Nursing Student s' Readiness toward Using Metaverse Mixed Reality Technology and its Relation to Creativity in Learning and Academic Resilience

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Abstract

Background: Mixed reality technology in learning offer students to engage in more interesting learning journey , also make students more resilient to think in the same thing in different ways, so it's not only require resilient student but also enhance students resilience to find creative solution to different challenges and problems. ***Aim:*** the present study aimed to assess nursing students' readiness toward using metaverse mixed reality technology and its relation to creativity in learning and academic resilience. ***Design:*** A descriptive correlational research design was utilized. ***Setting:*** This study was conducted at the Faculty of Nursing, Benha University. **Subjects**: Were composed of stratified random sample constituted of 1107 from 3741 total of nursing students from the four academic levels at academic year (2024-2025). ***Tools of data collection***: Three tools were used to collect data; 1) total readiness toward using metaverse mixed reality technology in learning questionnaire, 2) nursing student's creativity in learning questionnaire, 3) nursing student's academic resilience in learning questionnaire. ***Results:*** The results of the present study showed that more than one half (57.7%) of studied nursing students had total high readiness level toward using of metaverse mixed reality technology in learning. Also, more than one half (54.5%) of studied nursing students had high creativity levels in learning. Moreover, more than one half (52.3%) of studied nursing students had high levels of academic resilience. ***Conclusion:*** the study concluded that there was highly statistical significant positive correlation among total nursing students' readiness toward using metaverse mixed reality technology, total creativity in learning and total academic resilience in learning. ***Recommendations:*** The current study recommended that encourage nursing student's participations within orientation and training programs prepared within the college to expand their knowledge about latest technological learning ,Requiring students to take a digital transformation course and making it one of the college admission requirements so that they can adapt to E-learning.

Key words: Academic resilience, Creativity in learning, Metaverse, Mixed reality technology, Nursing students.

Introduction:

The need for alignment with global standards and technological advancements remains a continuous challenge, beside the dynamic nature of global educational trends demands constant adaptation and innovation within the higher education sector. Therefore embracing technological advancements essential for staying relevant globally , enhancing the

quality and effectiveness of educational delivery. furthermore, opens avenues for innovative learning methods, online education and interactive platforms to enhances the overall quality of education and equips students with essential digital literacy skills for the future workforce (**Sundoro et al., 2024)**.

Hence the integration of digital immersive technologies into higher education has reshaped the landscape of learning through providing virtual learning environment rather than traditional classrooms which significantly influenced student engagement and academic outcomes. In addition to create distinct experience by merging the physical world with a digital simulated reality, thus immersive technology includes Virtual Reality, Augmented Reality, and Mixed Reality (**Ravshanovna, 2025)**.

While virtual reality uses computer-generated information to provide a full sense of immersion However, augmented reality blends computer-generated information onto the user's real environment, therefore Mixed Reality creates a new form of simulation by merging the real and virtual worlds, in which physical and digital elements coexist and interact with each other. Through a head mount device ***(Koumpouros et al .,2024***). In addition to, mixed reality initially provides students with sense of immersion into virtual world .Also, enriches students with a large amount of high-quality sensory information. Both aspects of sensory information and immersion create a realistic digital environment, make students feel inhabit and interact within **(Iqbal& Hassan, 2024)**.

Furthermore mixed reality enhances student learning outcomes in various educational contexts and broaden learning environments by overcoming limitations in physical space, fostering collaboration and experiential learning, offering personalized learning approaches to support students regardless knowledge level, enable students to explore complex topics and scenarios in realistic and interactive ways to a greater extent than conventional methods improve learning outcomes. Moreover mixed reality provides students with flexible access and self-directed learning opportunities suit needs and preferences. Beside reduce the unimportant cognitive load and facilitate the intrinsic and relevant cognitive load associated with learning complex information **(Petruse et al., 2024)**.

Certainly, in the 21st century, creativity is regarded as one of the most important skills enables people to remain adaptable and capable of dealing with the opportunities and challenges which complicated world presents, the ability to observe and evaluate issues from various viewpoints, devise new solutions, and achieve new cognitive capacities are all examples of creativity. Thus, creativity consider crucial for long-term success for students and all

countries. Beside creativity can improve other student's abilities, such as problem-solving skills and self-achievement ***(Novia et al., 2024)***.

Moreover student's creativity showed by the following indicators namely (originality, flexibility, fluency, and elaboration*). Initially originality:* refers the ability to generate new ideas with one's own mind. While *secondly flexibility:* refers the person's ability to openness to various kinds of ideas. Therefore *thirdly fluency:* refers the ability to generate ideas. *Finally elaboration:* refers the ability to provide more complex ideas **(Yulianti et al., 2025)**.

Regarding mixed reality creates immersive, interactive environments that allow learners to explore and manipulate virtual objects in real-world contexts through hands-on experience students practice experimentation and creative problem-solving. Beside, supports collaborative learning by allowing multiple learners to interact with the same virtual objects in real-time, regardless physical location. In addition to, fosters teamwork and collective creativity. Furthermore, mixed reality adapts to individual learning styles and paces, allowing students to explore topics in ways that resonate with. Therefor personalization encourages creative thinking and self-expression **(Reis et al., 2024)**.

