's knowledge, needs and preference [12] and the quality of the e-learning platform and materials. In most practice, the student's behaviour was analysed by monitoring their activity logs, such as viewing course notes, doing exercises, and participating in online discussions. This approach was made [13] to analyse students' online learning behaviour using Moodle by generating visualisations of students' level activity and identifying students that are not well performed. Understanding the student's learning behaviour during a specific learning activity will give the instructor insights to adjust the pedagogical strategies.

By understanding the student's learning behaviour, the student's achievement on a certain assessment can be observed. Instead of monitoring the student's activity logs, the instructor also needs to ensure the lesson plan and learning materials are well prepared [14][15] to ensure the students achieve the course learning outcomes. An organised online lesson and guidelines on conducting online classes are needed to ensure students achieve their learning outcomes. The flexibility of e-learning and access to massive e-learning materials positively impact students' academic performance [16].

Thus, integrating AI, AR, VR, MR and XR in e-learning intends to promote better learning behaviour and achievement. Since these technologies provide a different learning environment that promotes a sense of learning and experience, it will create more learning engagement that may influence the student's learning behaviour and achievement. The relationship between students' learning behaviour and achievement needs to be discovered to enhance the quality of online education. Furthermore, the potential impact of AI, AR, VR, MR, and XR on this relationship needs to be discovered. Hence, this paper aims to explore the variables that would sustain students' education and enhance e-learning quality.

2. Method

This study uses mixed methods research where the quantitative study will focus on survey findings, while the qualitative study will be based on observations and focus group discussion, which will be presented in a later paper. Descriptive analysis was used in this study to obtain a deeper understanding of the survey data.

2.1. Participants

The approach has been approved as a lower-risk study. Prior to the survey, a participant information sheet was distributed to the participants to obtain their consent. All responses from the participants remained anonymous and confidential. This study was conducted with 155 students who were part of the information technology undergraduate course at a university. However, there were only 120 completed online surveys that will be considered valid for this study. The participants of the course were 57 female (47.5%) and 63 male (52.5%), see Table 2. During this study was conducted, 14.2 % of students were staying on campus. At the same time, 85.8% of students were off campus, such as at home.

Table 2. Participants Demographic

		Frequency	Percentage
Gender	Female	57	47.5%
	Male	63	52.5%
	Total	**120**	**100%**
Location	Off-campus	103	85.8%
	On-campus	17	14.2%
	Total	**120**	**100%**
Online learning experience	Yes	103	85.8%
	No	17	14.25
	Total	**120**	**100%**

The students were given a description of AI, VR, AR, and XR that included definitions, system requirements, and examples to ensure they understood the ability of these technologies in e-learning.

2.2. Tools

Questionnaires for the online survey were prepared to measure variables in this study, see Table 3. Since MR and XR are a combination of AR and VR, both MR and XR were combined for this study. Thus, the four variable categories in this study are AI, AR, VR, and MR/XR. The online survey was used on students who took the information technology course. Questionnaires were distributed and collected through an online platform which is Google Form. The questionnaire was reviewed for its appropriate content and purpose for this study. Likert scales were standardised into Not Important (1), Less Important (2), Neutral (3), Moderately Important (4), and Very Important (5).

Table 3. Online survey questionnaires

Variables	Items
Artificial Intelligence	*Importance of AI in e-learning*
	Importance of AI to motivate learning
	Importance of AI in promoting humanising education through e-learning
	Impact of AI on providing better learning material
	Importance of activity analytics to improve learning achievement
Virtual reality (VR)	*Importance of VR in providing real-world experience*
	Importance of VR in providing a wider learning environment
	Importance of VR in creating feelings and sense rather than just thinking to promote humanising education.
	Importance of VR to improve learning performance
	Importance of VR to motivate learning
Augmented Reality (AR)	*Importance of AR in providing real-world experience*
	Importance of AR in providing wider learning environment
	Importance of AR in create feelings and sense rather than just thinking to promote humanising education
	Importance of AR to improve learning performance
	Importance of AR to motivate learning
Mixed Reality (MR)/ Extended Reality (XR)	*The need for MR/XR in the learning process*
	Importance of MR/XR to improve learning performance
	Importance of MR/XR to promote humanising education
	Importance of MR/XR to improve education quality
	Importance of MR/XR to motivate learning
General	Importance of quality digital learning materials
	Importance of students' motivation in improving online learning performance
	Importance of AI in AR/VR/MR/XR environment to assist student learning

