ISSN 2278-3083
Volume 14, No.2, March – April 2025
International Journal of Science and Applied Information Technology
Available Online at http://www.warse.org/IJSAIT/static/pdf/file/ijsait041422025.pdf
https://doi.org/10.30534/ijsait/2025/041422025

Optimal Performance of the Educational Process Towards the Active Role of Metaverse Technology in Supporting the Educational Process

[1]Ahmed Saleh Al Ghamdi, [2]Ezzat Abd El Aziz Mansour
[1]Information Science, College of Arts and Humanities, King Abdulaziz University Department of,
Aalghamdi3891@stu.kau.edu.sa
Department of Information Science, College of Arts and Humanities, King Abdulaziz University
Ezzat556655@hotmail.com

Received Date : February 24, 2025 Accepted Date : March 30, 2025 Published Date : April 07, 2025

ABSTRACT

Distance learning has become the main teaching and learning method, and currently the metaverse is being proposed as a new alternative to access educational information. Therefore, metaverse technology is a new alternative to accessing educational information. As it began to be used educationally in several countries such as Korea and Japan and through this study it can show that it is important to know the opinion of students in their teaching and learning using the metaverse technology by collecting opinions, and it will be possible to know how to use educational spaces better. Such investigations are required to determine the effectiveness of the results obtained using the metaverse for educational purposes, and it will be worthwhile to gain an understanding of how to use the educational environment more effectively, and for the need to educate students about metaverse technology and how it can be used to access information, the current study looks to know what students think about how to use metaverse applications in the classroom and access to information. In this research, the descriptive analytical approach was used in the current research, and the research community was represented in the students of the Department of Computer Engineering at King Abdulaziz University in Jeddah, where a random sample of 89 students of the Department of Computer Engineering was taken, and through the use of the questionnaire as a tool for this study, to collect information and data related to it. The results showed that the degree of students' response to the use of metaverse technology in education, and the benefits of using metaverse technology in the classroom, was highly approved. The results also showed that the degree of students' response to the disadvantages of using metaverse technology in the classroom was with an average degree of approval, and there were no statistically significant differences between males and females, ages, the extent to which metaverse technology was used before, and the availability of metaverse technology in permanent and purposeful learning in the classroom in the axes of the tool Study at a statistical significance level (0.05). The creation of digital learning and research environments for immersive experiences is not reflected in the proliferation of a large number of educational experiments conducted on metaverse technology, and therefore the subject of study is of interest for further research and innovation to lay the theoretical foundations for the expansion of the field of study. It has become necessary to carry out a systematic review of the main scientific literature to contribute to the subject of study with great potential to ensure the optimal establishment of its theoretical foundations and its subsequent adoption as the main topic for the use of technology in the field of education, after which to demonstrate the theoretical peculiarities that can be applied to the teaching methodology.

Keywords: Metaverse, Blended learning, avatar, smart device, virtual reality.

1. INTRODUCTION

Although the metaverse refers to a three-dimensional interactive world, perceptions regarding the nature and organization of the metaverse have changed over time[1]. According to the general trend, the metaverse is a network of interconnected virtual worlds as an alternative to a single

virtual world version [3]. Therefore, to understand The metaverse is better and it is necessary to understand the concept of virtual worlds, which are environments that contain three-dimensional graphical worlds. Seen as A kind of simulation of concrete reality [6] according to [2], virtual worlds are online desktop applications through which users can interact and move in three-dimensional simulation environments [7].

May be Look at the use of The metaverse in education as A learning environment enhanced by metaverse-related technologies that integrate with elements of the virtual and real learning environment, enables learners to use wearables to access the educational setting without being constrained by time and locations and allows them to use digital identities to conduct real-time interactions with different forms of elements (e.g., avatars, NPCs, or virtual learning resources) ([13] [9],[12]). The researcher believes that metaverse technology will create more jobs in ways we can't imagine now, and that this technology has the potential to enrich the quality of life, especially for people who lack material resources, but like any new technology, the benefits derived depend on how the technology is designed.Cannula and its infrastructure.

