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Evaluation of Nursing Students' Knowledge, Attitudes and Behaviors toward the Metaverse

Hemşirelik Öğrencilerinin Metaverse'e Yönelik Bilgi, Tutum ve Davranışlarının Değerlendirilmesi

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ABSTRACT

Objective: The aim of this study was to evaluate nursing students' knowledge, attitudes and behaviors regarding the Metaverse.
Methods: This cross-sectional study was conducted between 1-23 June, 2023. The sample included 317 nursing students who voluntarily participated in this study and were enrolled at a university in Ankara. Data were collected using an introductory form and the Metaverse Scale. Multiple regression analysis was performed to investigate the significance of the relationship between the Metaverse scale score and various characteristics of the participants.
Results: The mean age of the participants was 21.47±1.48 years. The mean total score on the Metaverse Scale was 54.60±9.56. In this study, 77% of the participants reported that they had no knowledge about the Metaverse. The regression analysis revealed that the variables included in the model explained 21% of the variance in Metaverse knowledge, attitudes and behaviors and was statistically significant (F=21.933, R^2=0.210, *P*=.001). In the model, the variables of age (β=0.180, *P*=.021) and having heard of the concept of the Metaverse (β=0.441, *P*=.001) were significantly related to Metaverse scale score.
Conclusion: The findings indicated that nursing students' knowledge, awareness and attitude scores regarding the Metaverse were at moderate levels. Given that familiarity with the concept of the Metaverse and age positively are related to the Metaverse scale scores, there is a need to provide training to nursing students about the Metaverse knowledge and awareness, especially starting from the first year of their education.
Keywords: Metaverse, nursing students, nurse training, virtual reality

ÖZ

Amaç: Bu çalışmada hemşirelik öğrencilerinin metaverse ile ilgili bilgi, tutum ve davranışlarının değerlendirilmesi amaçlandı.
Yöntemler: Çalışma, 1 – 23 Haziran 2023 tarihleri arasında kesitsel bir çalışma olarak yürütüldü. Örneklem, Ankara'da bir üniversiteye kayıtlı gönüllü 317 hemşirelik öğrencisinden oluştu. Veriler, tanıtıcı bilgi formu ve Metaverse Ölçeği ile toplandı. Katılımcıların Metaverse ölçeği puanı ile bazı özellikleri arasındaki ilişkinin anlamlılığını incelemek için Multiple regresyon analizi yapıldı.
Bulgular: Katılımcıların yaş ortalaması 21,47±1,48'ti. Metaverse Ölçeği toplam puan ortalaması 54,60±9,56 olarak hesaplandı. Çalışmada, katılımcıların %77'si metaverse ile ilgili bilgi sahibi olmadığını bildirdi. Yapılan regresyon analizinde modele alınan değişkenlerin Metaverse bilgi düzeyini %21 oranında açıkladığı ve istatistiksel olarak anlamlı olduğu belirlendi (F=21,933, R^2=0,21, *P*=,001). Modelde yaş (β=0,180, *P*=,021) ile Metaverse'i daha önce duyma (β=0,441, *P*=,001) değişkenlerinin Metaverse Ölçek puanı ile anlamlı ilişkide olduğu saptandı.
Sonuç: Hemşirelik öğrencilerinin Metaverse ile ilgili bilgi, farkındalık ve tutum puanlarının ortalama düzeyde olduğu belirlendi. Daha önceden Metaverse kavramını duyma ve yaş metaverse ölçeği puanları ile pozitif ilişkili olması nedeniyle özellikle birinci sınıftan itibaren hemşirelik öğrencilerinde Metaverse bilgisi ve farkındalığı hakkında eğitimlerin verilmesine gereksinim duyulmaktadır.
Anahtar Kelimeler: Metaverse, hemşirelik eğitimi, hemşirelik öğrencileri, sanal gerçeklik

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INTRODUCTION

The Metaverse is defined by the terms "virtual reality" or "alternative universe."[1,2] Individuals can experience the sensation of being in a different place and time, apart from their physical location and the time, through the various Metaverse applications.[2-4] In other words, the Metaverse encompasses a range of technological applications that offer engaging and immersive virtual experiences, which can appear real to participants as a link to the physical world.[3,5,6] The Metaverse applications, regarded as one of the most promising technologies today, are evaluated in four groups: three-dimensional (3D) technologies, augmented reality, virtual reality, mixed reality.[7,8] The use of different Metaverse applications is increasingly widespread across various fields, including communication, commerce, entertainment, art, architecture, and particularly in healthcare and health education.[2,7,9,10]