On the other hand, academic resilience defined as the ability to survive or maintain success and overcome challenges, setbacks, and stressors in educational journey despite being in difficult conditions or unpleasant situations in the academic field, through developing coping strategies, a growth mindset, and the ability to adapt to difficult situations such as: integrating new learning method, academic failure, heavy workloads, or personal struggles. Therefore resilient students view obstacles as opportunities for growth rather than insurmountable barriers. By fostering resilience, learners can build confidence, persistence, and a positive attitude toward learning, which essential for long-term academic and personal success **(Iriana et al., 2025)**.

Moreover, mixed reality enable students visualize abstract ideas, practice skills in a risk-free virtual setting, receive real-time feedback, which fosters a growth mindset and encourages persistence. Additionally, mixed reality's collaborative features enable students work together, share ideas, and support one another, therefore strengthening social and emotional resilience by providing personalized, interactive and adaptive learning experiences **(Ghanbaripour et al., 2024)**.

Accordingly mixed reality play a significant role in enhancing student's academic resilience by creating immersive, engaging and supportive learning environments which helping students overcome challenges and builds confidence.

Through mixed reality, students can interact with complex concepts in a tangible way, making difficult subjects more accessible and reducing frustration. Therefore resilience teaches students to overcome challenges by thinking in different creative ways out of the box to handle any challenge. Subsequently, three concepts strongly related each other's. Hence mixed reality consider the common factor improve both students 'creativity and academic resilience ***(Salim & Sarajar, 2024).***

Significance of the Study

Today, in order to be competitive, it is not enough to have only certain theoretical knowledge, it is necessary to be able to apply it in real life. the role of universities in educating active, proactive, creatively and critically thinking student, with developed skills , abilities to work with information , solve various problematic tasks and ready for self-education. The universities' effort to meet the requirements of the rapidly changing world is to focus on a competency based approach to the content of education. **(Gniezdilova& Mykytyn, 2023).**

MR technology in education in recent years has benefited learners by improving their motivation, problem-solving skills, and overall learning experience **(Hauze & Marshall, 2020).** Mixed reality allows students to actively participate in the learning process To creates a learning environment that positively influences learners' attention and provides them with a more engaging and fun learning experience than traditional methods **(Pellas et al., 2020).**mixed reality has many wide applications and features to offer in the healthcare field such as the 3D operating room with simulations, broadcasting options, virtual organ models for complex surgeries and more **(Pavithra, et al .,2020).**

From the investigator point of view this study highlight the importance of keeping pace with continuous technological development and integrating it into the field of nursing learning and benefiting from it in developing deep thinking skills, creativity and flexibility in nursing learning. so that this study conducted to assess readiness of nursing student toward using metaverse mixed reality technology and its relation to their creativity in learning and academic resilience.

Aim of the study

This study aims to assess nursing students' readiness toward using metaverse mixed reality technology and its relation to creativity in learning and academic resilience.

Research questions

1. What are the levels of nursing students' readiness toward using metaverse mixed reality technology in learning?
2. What are the levels of creativity in learning among nursing students?
3. What are the levels of academic resilience among nursing students?
4. Is there a relation between nursing students' readiness toward using metaverse mixed reality technology and creativity in Learning?
5. Is there a relation between nursing students' readiness toward using metaverse mixed reality technology and academic resilience in Learning?

Subjects and method:

I) <u>Technical Design:</u>

The technical design included: study design, setting, subjects, study tools and methods that used in data collection.

Study design

A descriptive correlational design was used to achieve the aim of the present study

Study setting:

The current study was conducted in all academic departments at Faculty of Nursing Benha University

Study subjects:

Nursing students was included in the present study:

consisted of 1107 nursing students out of 3741 students from the four academic levels in the academic year (2024/2025) who were selected using a stratified random sample, The sample size was taken from each stratum (an academic level) according to sample size equation and distributed as the following:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n → The required sample size

N → Total number of nursing students in each academic level

e → Error tolerance (0.05)

1→ A constant value. ***(Simarjeet, 2017)*.**

Tools of data collection:

Three tools were used for data collection in the present study namely:

Tool (1):**Total readiness toward using metaverse mixed reality technology in learning questionnaire:**

It consists of three parts

Part I: Personal data of nursing students: it includes two types of data:

a) Personal characteristics of nursing students: it include the following six questions (age, sex, marital status, academic level, what learning methods do you prefer, what learning style do you prefer.

b) Technology experience data of nursing students: it include the following six questions (do you have a mobile phone, what type of your mobile phone, do you have a computer, what is the type of your computer, have you attended training courses on learning with virtual or mixed reality, if your answer is (yes), mention the name of the courses taken, Select the health problems you face when using your phone or laptop for a long time).