2.3. Data Analysis

This study investigated the variables impacting students learning behaviour and performance. These variables were then considered as part of the humanised education framework development and will be validated through participant observations study and focus group in the next stage of this study. SPSS was used for statistical analysis of the collected data from the online survey. Descriptive statistics are used to manage and explain participants' characteristics to summarise a conclusion ([17]. Frequency and correlation coefficients were used to analyse the general characteristics of the data and the relation between the variables. A five-point Likert scale was used, ranging from Not Important (1), Less Important (2), Neutral (3), Moderately Important (4), and Very Important (5). These Likert scales will be considered ordinal measures since it is a numeric hierarchically order. Furthermore, reliability and validity analyses were conducted to verify the quality and integrity of the data measurement

3. Results and Discussion

3.1 Descriptive Statistics for Survey

Descriptive statistics are used in this study to manage and explain the participants' characteristics. Since the measurement level for the Likert Scale is ordinal, according to Boone and Boone [18] the measure of central tendency will be mode and median. By using SPSS, the results of descriptive analysis and normality test represent the mean, mode, standard deviation, skewness, and Kurtosis. Table 4 represents the median and mode for the survey. While Figure 1 shows the students' level of agreement with the findings. The skewness and Kurtosis were used to evaluate the normal distribution [19]. Based on the output from SPSS descriptive statistic, the values of skewness are less

near zero, while the Kurtosis value is near the value of 3. This is aligned with the normal distribution rule stated by Brown in 2006.

Table 4. Descriptive statistics for online student survey on emerging e-learning technologies

Measure of central tendency	Artificial Intelligence (AI)	Virtual reality (VR)	Augmented Reality (AR)	Extended / Mixed Reality (XR/MR)
Median	5.00	4.6	3.6	5.00
Mode	5	5	4	5

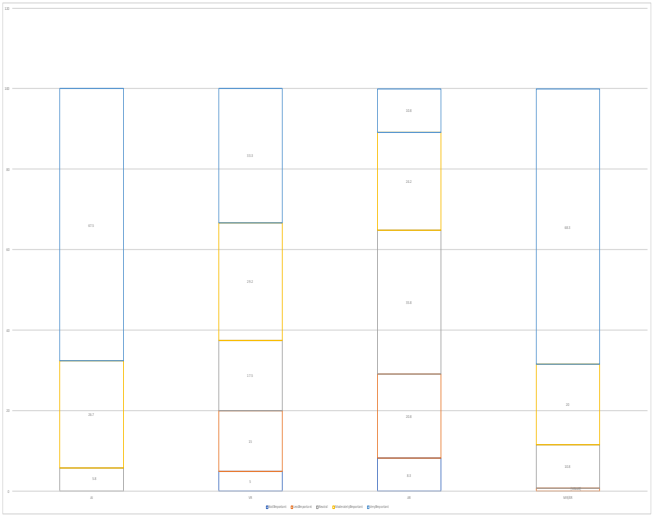


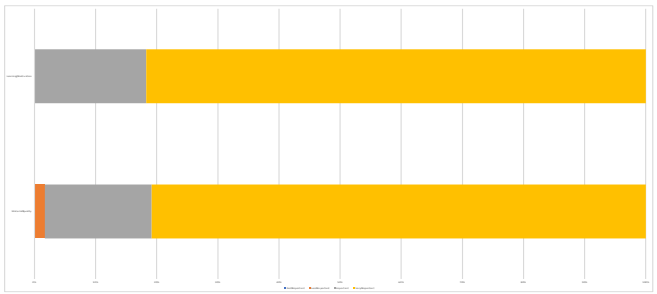
Figure 1. Students' level of agreement on the importance of AI, VR, AR, MR, and XR in learning motivation

Figure 1 shows the overall level of agreement with AI, VR, AR MR and XR in e-learning motivation. The AI, MR and XR have the same median and mode value, with the Very Important rate was 67.5.7% and 68.3%, respectively. This indicates that students had a positive attitude towards the use of the intelligent system in the e-learning system that can improve their motivation, thus improving their learning performance. Similarly, students believe that MR and XR will improve their learning motivation through e-learning. This is due to extended learning experiences in a mixed learning environment.