He also believes that metaverse technology is capable of creating engaging activities within the classroom; and the use of this technology for course content, online resources, and teacher input makes it a tool that can work in most classrooms.

Recently, due to the Corona pandemic (COVID-19), lectures are held online but without an interactive environment all over the world, and in higher education, especially the post-Corona era, distance learning has become the main teaching and learning method, and currently the metaverse is being proposed as a new alternative to access educational information, and the problem of the study revolves around answering a question: What is the role and impact of using metaverse technology in supporting and activating the performance of the educational process?

When a new technology is used in education, qualitative research is required to obtain detailed information, as qualitative research is also necessary to understand how students feel when learning using metaverse technology, and to know the challenges they face in this environment, and such investigations are required to determine the effectiveness of the results obtained using the metaverse for educational objectives, and it will be worthwhile to gain an understanding of how to use the educational environment more effectively, and this study is also necessary to educate students about the use ofMetaverse technology and how it can be used to access information.

The current study tends to answer several questions, including: What is the role of metaverse technology in supporting education, the extent to which students know the metaverse technology and how they feel about the use of metaverse in education and access to information, and what is the impact of metaverse on raising the efficiency of education and what are the accompanying challenges?

This study means knowing the opinion of students in their teaching and learning using metaverse technology by collecting opinions, it will be possible to know how to use educational spaces better, and it is also important for students to learn about metaverse technology through study, and it is possible to make the metaverse a better place to learn by discovering the problems that students face while they are there, in which case the goal of that study is to Find out what students think about how to use metaverse applications in the classroom and get information.

2. PREVIOUS STUDIES

Since there are many metaverse-related studies in a variety of fields, there are manystudies on metaverse-based education , and these studies allow us to better understand education and its qualifications in the metaverse environment.

[11] entitled "Using the metaverse technique" In the field of education". The study aimed to Select apps The metaverse and activities in the field of education، Define the framework of the hypothesis and propose a model for better quality and education accessible to all Using theMetaverse، Specifically create an interactive classroomandAn environment for group discussion, presentation and theses and meetings using the Mozilla HPS platform "Mozilla Hubs" Open source which is free, customizable and accessible from all over the world. The methodology was adopted This search on Use the qualitative method of analysis، Add to review Ten key technologies based on quality The metaverse in education. This research will influence on The entire education sector through content visualization, virtual campus, Three-dimensional simulation, and mastery of the distance education process with quality High and accessible to all Everywhere. The study provided Look Comprehensive look at the technical and educational roadmap For metaverse applications, specifically in the context of classrooms. However, the study also recognizes the limitations and social implications of this technology; she shed Education Highlights the need for more research To fully understand its possibilities and limitations. Despite the fact that the development of Metaverse Technology They are still in their early stages, and there are obstacles to this that must be overcome before people's social activities are fully integrated.. However, There's optimism. In the future The metaverse is about the Integration into our daily lives, especially in sector education. In the end, it has confirmed Study on the importance of continuity in Ecosystem development and refinement For the metaverseAchieving its full impact in the education sector.

[1] entitled " Systematic review of the literature on the acceptability of the use of The metaverse in education over 16 years", in order to answer what is the orientation towards use The metaverse In educationHow do you say Distribution of platform, software, and hardware types based on type The metaverse In different education sectors, and is there a tangible benefit to using metaverse in Different education sectors, and is it easy use Metaverse Technology in various sectors of education. The study applied the comprehensive search method through databases, The results of This one Search Towards heading to Change from a single platform or program Metaverse to More diverse range of software and hardware of metaverse techniques in education, in order to identify The importance of perceived benefit ease of use in accepting and rejecting the use of The metaverse In education.

Future research suggests exploring the tangible utility and usability of a wider range of areas of education, and considering different types in relation to the design of platforms and devices. Metaverse [4].