In developed countries, students in fields, such as medicine, nursing and midwifery, frequently receive training through the Metaverse applications in various laboratories and skills.[11-14.] This training often emphasizes skill acquisition and interactive feedback by simulating real-world scenarios. Furthermore, training using the Metaverse can facilitate and enhance individual learning according to students' needs and priorities.[10,15,16] In nursing education, the goal is to enhance students' knowledge and skills with Metaverse applications in a safe and controlled environment before applying them to real patients in the clinic and/or field.[7,15-17] Metaverse-based training contributes to patient safety and create opportunities for students to have more interactive, accessible, enjoyable, reproducible, controlled, safe, easy and permanent learning experiences.[4-7,16-19] Moreover, the Metaverse enhances nursing students' self-confidence and coping skills through individualized, interactive and engaging learning experiences[15], as well as effective time management and reducing educational costs.[20]

Studies have reported that the Metaverse practices in nursing education improve students' knowledge, skills, self-confidence, satisfaction and academic performance.[5,15,17] In a randomized controlled trial based on family-centered care based on experiential learning theory, it was reported that the Metaverse simulation program enhanced nursing students' self-efficacy.[6] Ahn[21] reported that Metaverse-based training in vital signs and subcutaneous injection skills significantly improved students' knowledge and clinical competencies. Ryu et al.[22], in a pilot study to develop a Metaverse-based learning system for nursing students, reported that the method created a student-centered educational environment. In a randomized controlled study, Çetinkaya Uslusoy et al.[4] reported that the Metaverse technology increased learning motivation and academic achievement among student nurses.

The use of Metaverse applications in education contributes to the development of 21st-century skills, such as creativity, collaboration, communication, social skills, critical thinking, problem-solving, and digital literacy, by providing students with enhanced learning experiences.[10,15,23] Cho and Kim[6] reported that virtual reality applications significantly improved nursing students' communication skills. Moreover, the Metaverse practices in education support lifelong learning by fostering the development of professional skills in an era where adaptability is crucial for career success.[10]

Nursing is a profession that must closely follow technological advancements to adapt to changing health conditions and continually innovate within health service provision.[24] The literature recommends establishing technical equipment related to the Metaverse and integrating it into the curriculum to use the Metaverse applications among students in health-related fields effectively.[4,18,20] In nursing education and training processes, students are expected to have knowledge and awareness of the Metaverse applications, gain positive attitudes and have the competence to use these applications to enhance their professional knowledge and skills and develop the potential to adapt to constantly evolving healthcare practices.[18,20] Studies conducted in various populations and with different research methods that would be contributed to the adaptation of nursing education to technological developments and the integration of the Metaverse practices into professional education are reported to be needed in the literature.[5,20,25]

AIM

The aim of this study was to evaluate nursing students' knowledge, attitudes and behaviors regarding the Metaverse.

Research questions/hypothesis

Hypotheses of the study were as follows:

- H_o: There is no significant relationship between participants' Metaverse scale scores and participant characteristics
- H_1: There is a significant relationship between participants' Metaverse scale scores and participant characteristics.

METHODS

Study Design

This study was conducted as a cross-sectional study.

Study Settings

This study was conducted between June 1 and June 23, 2023, at the Faculty of Nursing of a state university in Ankara. The faculty where this research was conducted was equipped with a fully functional nursing simulation laboratory. At the time of this study, 42 hours of laboratory practice for professional skills applications were integrated into all mandatory courses at the relevant faculty. At the faculty where the study was conducted, during the 2022–2023 academic year, first-year students received laboratory practice in Nursing Fundamentals for a total of 70 hours, conducted 5 hours per week. Second-year students attended laboratory practice courses in Internal Medicine Nursing, Surgical Nursing, and Obstetrics and Gynecology Nursing for a total of 42 hours, conducted 3 hours per week. Third-year students participated in laboratory practice courses in Public Health Nursing and Psychiatric Nursing for a total of 42 hours, also conducted 3 hours per week. At the faculty where the study was conducted, first-, second-, and third-year students receive laboratory practice prior to clinical or field practice. In the fourth year, students participate in the internship program in clinical or field practice for two semesters.[26]

The Faculty Clinical Simulation Education Laboratory is a state-of-the-art training facility equipped with high- and low-fidelity simulators (JUNO Clinical Skills Patient Simulator), virtual patients (Body Interact), game-based simulators, realistic hospital equipment, and other models, enabling students to gain life-like experiences in a controlled environment. In laboratory practice, various instructional methods such as scenario-based simulations, standardized patients, case analyses, group work, role play, and demonstration techniques are employed to help students acquire relevant nursing skills. Virtual reality applications are utilized to facilitate the acquisition of fundamental nursing skills, including intravenous catheter insertion, parenteral medication administration, basic life support, and patient care. Once a selected scenario begins on the simulators, students can engage in patient interaction, conduct patient observation, perform physical examinations, and deliver nursing care in a simulated clinical environment.[27]

Study Sample

The study population comprised 758 undergraduate students enrolled in the Faculty of Nursing of a university for the 2022-2023 academic year (Freshman: 24.1% [n=183]; Sophomore: 21.8% [n=165]; Junior: 25.5% [n=193]; Senior: 28.6% [n=217]). The sample size was calculated as 256 participants with a 5% margin of error at 95% confidence interval.[28] The sample size was set to at least 281 with 10% reserve participants, considering possible data loss. Stratified sampling was employed, with each class serving as a stratum in this study. According to the weights of the class sizes, the number of students that should be in each stratum was calculated. The number of students selected from each stratum was: 68 from the freshman class, 61 from the sophomore class, 72 from the junior class, and 80 from the senior class randomly. The inclusion criteria were determined as actively continuing education at the faculty where this study was conducted and completing the questionnaire form. The present study was completed with 317 participants who met the inclusion criteria and volunteered to participate in this study.