Part II: Metaverse mixed reality technology knowledge questionnaire:

Self-administered questionnaire developed by the investigator based on related literatures review (***Champion, 2019; Hauze et al., 2019 & Zhang et al., 2022)*** to assess nursing students' knowledge regarding using of metaverse mixed reality technology. It consisted of 29 items divided into 3 main categories distributed as the following: knowledge about (concept, advantages and disadvantages) of mixed reality technology

Part III: **Metaverse mixed reality technology readiness questionnaire:**

Self-administered questionnaire developed by the investigator based on related literatures review **(Akaslan, 2011; Nordin & Daud, 2020 & Omolafe et al., 2021).** To assess nursing students' readiness toward using of metaverse mixed reality technology. It consisted of 9 main dimensions distributed as following: (usefulness, ease of use, intention to use, social influences, self-competence, self-directed learning, discomfort, insecurity and hindrances).

Scoring system:

Studied nursing students responses were scored based on two Scale ranged from (0-1) as; (1) correct, (0) Incorrect.scores were ranged from (0-29) and it was considered high knowledge level if the percent score was ≥75% that equals (22-29 point score), while considered moderate knowledge level if the percent score was ranged from 60 to < 75 % that equals (17-21 point scores), and

considered low knowledge level if it is < 60 % that equals (0-16 point scores).

Tool (2): Nursing student's creativity in learning questionnaire :

Self-administered questionnaire developed by the investigator based on related literature review **(Cheung, 2003; Sarikhani et al., 2016 & Lehmkuhl et al., 2021).** To assess nursing students' creativity in learning. It consisted of 45 items divided into 8 main dimensions distributed the as following: (creative personality and curiosity, knowledge and skills expansion advanced cognitive linking, boldness, originality, fluency, flexibility and elaboration).

Scoring system:

Studied nursing students responses were scored based on a three-point Likert Scale ranged from (3) agree, (2) agree to somewhat, (1) disagree.score was ranged from (45-135) and it was considered high creativity level if the percent score was ≥75% that equals (101-135 point scores), while considered moderate creativity level if the percent score was ranged from 60 to < 75 % that equals (81-100 point scores), and considered low creativity level if it is < 60 % that equals (45-80 point score).

Tool (3): Nursing student's academic resilience in learning questionnaire

Self-administered questionnaire developed by the investigator based on related literature review **(Ali-Abadi et al., 2021; Rachmawati et al., 2021; *&Ramdani, 2021*)**. It consisted of 25 items divided into 4 main dimensions distributed as following: (social skills, student empathy, and problem solving ability and self-efficacy).

Scoring system:

Studied nursing students responses were scored based on a three-point Likert Scale ranged from (3) agree, (2) agree to somewhat, (1) disagree.

score was ranged from (25-75) and it was considered high academic resilience level if the percent score was ≥75% that equals (56-75 point scores), while considered moderate academic resilience level if the percent score was ranged from 60 to < 75 % that equals (45-55 point scores), and considered low academic resilience level if it is < 60 % that equals (25-44 point score).

II. Administrative Design:

An official permission was issued from the vice dean for learning and students affairs to heads of academic departments at the Faculty of Nursing, Benha University to conduct

the study, and seek their support for completing the data collection.

III. Operational Design:

It included preparatory phase, pilot study and field work these phases took about 7 months started from April 2024 to the end November 2024.

a. Preparatory phase:

This phase took three months started from April 2024 to July 2024. It included the following: Reviewing the national and international related literatures using journals, periodicals, textbooks, internet and theoretical knowledge of the various aspects concerning the topic of the study for developing the tools and translating the tools into Arabic language and back translation to check its accuracy.

b. Validity of the tools:

- To arrive at the final version of the tools. The tools were regarded as valid from the experts' point of view. It took one month Augusts 2024.
- Face and content validity of study tools were done by group of Jury consisted of seven experts, five of them from different Faculty of Nursing, one professor doctor from each the following universities (Tanta University, Menoufia University, Cairo University, one professor doctor and one assistant professor from Benha University in nursing administration department). In addition to professor doctor of computer science in Misr International University and professor doctor of veterinary medicine ,director of the Quality Assurance and Accreditation Center.
- The validity of the tools aimed to judge its clarity, comprehensiveness, relevance, simplicity and accuracy. Some modifications in statements were done in tools based on comments of Jury experts.

Reliability of tools:

Reliability of tools was conducted to determine the internal consistency and homogeneity of used tools by using Cronbach's Alpha Coefficient test as the following:

Table (E): Reliability of the study tools:

	Tools	Studied nursing students
1	Total Readiness for 101 items	0.976
	-Knowledge for 29 items	0.854
	-Readiness for 72 items	0.986
2	Creativity for 45 items	0.990
3	Academic resilience for 25 items	0.984

Pilot study:

A pilot study was carried out in September 2024 to ascertain the clarity and applicability of the study tools representing 10 % of total study subjects. 111 nursing students from four academic levels were included in the pilot study. It has also served in estimating the time needed for filling the questionnaires. It ranged between 10-12 minutes for readiness toward using metaverse mixed reality technology in learning questionnaire by nursing students, between 10-12 minutes for nursing student's creativity in learning questionnaire and between 10-15 minutes for nursing student's academic resilience in learning questionnaire. No modification was needed. The pilot study included in the study main subjects.