[14] Zhou, entitled "Development of Smart education ecosystem from a perspective metaverse". Leads The metaverse Future education trends and profound changes in education، Based on the analysis of the direction of development of smart education, the significance and mechanism of action The metaverse in education, this paper develops the smart education ecosystem Through core educational technologies that included developing resource and interaction scenarios, combining virtual reality, spatial query and building three modular smart learning spaces based on Scenario To form a new educational mode characterized by virtual reality, coexistence with reality, spatial integration, and collaborative research. The application value for the mode is then verified using the analytical hierarchy process. Finally, the The education system developed in this study Creates a smart learning ecosystem of four Integrated environmental elements - Resource environment, interaction environment, space environment, and collaboration environment, accelerating the organic integration of changing and smart education and providing the theoretical basis and reference for the new application of the future.

[10] entitled "Perceptions of primary school teachers about technical possibilities The metaverse As a Technology Transforming interactive learning in Indonesia". There are currently many technology-based learning styles that can be used in effective teaching and learning.. This research aims into Identify how primary school teachers in Indonesia understand the potential of metaverse technology such as learning media transformation. The research method used by researchers is descriptive with a qualitative and descriptive approach In order to describe Actual situation regarding the importance of The metaverse For teachers in primary schools. The participants in this study were twenty primary school teachers in it Have good technical skills. Data was collected through observation and interviews.. The results of this study show that primary school teachers are interested in using The metaverse As an educational tool for teachers, An option to improve the performance of Learning is the use of The metaverse As a tool or as a new method of learning and teaching. use The metaverse Doesn't mean the teacher has to change teaching methods Traditional، It helps the teacher to effectively convey the material to the students..

[5] entitled "Educational applications of the metaverse: possibilities and limitations". This study aims to identify the four types of metaverse and explain the potential and limitations of its educational applications.. Categorized road map The metaverse into four Genres: Augmented Reality, Life Record, Mirror World, Virtual Reality. An example of the application of augmented reality in medical education would be an augmented reality T-shirt that allows students to examine inside the human body as an anatomy laboratory.. Furthermore, a research team at a Seoul hospital has developed a platform for spine surgery that applied augmented reality technology [8]. It is proposed that the potential of The metaverse as a new learning environment as follows: a space for new social networking; a higher degree of freedom to create and share; and provide new experiences and indulgence Higher through virtualization. Some limitations may be the weakness of social ties and the possibility of violating privacy; committing various crimes due to virtual space and anonymity in The metaverseand poor real-world adaptation to unidentified students. The next future assignments have been proposed for the educational use of the metaverse, first, teachers should carefully analyze how students understand the metaverse; second, teachers should design classrooms for students to solve problems or implement projects collaboratively and creatively; third, platforms should be developed The metaverse Educational that prevents the misuse of student data.

The study of [11] differed in the use of metaverse technology in education in order to propose an interactive classroom by involving students in the process of improving education, similar to the current study that collects students' opinions in terms of using technology in education. The current study differed with the study of Rahman et al. in the methodology used, where qualitative analysis and suggestion of a classroom model were used in the study of [11], while the descriptive analytical approach was followed in the current study. The study of [1] coincided with the current study in terms of the acceptability of the use of metaverse technology, and varied in terms of the type of research as a review or original research. [14] study agreed with the current study in terms of the application of metaverse technology in education, and varied in terms of the study sample, as Zou's study focused on building a smart learning system on interactive educational resources. The studies of [1] and [1] agreed with the current study in terms of objectives, and differed in terms of the study population, as the studies relied on reviewing and narrating the teachers' point of view, while the current study tended to know the views of students. Table 1 shows the results of SOWT's analysis of previous studies in terms of strengths, weaknesses, opportunities, and challenges.

The current study is distinguished from the rest of the previous studies as it was applied in a community that includes engineering students at King Abdulaziz University to find out the extent of these students' awareness and interest in metaverse technology, and the effectiveness of its use in the field of education from the point of view of male and female students. Table 1 below shows SWOT analysis of previous studies on the use of metaverse technology in education.

Table 1: SWOT analysis of previous studies on the use of metaverse technology in education (from the work of the researcher).