While VR and AR have less median value, VR has a higher Very Important rate at 33.3 % than AR with an Important Rate of 10.8%. This shows that VR intends to promote better learning engagement that enhances students' motivation to learn online. However, some students found that VR is less important and not important. This may be due to accessibility to VR being much harder compared to AR technology since AR can be used using devices such as smartphones and tablets that support AR. Unlike VR, it needs specific devices such as Meta Quest 2, Sony PlayStation VR, and HTC Vive Pro 2, to create a full virtual reality environment.

While most learning materials have been converted to digital format, the quality of the materials plays a significant role in students' achievement. Furthermore, these digital learning materials are accessible in an enhanced online learning environment, such as AR and VR. While learning motivation from instructors teaching styles also plays a crucial role in students' achievement. The teaching methods should meet the student's learning styles to improve students' performance. Figure 2 shows that the students agreed that learning motivation and material quality are essential in improving students' achievement. These findings are also supported by [15][20]. The learning motivation is influenced by the attractiveness of the learning activities and learning needs, [20] which can be delivered through quality learning materials.

Figure 2. Agreement level on the importance of learning motivation and learning material quality in students' achievement

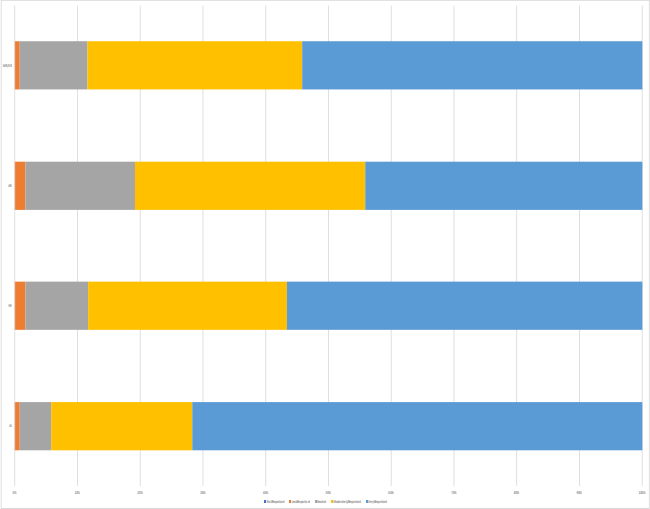


Student motivation and quality learning materials are essential for student performance and achievement [20]. The role of instructors to motivate online learning through attractive learning materials would increase students' engagement, which will lead to the improvement of their learning achievement.

3.2 Importance of Artificial Intelligence, Virtual Reality, Augmented Reality, Mixed Reality and Extended Reality in improving student performance.

The intelligent agent seems to be very important compared to Virtual Reality, Augmented Reality, Mixed Reality and Extended Reality in improving student performance (see Figure 3). This is because AI should provide a learning environment that caters to students' needs. Smart content and content analytics provided by the IA [5][21] will improve student learning performance as they learn based on content that meets their learning needs.

Figure 3. Agreement on the importance of AI, VR, AR, MR, and XR in improving learning performance



Overall, most students agreed on the importance of AI, VR, AR, MR and XR improving learning performance. This finding is supported by Farsi et al. [22], Pizer [23], and [24] indicate that the enhancement of learning experiences through VR, AR, MR and XR intend to create more interaction, engagement, hands-on practice, and collaboration in a safe environment. Consequently, this will improve students' performance and achievement in e-learning.

3.3 Importance of Artificial Intelligence, Virtual Reality, Augmented Reality, Mixed Reality and Extended Reality in promoting humanising education.

Figure 4 shows that most students agreed on the importance of AI and VR in promoting the concept of humanising education. Unlike AR, VR creates feelings and emotions in a full virtual world that promotes multi-sensory learning, enjoyment, self-learning, and social interaction [24] On the other hand, AI seems to be important in creating humanised education. This may be due to AI's ability to understand learners' learning styles and provide an intelligent tutoring system [25]. Furthermore, in Sustainable Development Goal 4, on providing quality education, AI is considered as a tool to augment human intelligence and enhance human capabilities [26].