Field work:

- Data collection took about 2 months from the beginning of October to the end of November 2024.
- The investigator prepared the questionnaire electronically via google form design and took the permission from heads of academic departments after explained the aim and the nature of the study and the method of filling the electronic questionnaires to the nursing students in their departments and then the link was sent to nursing students through the practical Whats App groups via heads of different academic departments. Nursing Students' questionnaires link: (https://forms.gle/VCCjfCiQMrL6paEx7) That include: readiness toward using metaverse mixed reality technology in learning and its relation to creativity in learning and academic resilience questionnaire**.** Nursing students started to open the links and fill the questionnaires.
- Data was collected daily and the average number of responses per day was ranged between 10-20 responses from nursing students.

Ethical Considerations:

Prior to the conduction of the study, ethical approval was obtained from the Scientific Research Ethics Committee at Faculty of Nursing, Benha University. All subjects were informed that participation in the study was voluntary and informal consent was obtained from the participants in the study through their acceptance for filling questionnaire. Confidentiality of data obtained was protected by the allocation of a code number to the questionnaire sheets. Subjects were informed that the content of the study tools will be used for the research purpose only. Participants' right to withdraw from the study at any time was ascertained.

IV. Statistical Design:

Data were collected, tabulated, statistically analyzed by using an IBM personal computer with statistical package of social science (SPSS) version 26 where the following statistics were applied. Descriptive statistics: In which quantitative data were presented in the form of Mean, standard deviation (SD), frequency, and percentages distribution. Correlation (r): Was used to study association between two qualitative variables. Chi-square test (χ^2): was used to study association between two qualitative variables. Fisher Exact Test (FET) cell2×2: The used tests of significance included p-value test: Statistical significance was considered at P-value 0.05, considered highly statistically significance at p-value P 0.001 and considered not significance at P > 0.05.

Results

Table (1): Shows that more than one half (55.0%) of studied nursing students aged ≥ 20 years old with Mean ±SD (19.73± 1.41). As related to their sex, more than two third (68.4%) of them were females. As far as their marital status, the most (96.2%) of them were unmarried. Regarding to their academic level, more than one quarter (26.5%) of them were in the third academic level. Regarding to preferred learning methods, more than one half (57.2%) of them prefer electronic learning methods. Regarding to preferred learning style, more than one half (57.0%) of them prefer visual learning style.

Table (2): Shows that the most (97.6%) of studied nursing students having a mobile phone. As related to type of mobile phone, the majority (84.4%) of them having smart phone.as pertaining to having a computer, more than three fifth (60.3%) of them had a computer. Regarding to type of computer, more than one half (55.5%) of them had handled computer "lap top or tablets". As related to attended training courses on learning with virtual or mixed reality, all (100%) of them had not attended training courses on learning with virtual or mixed reality. Regarding to health problems facing nursing students when using phone or laptop for a long time, less than two third (64.1%) of them had faced eye strain and difficulty focusing.

Figure (1): Clarifies that more than one half (57.7%) of studied nursing students had high total readiness levels toward using metaverse mixed reality technology. on the other hand, the minority (5.8%) of them had low total readiness level.

Table (3): Demonstrates that the total mean scores and standard deviation of studied nursing student total readiness was (192.01±32.83) with (79.37%).in addition to, the highest ranking (81.06%) of studied nursing students was related to the metaverse mixed reality technology readiness. While, the lowest ranking (58.3%) of studied nursing students was related to metaverse mixed reality technology knowledge.

Figure (2): Clarifies that more than one half (54.5%) of studied nursing students had high levels of creativity in learning. While, the minority (6.7%) of them had low levels of creativity in learning.

Table (4): Represents that the total mean scores and standard deviation of studied nursing student's total creativity in learning was 108.72±24.25 with (80.53%) in addition to, the highest ranking (80.73 %) of studied nursing students was related to originality**.** While, the ranking (80.16%) of studied nursing students was related to knowledge and skills expansion**.**

Figure (3): Clarifies that more than one half (52.3%) of nursing students had high levels of academic resilience. While, minority (8.7%) of them had low levels of academic resilience.

Table (5): Represents that the total mean score and standard deviation of total academic resilience was 59.73±13.92 with (79.6%), in addition to the highest ranking (79.9%) of nursing students was related to student empathy .while, the lowest ranking (79.1%) of studied nursing students was related to student self-efficacy.

Table (6): Indicates that there was highly statistical significant (positive) correlation between total nursing students' readiness toward using metaverse mixed reality technology, total creativity in learning.