Vulnerability	**Strength**
1. Insufficient research and development studies in the field of metaverse. 2. Students in universities are not sufficiently prepared in the field of digital learning. 4. The existence of shortcomings in the field of cybersecurity. 3. Deficiencies and delays in implementation. 5. Decline in digital culture. 6. Low access to Internet use in the community. 7. An educational system in which educational services are weighty	1. There is a high adaptability to changes and the potential to contribute to developments. 2. An intelligent learning system based on interactive educational resources. 3. A new approach to effective learning. 5. Free, easy access and customizability. 6. The education system facilitatesthe transition of the educational system to the metaverse. 7. The existence of educational institutions that provide educational services with advanced technology.
Challenges	**Opportunities**
1. Many developments and opportunities related to transformation exist in foreign powers. 2. A more diverse range of software and hardware for metaverse technologies in education. 3. Lack of research and development at the academic level. 4. External dependency at the technical level. 5. Problems caused by cyber insecurity. 6. Potential issues related to ethics and privacy. 7. Due to the frequent use of metaverse for a certain audience, it becomes addicted and the resulting educational problems arise . 8. Society's inability to adapt to digital learning. 9. With the spread of metaverse technology , the pace of sedentary life and associated educational problems increased . 10. Increased separation from real life and increased psychological problems associated with it. 11. Deepening inequalities in access to educational services. Students with sufficient digital opportunities get more service, while individuals in the opposite situation get less service.	1. Provide important employment opportunities. 2. Providing investment opportunities for investors outside the educational sector. 3. Deployment of personalized educational services. 4. Reduce the costs of educational services. 5. Access to health data with increased use of wearable technologies. 6. Understand the importance of research and development. 7. Incentives offered by the government to increase educational technologies. 8. Provide ample opportunities in technology education. 9. Reduce the risk ratio in educational services. 10. Creation of a large global system of metaverse technology. 11. Reducing physical and psychological violence against educational workers.

3. METHODOLOGY USED

The descriptive analytical approach was used in the current research, and the questionnaire was used as a tool for this study, to collect information and data related to it, due to its nature in terms of its objectives, methodology and society. The questionnaire instructions were formulated for the purpose of introducing the sample members to the objective of the study tool, taking into account the clarity of the statements and their suitability to the level of respondents, and emphasizing the writing of data on the study variables. The questionnaire was presented to the supervising doctor for review, observations and appropriate adjustments. The areas of measurement of the research tool were represented in two sections , which included demographic data, and the axes of the study tool, which were the extent to which the students participating in the study knew about metaverse technology, the participants' opinions on the use of metaverse technology in education, the participants' opinions on the benefits of using metaverse technology in the classroom, and the participants' opinions on the disadvantages of using metaverse technology in the classroom.

The research community is represented by male and female students of the Department of Computer Engineering at King Abdulaziz University in Jeddah. A random sample of 89 male and female students of the Department of Computer Engineering was taken.

The results of Pearson's correlation coefficients and statistical significance showed that all correlation coefficients were positive and their values range between (0.507 – 0.900) and a function at the level of statistical significance (0.01), which indicates that the questionnaire is characterized by the sincerity of internal consistency and that its phrases are highly related to the axes and therefore the statements in each axis measure what they were designed for.

To verify the stability of the search tool, Cronbach alpha coefficients were used, and the results showed that the Cronbach alpha coefficients for statements ranged between (0.871 – 0.887), while the value of Cronbach alpha for the tool as a whole was (0.901), we note that all stability coefficients were high.

The results of the stability reached showed that the research tool is characterized by stability, which makes the researcher reassured by the responses of the sample members to the questionnaire and therefore the results that will be reached through the questionnaire will be reliable and reliable in reaching sound decisions.

The data of this study were analyzed using the Statistical Package for Social Sciences (SPSS) program, and the Excel program was used to make graphs, and statistical treatments and tests including Pearson's correlation coefficient were used to measure the internal consistency of the study tool, and Cronbach alpha coefficient to find the stability coefficient, frequencies and percentages to describe the research sample according to the initial variables, arithmetic mean, and single variance analysis test (ANOVA)., and the (t) test for the two independent samples.

4. RESULTS AND DISCUSSIONS

This section includes a presentation of the results of the study, based on the statistical analysis of the data collected by the questionnaire, verifying the objectives of the study and answering the questions raised.