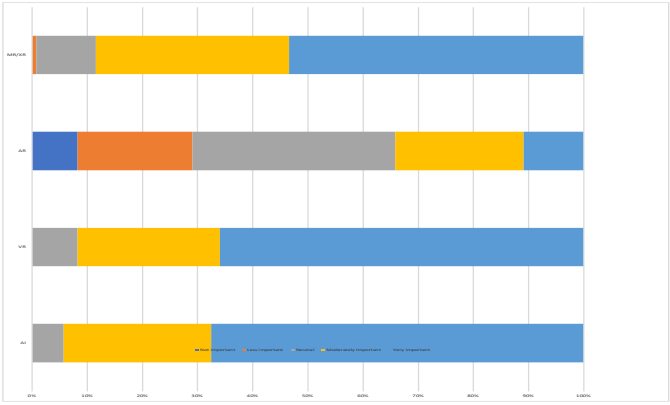


Figure 4. Agreement level on the importance of AI, VR, AR, MR, and XR in promoting humanising education

The participants agreed that the experience of learning using VR, MR, and XR are significant in developing humanising education. Rather than learn using digital materials such as books, videos, and audio, AI, VR, MR, and XR provide a sense of motion and intelligence that promote intrinsic motivation among learners [24] to learn more. Thus, this will lead to the concept of a sense of belonging to the community and environment.

4. Conclusion

The use of e-learning along with Artificial Intelligence (AI), Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR) and Extended Reality (XR) technologies as a platform intend to improve students' motivation to learn and learning performance provides an insight into e-learning development and humanising education approach. The emerging technologies such as AI, VR, MR, and XR provide opportunities for learners to expand their learning environment beyond the classroom, where they can immerse themselves in a virtual world to learn about a real-world situation without the need to travel. The technologies intend to offer a meaningful e-learning experience while promoting humanising and sustainable education. These benefits intend to enhance the quality of education that will meet the real-world needs and provide future-ready graduates. Thus, these findings addressed the study objectives on identifying how sustain students' education can be sustained and how e-learning quality can be improved.

Furthermore, AI is the way to provide wider and equitable education for all, which supports the Sustainable Goal 4 on providing quality education. Integrating AI and VR is important to provide an online learning environment that understands the learners' needs and provides a practical assessment in a safe and accessible place. Farsi et al. [22] believe that VR benefits will remain countless and recommend the need to conduct research on virtual labs in

higher education. Thus, this study will consider the variables identified from the data analysis to be tested through observational and focus group studies.

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REFERENCES

[1] Sangrà, A., Vlachopoulos, D., and Cabrera, N., " Building an Inclusive Definition of E-learning: An Approach to the Conceptual Framework." *International Review of Research in Open and Distributed Learning*, vol.13, no.2, pp. 145–159, 2012. DOI: https://doi.org/10.19173/irrodl.v13i2.1161

[2] Nalevska, G. P., and Kuzmanovska, M., "Teaching Methods as a Factor of Students' Learning Motivation". *Journal of Educational Research*, vol. 2, no. 3-4, pp. 40-50. (2020).

[3] Henry P., "E-Learning Technology, Content and Service" *Education and Training*, vol. 43, no.4/5, pp. 249-255. 2001. DOI: https://doi.org/10.1108/EUM0000000005485

[4] Lamba Solutions, "5 Technologies that are transforming eLearning.''. Lamba Solutions, https://www.lambdasolutions.net/blog/5-technologies-that-are-transforming-elearning (accessed September 29, 2022)

[5] Kose, U., and. Arslan, A., "E-learning experience with artificial intelligence supported software: An international application on English language courses.' *GLOKALde*, vol.1, pp. 61-75. 2015. https://www.glokalde.com/pdf/issues/3/Article3.pdf

[6] Seo, K., Tang, J., Roll, I., Fels, S., and Yoon, D., "The impact of artificial intelligence on learner-instructor interaction in online learning." *International Journal of Educational Technology in Higher Education*, vol. 18, no.54. 2021. DOI: https://doi.org/10.1186/s41239-021-00292-9

[7] Greengard, S., "Virtual Reality", The MIT Press; Illustrated edition, 2019.

[8] Marr, B., "What is Extended Reality Technology? A Simple Explanation for Everyone.", Forbes, https://www.forbes.com/sites/bernardmarr/2019/08/12/what-is-extended-reality-technology-a-simple-explanation-for-anyone/?sh=48d849fb7249 (accessed August 3, 2022).

[9] Qualcomm, "XR/VR/AR: Reimaging reality as we know it.", Qualcomm, https://www.qualcomm.com/products/application/xr-vr-a (accessed September 2, 2022).

[10] Microsoft, "Microsoft Mixed Reality", Microsoft, https://www.microsoft.com/en-us/mixed-reality/windows-mixed-reality (accessed September 7, 2022).