Table (7): Indicates that there was highly statistical significant (positive) correlation between total nursing students' readiness toward using metaverse mixed reality technology and total academic resilience in learning

Table (1): Frequency distribution of nursing students regarding their personal characteristics (n=1107)

Personal characteristics	No.	%
Age		
≤ 20 years	498	45.0
≥20 years	609	**55.0**
Range	**18-23**	
Mean ±SD	**19.73±1.41**	
Sex		
Male	350	31.6
Female	757	**68.4**
Marital status		
Married	42	3.8
Unmarried	1065	**96.2**
Academic year		
First year	237	21.4
Second year	291	26.3
Third year	293	**26.5**
Fourth year	286	25.8
What learning methods do you prefer		
Traditional learning methods	474	42.8
Electronic learning methods	633	**57.2**
What learning style do you prefer(you can select more than one answer)		
Visual learning style	631	**57.0**
Auditory learning style	557	50.4
Reading and writing learning style	593	53.6
kinesthetic learning style	376	34.0

Table (2): Frequency distribution of nursing students regarding their Technology experience (n=1107)

Technology experience data	No.	%
Do you have a mobile phone		
Yes	1080	**97.6**
No	27	2.4
What type of your mobile phone (no.=1080)		
Basic phone	169	15.6
Smart phone	911	**84.4**
Do you have a computer		
Yes	668	**60.3**
No	439	39.7
What is the type of your computer (no.=668)		
Desktop computer	297	44.5
Handled computer "lap top or tablets"	371	**55.5**
Have you attended training courses on learning with virtual or mixed reality		
Yes	0	0.0
No	1107	**100.0**
health problems you face when using your phone or laptop for a long time(you can select more than one answer)		
Vertigo and blurred vision	595	53.7
Headache and drowsiness	474	42.8
Eye Strain and difficulty focusing	710	**64.1**
Nausea and vomiting	65	5.9
Others	117	10.6

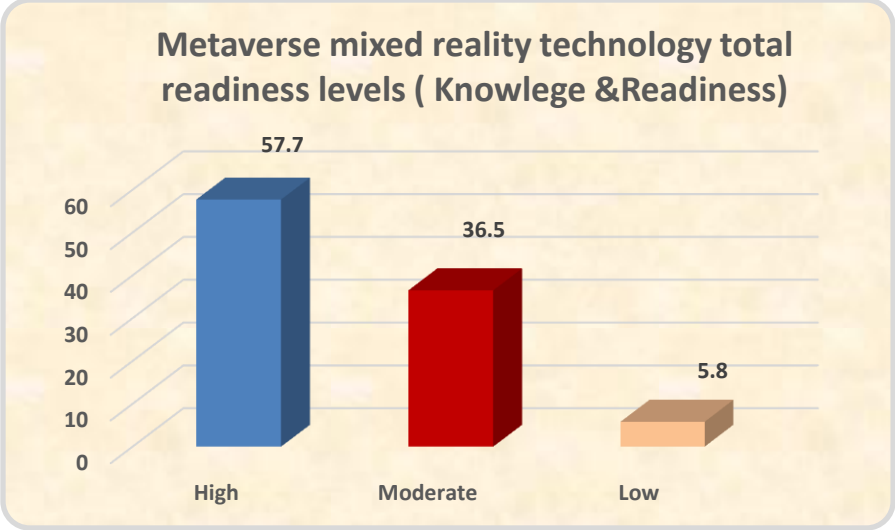

Figure (1): Percentage distribution of nursing students' total readiness levels toward using metaverse mixed reality technology

Table (3): Total mean scores and standard deviation with ranking regarding metaverse mixed reality technology total readiness levels

Total readiness variables	Total score	M ±SD	%	Ranking
Metaverse mixed reality technology knowledge	29	16.91±6.10	**58.3**	**2**
Metaverse mixed reality technology readiness	216	175.09±32.96	**81.06**	**1**
Total of metaverse mixed reality technology total readiness levels	**245**	**192.01±32.83**	**79.37**	

M = Mean **SD= Standard deviation**

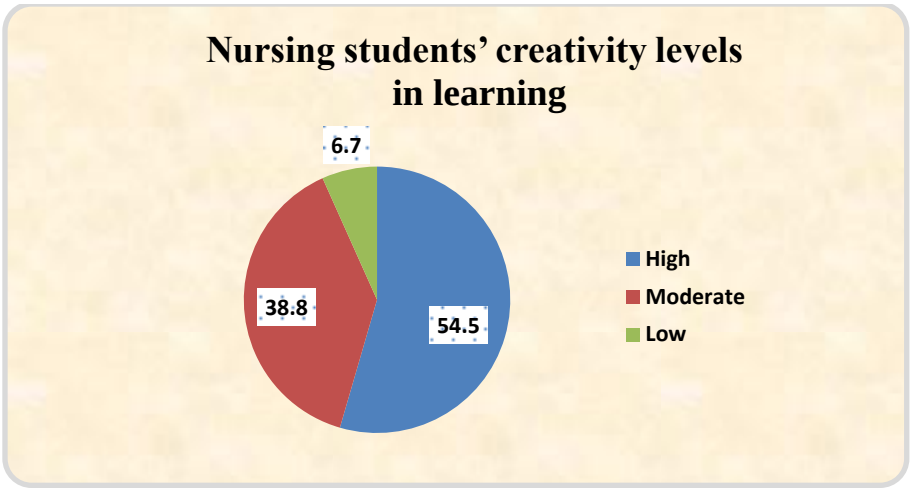

Figure (2): Percentage distribution of nursing students' creativity levels in learning.