The results of the percentages and frequencies of the distribution of the sample members by sex showed that the majority of the sample members were males (77.5%), while the percentage of females was (22.5%). In terms of age group, the majority (20 years and below) by (42.7%), followed by the age group (22 and over) years (29.2%), while the group (20 to 22 years) years is at the end of the ranking by (28.1%).

As for the extent to which the metaverse technology is used by male and female students, the results of the percentages and frequencies for the distribution of the sample members according to their use of the metaverse technology before showed that the majority used it by (69.7%), while the percentage of those who do not use it reached (30.3%). In terms of the desire to benefit from the metaverse technology in the classroom, the results showed Percentages and frequencies to distribute respondents according to the desire to benefit from the metaverse technology in the classroom, we find that the majority want to benefit from this technology (84.3%), while the percentage of those who do not want (15.7%).

On a related level, the results of the arithmetic averages and standard deviations of the participants' opinions on the use of metaverse technology in education showed that the general average reached (3.66) falls into the fourth category (3.4 - 4.2), which means knowing the level of participants' opinions about the use of metaverse technology in education was with great approval. Based on the arithmetic averages, the phrases were arranged in descending order, so we find that the phrase (I think that the metaverse technique can enhance my knowledge of the subject of the lecture) at the beginning of the order With an average of (3.79) and a large degree of approval, and then the phrase (the metaverse technology will be used in the classroom in the near future) with an average of (3.78) and a large degree of approval, and then the phrase (if possible to use the metaverse technology in any lecture in the college) with an average of (3.64) and a large degree of approval, and then the phrase (metaverse technology has educational benefits) with an average of (3.61) and a large degree of approval, followed by the phrase (if possible the metaverse technology increases the motivation for the lecture) with an average of (3.60), and finally the phrase (if possible) The metaverse technology makes the lecture content more enjoyable (with an average of 3.54) and a high approval score.

The results of the arithmetic averages and standard deviations of the respondents' answers about the benefits of using the metaverse technology in the classroom showed that the general average reached (4.03) falls into the fourth category (3.4 - 4.2), which means that the respondents' opinions about the benefits of using metaverse technology in the classroom were in great agreement. Based on the arithmetic averages and standard deviations, the phrases were arranged in descending order, so we find that the phrase

(metaverse technology increases the desire to learn) at the beginning of the ranking with an average of (4.13) And a large degree of approval, and then the phrase (metaverse technology facilitates learning) with an average of (4.11) and a large degree of approval, followed by the phrase (metaverse technology increases interest in the lesson and saves time) with an average of (4.09) and a large degree of approval, and then the phrase (metaverse technology provides focus on instructions) with an average of (4.08) and a large degree of approval, and then the phrase (if possible to use metaverse technology outside the laboratory supports distance learning) with an average of (4.07) and a large degree of approval, followed by the phrase (metaverse technology creates better understanding and active learning) With an average of (4.04) and a large degree of approval, and then the phrase (metaverse technology is suitable for practical applied disciplines such as medicine and engineering for easy creation of virtual reality for practical experiments and the participation of students from anywhere in these experiments practically as if inside the classroom) with an average of (4.03) and a large degree of approval, followed by the phrase (metaverse technology is a fast and effective learning method) with an average of (4.01) and a large degree of approval, followed by the phrase (if possible to use metaverse technology as a means of interaction between teachers and classmates) with an average of (3.93) and a degree of approval Large, and finally the phrase (metaverse technology provides a fun and flexible learning environment (anytime, anywhere) with an average of (3.81) and a great approval score.