[11] Meta, "Meta Quest", Meta, https://www.meta.com/quest/?utm_source=www.oculus.com&utm_medium=oculusredirect (accessed September 7, 2022).

[12] Boca, G. D., "Factors Influencing Students' Behavior and Attitude towards Online Education during COVID-19", *Sustainability 2021*, vol. 13, pp. 1-21. 2021. DOI: https://doi.org/10.3390/su13137469.

[13] Estacio, R. R., and Raga Jr, R. C., "Analysing students online learning behavior in blended courses using Moodle." *Asian Association of Open Universities Journal*, vol.12, no.1, pp. 52-68. 2017. DOI: 10.1108/AAOUJ-01-2017-0016.

[14] Saputra, A., and Hidayani, "The impact of e-learning on students' academic achievement in English." *Jurnal Keislaman dan Ilmu Pendidikan*, vol. 1, no.1, pp. 124-137. 2021. https://ejournal.yasin-alsys.org/index.php/alsys

[15] T. Tossy, "Measuring the impacts of e-learning on students' achievement in learning process: An experience from Tanzanian public universities." *The Online Journal of Distance Education and e-Learning*, vol.5, no.3, pp.61-68. 2017. DOI: 10.24032/IJEACS/0202/01

[16] Y. A. L. A. Jawad, and B. Shalash, "The impact of e-learning strategy on students' academic achievement case study: Al-Quds Open University." *International Journal of Higher Education*, vol. 9, no.6, pp. 44-53. 2020. DOI: 10.5430/ijhe.v9n6p44

[17] M. J. Fisher, and A. P. Marshall, "Understanding Descriptive Statistics." *Australian Critical Care*, vol. 2009, no.22, pp. 93-97. 2009. DOI: https://doi.org/10.1016/j.aucc.2008.11.003

[18] H. N. Boone, and D. A. Boone, "Analysing Likert Data." *Journal of Extension.* vol. 50, no.2. 2012. http://www.joe.org/joe/2012april/tt2p.shtml

[19] D.P. Doane, and L. E. Seward, "Measuring skewness: a forgotten statistic" *Journal of Statistic Education*, vol.19, no.2, pp.1-17. 2011. www.amstat.org/publications/jse/v19n2/doane.pdf

[20] R. Dwijuliani, T. Rijanto, M. Munoto, L. Nurlaela, I. Basuki, and Maspiyah, "Increasing student achievement motivation during online activities." *Journal of Physics: Conference Series*, vol.1810, no.1, pp,1-6. 2021. DOI: 10.1088/1742-6596/1810/1/012072

[21] Z. Fasihfar, and H. Rokhsati, "Study of application of intelligenet agents in e-learning." *Bulletin de la Société Royale des Sciences de Liège*, vol. 86, special edition, pp. 398 - 40. 2017. DOI: 10.25518/0037-9565.6781

[22] G. A. Farsi, A. Mohd Yusof, W. J. Fauzi, M. E. Rusli, S. I. Malik, R. M. Tawafak, R. Mathew, and J. Jabbar. "The Practicality of Virtual Reality Applications in Education: Limitations and Recommendations", *Journal of Hunan University Natural Sciences*, vol. 48, no. 7. 2021. http://jonuns.com/index.php/journal/article/view/666/662

[23] Pizer, T., "The Truth About Extended Reality in Learning and Development", Association for Talent Development, https://www.td.org/atd-blog/the-truth-about-extended-reality-in-learning-and-development (accessed October 2, 2022)

[24] A. J. A. Alnagratm, R. C. Ismai, S. Z. S. Idrus, and R. M. A. Alfaqi, "A Review of Extended Reality (XR) Technologies in

the Future of Human Education: Current Trend and Future Opportunity." *Journal of Human Centered Technology*, vol. , no. 2, pp.81 – 96. 2022. DOI: 10.11113/humentech.v1n2.27.

[25] N. Goksel, and A. Bozkurt, "Artificial Intelligence in Education: Current Insights and Future Perspectives", in S. Sisman-Ugur, & G. Kurubacak (Eds.), *Handbook of Research on Learning in the Age of Transhumanism*, IGI Global, Hershey, PA, pp. 224-236. 2019. DOI: 10.4018/978-1-5225-8431-5.ch014.

[26] UNESCO, *Final Report: Planning Education in the AI Era: Lead the leap*. International Conference in Artificial Intelligence and Education 2019, Beijing, China, May., 2019, pp. 1-46 (2019).