Table (4): Total mean scores and standard deviation with ranking regarding creativity in learning (n=1107)

Dimensions	Total score	M ±SD	%	Ranking
Creative personality and curiosity	21	16.93±3.53	80.61	3
Knowledge and skills expansion	12	9.62±2.32	**80.16**	**8**
Advanced cognitive linking	15	12.09±2.97	80.60	4
Boldness	24	19.31±4.55	80.45	5
Originality	15	12.11±2.84	**80.73**	**1**
Fluency	15	12.05±2.86	80.33	6
Flexibility	21	16.94±3.96	80.66	2
Elaboration	12	9.64±2.28	80.32	7
Total creativity in learning	135	**108.72±24.25**	**80.53**	

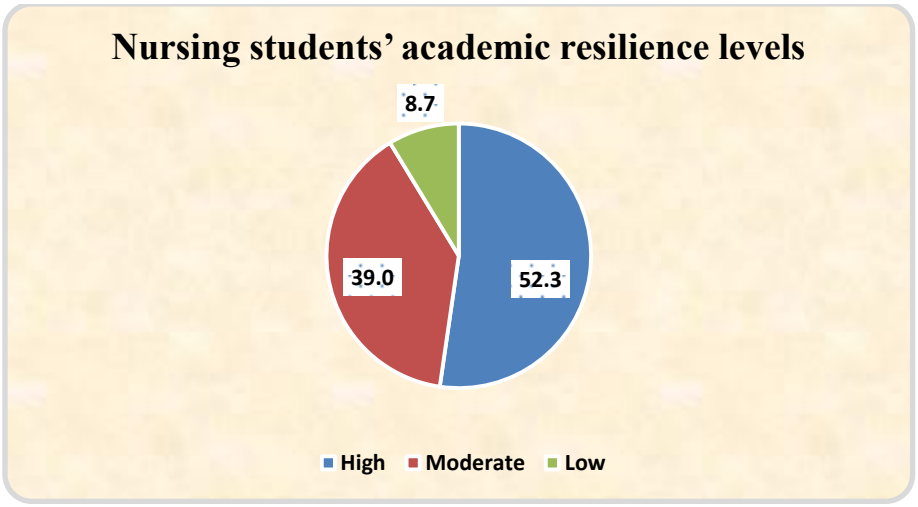

Figure (3): Percentage distribution of nursing students' academic resilience levels

Table (5): Total mean scores and standard deviation with ranking regarding academic resilience (n=1107)

Dimensions	Total score	M ±SD	%	Ranking
Student Social Skills	27	21.54±5.19	79.8	2
Student Empathy	12	9.59±2.32	**79.9**	**1**
Student ability for Problem Solving	18	14.36±3.51	79.7	3
Student Self-Efficacy	18	14.23±3.56	**79.1**	4
Total academic resilience	75	**59.73±13.92**	**79.6**	

M = Mean **SD= Standard deviation**

Table (6): Correlation between nursing student s' readiness toward using metaverse mixed reality technology and creativity in learning.

Variables	Total nursing students' readiness toward using metaverse mixed reality technology	
	r	**P value**
Total creativity in learning	0.140	0.000**

(**) A highly statistical significant difference P ≤ 0. 001 - r = Pearson Correlation Coefficient

Table (7): Correlation between total nursing students' readiness toward using metaverse mixed reality technology and total academic resilience in learning.

Variables	Total nursing students' readiness toward using metaverse mixed reality technology	
	r	**P value**
Total academic resilience in learning	0.103	0.001**

(**) A highly statistical significant difference P ≤ 0. 001) - r = Pearson Correlation Coefficient)

Discussion

Regarding to personal data of the studied nursing students, the findings of the present study clearly showed that more than one half of nursing student's ≥ 20 years old. From investigator's point of view this could be due to most students enter these programs directly after high school, around age of 18 years nursing institutions students enter with age of 19 years into second level directly, both complete their nursing degrees in about 4 years, graduates from nursing college around age of 22 years.

This result was aligned with the finding of **Chang & Lai, (2021)** who conduct study about "Exploring the experiences of nursing students in using immersive virtual reality to learn nursing skills" .and showed that the mean participant nursing student's age was 22 years old.

As related to their sex, more than two third of them were females. This result was supported with the finding of **Jallad et al., (2024)** who conducted study about "nursing student's perceptions, satisfaction, and knowledge toward utilizing immersive virtual reality application in human anatomy course: quasi-experimental" and revealed that most of the participants of this study were female.

As far as their marital status, the most of studied nursing students were

unmarried. From investigator point of view this could be due to students still in their basic learning years, and marriage in the basic educational stages consume a lot of the time available for students to learn compared to their unmarried colleagues.

Regarding to their academic level, more than one quarter of them were in the third academic level. Regarding to preferred learning methods, more than one half of them prefer electronic learning methods, This result aligns with the finding of **Baxter& Hainey,(2024)** who conducted study about **"**using immersive technologies to enhance the student learning experience. Interactive technology and smart education" and revealed that there was thirty-two participants strongly agreed about preferred immersive electronic learning method than traditional face-to-face classes.