The results of the arithmetic averages and standard deviations of the responses of the sample members to the statements of the risk level analysis showed that the general average reached (3.09) falls in the third category of the Likert five-year standard (2.6 - 3.4), which means that the level of risk analysis among the sample members was with average approval. Based on the arithmetic averages and standard deviations, the phrases were arranged in descending order, so we find that the phrase (metaverse technology requires access to the Internet and depends on high-speed Internet connection and leads to interruptions The Internet to the disruption of a complete halt to education based on it) at the beginning of the ranking with an average of (4.28) and a very large degree of approval, and then the phrase (metaverse technology needs a high-cost technical infrastructure) with an average of (3.91) and a large degree of approval, followed by the phrase (metaverse technology provides a break from real life) with an average of (3.66) and a large degree of approval, and then the phrase (metaverse technology has a negative impact on the social life of the individual) with an average of (3.25) and a medium degree of approval, followed by the phrase (metaverse technology causes problems Health) with an average of (3.23) and an average degree of approval, and then the phrase (metaverse technology constitutes the inability to maintain discipline in the classroom) with an average of (3.15) and an average degree of approval, and then the phrase (metaverse technology created a permanent deficit in learning) with an average of (2.63) and a medium degree of approval, followed by the phrase (metaverse technology creates distraction and inability to focus) with an average of (2.62) and an average degree of approval, and then the phrase (metaverse technology makes learning difficult) with an average of (2.16) and a weak degree of approval, Finally, the statement (metaverse technique is an inappropriate transfer of ideas) with an average of (2.02) and a weak approval score.

Differences between personal variables in the axes of the study tool (Table 2):

Table 2: Results of the test of differences between male and female samples in the axes of the study tool.

Significance level	Value (t)	Standard deviation	Average	Sample	Sex	axles
0.199	1.311	3.90526	17.8841	69	males	Participants' opinions on the use of metaverse technology in education
		3.77352	19.1500	20	females	
0.191	1.344	5.49564	40.7826	69	males	Participants' opinions about the benefits of using metaverse technology in the classroom
		7.17800	38.4500	20	females	
0.829	0.218	6.26197	36.6087	69	males	Participants' opinions about the disadvantages of using metaverse technology in the classroom
		7.68183	36.2000	20	females	

The above table shows the differences between the average males and females by testing (t) for the two independent samples in the axes of the study tool, we find the following:

As for the participants' opinions on the use of metaverse technology in education, we find the value of the corresponding statistical function level reached (0.199) greater than (0.05), which means that the participants' opinions on the use of metaverse technology in education among the sample members do not lag behind according to sex at the level of statistical significance (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.191) greater than (0.05), which means that the participants' opinions about the benefits of using metaverse technology in the classroom among the sample members do not lag behind according to sex at the level of statistical significance (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.218) greater than (0.05), which means that the participants' opinions about the disadvantages of using metaverse technology in the classroom among the sample members do not lag behind according to sex at the level of statistical significance (0.05). Table 3 below shows Results of ANOVA analysis of the differences between the ages of the sample members in the axes of the study tool.

Table 3: Results of ANOVA analysis of the differences between the ages of the sample members in the axes of the study tool

Statistical significance	Test value F	Squares of averages	Degree of freedom	Sum of squares	Sources of variation	axles
0.225	1.482	22.079	3	66.237	Between groups	Participants' opinions on the use of metaverse technology in education
		14.897	85	1266.235	Inside groups	
			88	1332.472	Total	
0.259	1.364	47.735	3	143.204	Between groups	Participants' opinions about the benefits of using metaverse technology in the classroom
		34.987	85	2973.853	Inside groups	
			88	3117.056	Total	
0.171	1.709	71.865	3	215.595	Between groups	Participants' opinions about the disadvantages of using metaverse technology in the classroom
		42.054	85	3574.629	Inside groups	
			88	3790.225	Total	

The above table is the differences between the ages of the sample members in the axes of the study tool by using the single analysis of variance test ANOVA:

As for the participants' opinions on the use of metaverse technology in education, we find the value of the corresponding statistical function level reached (0.225) greater than (0.05), which means that the participants' opinions on the use of metaverse technology in education among the sample members do not lag behind according to age at the level of statistical significance (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.259) greater than (0.05), which means that the participants' opinions about the benefits of using metaverse technology in the classroom among the sample members do not lag behind according to age at the level of statistical significance (0.05).

As for the participants' opinions about the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.171) greater than (0.05), which means that the participants' opinions about the disadvantages of using metaverse technology in the classroom among the sample members do not lag behind according to age at the level of statistical significance (0.05). Table 4 below shows Test results of differences between the extent to which metaverse technology has been used before.

Table 4: Test results of differences between the extent to which metaverse technology has been used before**.**

Significance level	Value (t)	Standard deviation	Average	Sample	Answer	axles
0.970	0.038	3.90419	18.1757	74	Yes	Participants' opinions on the use of metaverse technology in education
		3.96172	18.1333	15	No	
0.358	0.937	6.13763	40.0270	74	Yes	Participants' opinions about the benefits of using metaverse technology in the classroom
		4.95407	41.4000	15	No	
0.138	1.558	6.35575	37.0405	74	Yes	Participants' opinions about the disadvantages of using metaverse technology in the classroom
		7.17602	33.9333	15	No	

The above table shows the differences between the averages (using the metaverse technique) by testing (t) for the two independent samples in the axes of the study tool, we find the following:

As for the participants' opinions on the use of metaverse technology in education, we find the value of the corresponding statistical function level reached (0.970) greater than (0.05), which means that the participants' opinions on the use of metaverse technology in education among the sample members do not lag behind according to the extent of the use of metaverse technology at the level of statistical significance (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.358) greater than (0.05), which means that the participants' opinions about the benefits of using metaverse technology in the classroom among the sample members do not lag behind according to the extent of using metaverse technology at a statistical significance level (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.138) greater than (0.05), which means that the participants' opinions about the disadvantages of using metaverse technology in the classroom among the sample members do not lag behind according to the extent of using metaverse technology at the level of statistical significance (0.05). Table 5 shows results of the test of differences between the availability of metaverse technology for permanent and purposeful learning in the classroom.

Table 5: Results of the test of differences between the availability of metaverse technology for permanent and purposeful learning in the classroom**.**

Significance level	Value (t)	Standard deviation	Average	Sample	Answer	axles
0.554	0.602	3.95014	18.0667	75	Yes	Participants' opinions on the use of metaverse technology in education
		3.64646	18.7143	14	No	
0.298	1.047	5.83784	39.9733	75	Yes	Participants' opinions about the benefits of using metaverse technology in the classroom
		6.54192	41.7857	14	No	
0.590	0.548	6.60908	36.6800	75	Yes	Participants' opinions about the disadvantages of using metaverse technology in the classroom
		6.47608	35.6429	14	No	

The above table shows the differences between the averages (the extent to which metaverse technology provides permanent and purposeful learning in the classroom) through the (t) test for the two independent samples in the axes of the study tool, we find the following:

As for the participants' opinions on the use of metaverse technology in education, we find the value of the corresponding statistical function level amounted to (0.554) greater than (0.05), which means that the participants' opinions on the use of metaverse technology in education among the sample members do not lag behind according to the extent to which metaverse technology provides permanent and purposeful learning in the classroom at the level of statistical significance (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.298) greater than (0.05), which means that the participants' opinions about the benefits of using metaverse technology in the classroom among the sample members do not lag behind according to the extent to which metaverse technology provides permanent and purposeful learning in the classroom at the level of statistical significance (0.05).

As for the participants' opinions on the benefits of using metaverse technology in the classroom, we find the value of the corresponding statistical function level reached (0.590) greater than (0.05), which means that the participants' opinions about the disadvantages of using metaverse technology in the classroom among the sample members do

not lag behind according to the extent to which metaverse technology provides permanent and purposeful learning in the classroom at the level of statistical significance (0.05).

5. CONCLUSION AND FUTURE WORK

The results showed that the students' response score about the use of metaverse technology in education was large, with an average of 3.66; the results showed that the students' response score about the benefits of using metaverse technology in the classroom was large, with an average of 4.03; and the results showed that the students' response score about the disadvantages of using metaverse technology in the classroom was average, with an average of 3.09. The results of the differences between the personal variables in the axes of the study tool showed that There were statistically significant differences between sex or age in the axes of the study tool at the level of statistical significance (0.05); There were no statistically significant differences between the extent to which metaverse technology was used before, or the extent to which metaverse technology is available for permanent and purposeful learning in the classroom in the axes of the study tool at the level of statistical significance(0.05). The results of the current study show that the use of metaverse technology in supporting and activating the performance of the educational process was positive according to the responses of the study sample of male and female students; and that the extent of use of metaverse technology and its availability can increase knowledge of what students think about how to use metaverse technology applications in the classroom and obtain information.