Regarding to preferred learning style, more than one half of students prefer visual learning style. This result was aligned with the finding of **Huang et al., (2020)** who conducted study about "influence of students' learning style, sense of presence, and cognitive load on learning outcomes in an immersive virtual reality learning environment" and revealed that the majority of students prefer visual learning.

Regarding to studied nursing student's technology experience data, the findings of the present study clearly demonstrated that the most of nursing students having a mobile phone, This result was supported with the finding of **Rashed et al., (2017)** who conduct study about "Nursing staff readiness toward advanced mobile devices utilization in nursing care in critical care units" and showed that the majority of participants having a mobile phone.

As related to type of mobile phone, the majority of them was having smart phone. This result was consistent with the finding of **Mgeni et al., (2024)** who conducted study about "adoption of mobile application for enhancing learning in higher education: students' views from the state university of Zanzibar" and revealed that the most of participants using smart phones and mobile devices in learning.

As pertaining to having a computer, the result of the current study demonstrated that more than three fifth of them had a computer. This result was consistent with the finding of **Hallila et al., (2014)** who conduct study about "Nursing students' use of Internet and Computer for their Education in the College of Nursing" and stated that most of the students had their own computer at home.

Regarding to type of computer, more than one half of nursing students had handled computer "lap top or tablets". This result was aligned with the finding of **Terkes et al., (2019)** who conduct study about "Determination of nursing students' attitudes towards the use of technology" and stated that more than two fifth having a computer and more than one half of students having a laptop.

As related to attended training courses on learning with virtual or mixed reality, all of them had not attended training courses on learning with virtual or mixed reality. The result in disagreement with the finding of **Ismail& Hashim, (2020)** who conducted study about "virtual reality-based education (VRBE): understanding students' readiness and expectancies" and revealed that the students are somewhat aware of VR, and showed that the students somehow realize that VR is coming its way in education.

Regarding to health problems facing nursing students when using phone or laptop for a long time, the result of this study revealed that less than two third of them had faced eye strain and difficulty focusing This result was in agreement with the finding of **Asgari Tapeh & Darvishpour,(2024)** who conducted study about "undergraduate nursing students' experiences of virtual learning during the covid-19 pandemic: a qualitative study" and revealed that the most participants complained of eye fatigue and headache after repeated use of mobile devices attending several hours of online virtual classes.

Pertaining to metaverse mixed reality technology readiness result of the present study clarified that less than two third of studied nursing students had high readiness levels toward using metaverse mixed reality technology. this result of the present study was consistent with the finding of **Hidayati et al.,(2024)** who conduct study about "readiness of educational institutions in utilizing immersive technology in learning" who stated that the students were ready for the implementation of immersive technology in learning but require some improvement .beside this result was consistent with the finding of **Garbutt et al ., (2023)** who conveyed study about "a student-dominant view of the readiness to use metaverse in education: the tri-f framework" and revealed that the students were ready for immersive technology although the some students felt some discomfort and insecurity.

On the other hand, the result of the prevailing study revealed that the minority of students had low readiness levels toward using metaverse mixed reality technology. This result of the prevailing study was consistent with the finding of **Ismail & Hashim, (2020)**.who conduct study about "Virtual reality-based education (VRBE): understanding students' readiness and expectancies" and revealed that the students' readiness level is rather low toward using virtual reality in learning

Regarding total mean scores and standard deviation with ranking of metaverse mixed reality technology total readiness levels. The result of the current study revealed that the highest ranking of studied nursing students was related to the metaverse mixed reality technology readiness. From investigator's point of view it could be due to many students prefer electronic learning methods that save time in learning and make understanding process of learning lessons more easily and interesting ,beside all of the mixed reality technology benefits in ease learning catch students attention to be ready to use it despite, lacking total knowledge about it .

In addition to the result of the present study demonstrated that the lowest ranking of studied nursing students was related to metaverse mixed reality technology knowledge. From investigator's point of view it could be due to students not seek about new learning method that help them in learning fast and easily, even lacking role of the college to inform and orient them about newly learning method despite pressure of traditional learning courses especially supporting concept of keeping pace with needs of the present times.

The finding of the prevailing study revealed that more than one half of nursing students had high levels of creativity in learning. This result was consistent with **Chen et al., (2024)** who conduct study about "effectiveness of virtual reality on learning engagement" and revealed that virtual reality technology can inspire learners and stimulate their imagination, creating an immersive creative environment that is conducive to fostering creativity.

On the other hand, the result of the prevailing study revealed that the minority of students had low levels of creativity in learning. The result of the prevailing study was contraindicated with the finding of **Alkhasawneh& Khasawneh, (2024)**.who conduct study about "the effect of using augmented reality technology in developing imaginative thinking among students with learning difficulties" and stated that learning with virtual reality showed higher levels of creativity

Regarding total mean scores and standard deviation with ranking in relation to creativity in learning. The finding of the proceeding study represents that highest ranking of

studied nursing students was related to originality dimension. From investigator's point of view originality means present new innovative ideas and mixed reality encourage this creative originalities by often present open-ended problems or learning scenarios with multiple solutions in virtual learning environment. This encourages divergent thinking, where students explore a wide range of original possibilities rather than settling for a single "correct" answer.