Knowing what students think about how to use metaverse applications in the classroom and get information represents the future of virtual learning in the medium and long term, as evidenced by some research after analyzing it, metaverse technology has become a reality in some educational situations. There is still a long way to go for future research lines to study the future of metaverse technology in education by reviewing the literature and the point of view of all parties to the educational process, so it is advisable to continue research on this topic for various other stages of education such as secondary and primary education and vocational education and training.

Due to the ability of interactive technology and its development in accessibility, which reflects its importance in terms of implementation with students, especially those with special needs, in addition to that, various barriers and obstacles such as auditory, visual and physical problems that students suffer from during learning can be overcome using metaverse technology and thus the need for research and innovation in this field to provide a high degree of accessibility and adaptability.

REFERENCES

1. Chua, Hui Wen, and Zhonggen Yu. 2023. 'A systematic literature review of the acceptability of the use of Metaverse in education over 16 years', Journal of Computers in Education: 1-51.

2. Dickey, Michele D. 2005. 'Brave new (interactive) worlds: A review of the design affordances and constraints of two 3D virtual worlds as interactive learning environments', Interactive Learning Environments, 13: 121-37.

3. Dionisio, John David N., William G. Burns III, and Richard Gilbert. 2013. '3D Virtual worlds and the metaverse: Current status and future possibilities', ACM Computing Surveys, 45: 34:1–34:38.

4. Bird, Oguz. 2021. 'The Metaverse: Perceptions of Opportunities and Concerns in the 'Digital Big Bang", Intermedia International E-journal, 8: 245-66.

5. Kye, Bokyung, Nara Han ,Eunji Kim, Yeonjeong Park, and Soyoung Jo. 2021. 'Educational applications of metaverse: possibilities and limitations', Journal of Educational Evaluation for Health Professions, 18: 32.

6. Metcalf, Shari, Amy Kamarainen, M. Tutwiler, Tina Grotzer, and Chris Dede. 2011. 'Ecosystem Science Learning via Multi-User Virtual Environments', IJGCMS, 3: 86-90.

7. Narin, Nida, and Ömer Aydın. 2021. 'A Content Analysis of the Metaverse Articles', Journal of Metaverse, 1: 17-24.

8. Owens, D. 2012. "Understanding the adaptive use of virtual world technology capabilities and trust in virtual teams." In.

9. Prieto, Julián de la Fuente, Pilar Lacasa, and Rut Martínez-Borda. 2022. 'Approaching metaverses: Mixed reality interfaces in youth media platforms', New Techno Humanities.

10. Rahmadtullah, Reza, Bramianto Setiawan, Andarmadi Jati Abdhi Wasesa, and Jatu Wahyu Wicaksono. 2023. 'Elementary school teachers' perceptions of the potential of metaverse technology as a transformation of interactive learning media in Indonesia', International Journal of Innovative Research and Scientific Studies, 6: 128-36.

11. Rahman, Khandaker Raiyan, Sholaiman Khan SHİTOL, Md Sohidul ISLAM, Kh Tanveer IFTEKHAR, and SAHA Pranto. 2023. 'Use of Metaverse Technology in Education Domain', Journal of Metaverse, 3:79-86.

12. Rospigliosi, Pericles ‘asher’. 2022. 'Metaverse or Simulacra? Roblox, Minecraft, Meta and the turn to virtual reality for education, socialisation and work', Interactive Learning Environments, 30: 1-3.

13. Suzuki, Sin-nosuke, Hideyuki Kanematsu, Dana M. Barry, Nobuyuki Ogawa, Kuniaki Yajima, Katsuko T Nakahira, Tatsuya Shirai, Masashi Kawaguchi, Toshiro Kobayashi, and Michiko Yoshitake. 2020. 'Virtual Experiments in Metaverse and their Applications to Collaborative Projects: The framework and its significance', Procedia Computer Science, 176: 2125-32.

14. Zhou, Binbin. 2022. 'Building a smart education ecosystem from a metaverse perspective', Mobile Information Systems, 2022: 1-10.