This result was in harmony with the finding of **Chau & Yahaya, (2024)** who conduct study about "the application and value of virtual reality technology in brainstorming from a creativity perspective" and described that virtual environments increased fluency and originality. Participants with high risk-taking propensity, divergent thinking, and mental flexibility performed better in virtual environments

Conversely the result of this study showed that the lowest ranking of studied nursing students was related to knowledge and skills expansion. From investigator's point of view this could be due to the nursing students knew they need various practical experience to expand their skills and practical their theoretical knowledge. But they not familiar that it can be allowed within virtual learning in MR technology.

This result was contraindicated with **Harris& Newcomb, (2024)** who conduct study about "a simulated placement: using a mixed-reality learning environment for social work field education" who conveyed that mixed reality help in develop new skills and knowledge for practice

The finding of the ongoing study revealed that more than one half of nursing students had high levels of academic resilience. This result was supported with the finding of **Devi et al., (2021)** who conduct study about "mediating effect of resilience on association among stress, depression, and anxiety in Indonesian nursing students" who stated that more than three fifth of participants a high level of resilience

Conversely, the finding of the ongoing study revealed that minority of studied nursing students had low academic resilience levels. This result was supported with the finding of **Hamadeh Kerbage et al., (2021)** who conduct study about "undergraduate nursing students' resilience, challenges, and supports during corona virus pandemic" and stated that the nursing students' resilience levels were often poor.

Regarding mean scores and standard deviation with ranking of academic resilience. The result of the existing study indicated that the highest ranking of nursing students

was related to student empathy. From investigator's point of view empathetic students are better at building and maintaining positive relationships with peers, teachers, and mentors. These relationships provide emotional and academic support, which is crucial for resilience. Also, Empathy involves understanding and managing one's own emotions as well as recognizing the emotions of others. This emotional intelligence helps students stay calm and focused during stressful situations, a key aspect of resilience.

This result was consistent with the finding of **Alradaydeh et al., (2024)** who conduct study about "empathy and attitude of university students toward students with disabilities in Jordan" who indicated that the highest score indicated an elevated level of empathy.

On the other hand, the result of the existing study illustrated that the lowest ranking of studied nursing students was related to student self-efficacy. From investigator's point of view students with high self-efficacy believe in their ability to overcome challenges, which motivates them to persist in the face of difficulties. This belief acts as a driving force for resilience.

This result was contraindicated with the finding of **Çelik et al., (2024)** who conduct study about "opinions and self-efficacy of health services associate degree students regarding their education" who revealed that the self-efficacy levels of the students were quite high.

Regarding, correlation between nursing student s' readiness toward using metaverse mixed reality technology and creativity in learning. The result of the preceding study Indicated that there was highly statistical significant (positive) correlation between total nursing students' readiness toward using metaverse mixed reality technology, total creativity in learning. This result was consistent with the finding of **Chang et al., (2023)** who conduct study about "effects of virtual reality on creative design performance and creative experiential learning" and stated that virtual environment has significant positive effects on creativity. Also, this result was supported with the finding of

Regarding, correlation between total nursing students' readiness toward using metaverse mixed reality technology and total academic resilience in learning. The result of the ongoing study indicates that there was highly statistical significant (positive) correlation between total nursing students' readiness toward using metaverse mixed reality technology and total academic resilience in learning. This result was aligned with the finding of **Pusey et al., (2022)** who conduct study about "resilience interventions

using interactive technology: a scoping review" and stated that interactive immersive technology can be used as an effective intervention to increase resilience.

Conclusion

Based on the results of the present study concluded that there were more than one half of studied nursing students had high total readiness level (knowledge and readiness)toward using metaverse mixed reality technology in learning. While, more than one half of studied nursing students had high creativity levels in learning. Moreover, more than one half of studied nursing students had high levels of academic resilience. Additionally, the results indicated that there was highly statistical significant positive correlation between total nursing students' readiness toward using metaverse mixed reality technology and total creativity in learning and there was highly statistical significant positive correlation between total nursing students' readiness toward using metaverse mixed reality technology and total academic resilience in learning.

Recommendations

I. For Faculty Administration

- Preparing orientation seminars on a regular basis to increase academic staff members and student's knowledge about the latest methods of education and teaching and how to incorporate them within the nursing curriculum.
- Making the digital transformation course a prerequisite for joining Nursing colleges so that students can adapt with e-learning.

II. For Nursing Students

- Encourage student's participations within orientation and training programs prepared within the college to expand their knowledge about latest technological learning.
- Motivate students to enhance their basic technical skills to be ready for technological learning through ongoing practice.

III. For further research:

- Finding relationship between using mixed reality technology, academic achievement and total final students grade point average.
- Finding relationship between using of blue light glasses in making head mounted devices and its effect on student's headache and visual problems (which consider the main problem for repeated using HMD in learning).

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