Data Collection Tools

A data collection form developed by the researchers, based on the literature, was used in this study.[5,29,30] The data collection form consisted of two main sections as follows: the "Introductory Information Form" and the "Metaverse Scale."

Introductory Information Form: The first section included a form with 16 questions designed to capture participants' sociodemographic characteristics (5 questions) and their knowledge, attitudes, and behaviors regarding the Metaverse (11 questions). One of the questions was used to measure the participants' self-assessment of the knowledge of Metaverse using the Visual Analog Scale (VAS).

Metaverse Scale: The scale is a valid and reliable 5-point Likert-type instrument consisting of 15 items across four subscales developed by Suleymanogulları et al.[8] in 2022. The scale item scores are ranged from "Strongly disagree=1" to "Strongly agree=5." The Technology subscale includes items 1, 2, 3, 4, 5, 10, and 13; the Digitalization subscale includes items 9, 11, and 12; the Social subscale includes items 14 and 15; and the Lifestyle subscale includes items 6, 7, and 8. The minimum possible score is 15 and the maximum score is 75, with higher scores indicating greater knowledge, attitude, and awareness about the Metaverse. The Cronbach's α value for the scale is 0.81 in the original study. In this study, the Cronbach's α value for the scale was calculated as 0.92.

Data Collection

Data collection was carried out after obtaining the necessary institutional permissions. To maximize participation, data was collected during class hours with high student attendance, scheduled around compulsory courses. First, the purpose and procedure of the study were explained to the students, and all were invited to participate. Students who did not wish to take part were

given time to leave the classroom in five minutes. Written informed consent was obtained from those who voluntarily agreed to participate. Subsequently, a link to the Data Collection Form was shared via the students' WhatsApp groups, and participants were asked to complete the form electronically in real time. Students accessed the form, which was created through Google Forms, and completed it under the supervision of the researcher in a quiet classroom environment. The data collection process took approximately 15 minutes.

Ethical Consideration

Approval for the application of the present study was first obtained from the Dean's Office of the Faculty, where this study would be conducted. Ethical approval was obtained from University of Health Sciences Turkey, Gulhane Scientific Research Ethics Committee (Date:16.05.2023/No: 2023-157). The participants who volunteered to participate in this study signed a "Consent Form." Permission for the Metaverse scale used in the present study was obtained from the corresponding author using e-mail.

Data Analysis

The data obtained in the study were presented as frequencies and percentage for categorical variables, and as mean±standard deviation, minimum (Min.) and maximum (Max.) values for variables determined by measurement. The normality of the sample distribution was assessed using the Kolmogorov-Smirnov test, histogram plots, and measures of kurtosis and skewness. The Mann–Whitney U test was used for pairwise comparisons. Multiple regression analysis was performed to explore the significance of the relationship between the Metaverse scale scores and certain participant characteristics. Statistical analyses were conducted using SPSS (IBM SPSS Corp., Armonk, NY, USA) version 25.0, with a significance level set at $P<.05$.

RESULTS

The mean age of the participants was 21.47±1.48 years, ranging from 17 to 24 years. Among the participants, 89.9% were female, and 58.0% reported that their income was equivalent to their expenses. In the study, 99.7% of the participants identified the mobile phone as the most frequently used technological device for educational, communication, and socialization purposes in daily life. While 63.1% of the participants had heard of the Metaverse concept, 77.0% lacked detailed knowledge. Of those familiar with the Metaverse (23.0%), 52.7% used the internet as their primary source of information. During

Table 1. The Characteristics of participants (n=317)

Characteristics	n	%
Gender		
Female	285	89.9
Male	32	10.1
Grade		
Freshman	79	24.9
Sophomore	68	21.5
Junior	88	27.8
Senior	82	25.9
Income status		
Income less than expenses	85	26.8
Income equals expense	184	58.0
Income more than expenses	48	15.1
Technological devices that are frequently used for education, communication and socialization in daily life*		
Mobile Phone	316	99.7
Computer	257	81.1
Television	136	42.9
Game console	13	4.1
To have heard of the Metaverse concept		
Yes	200	63.1
No	117	36.9
To have knowledge about the Metaverse concept		
Yes, I have knowledge	73	23.0
I don't have knowledge	244	77.0
Source of knowledge the Metaverse concept (n=73)*		
Internet	70	95.9
Instructor	11	3.5
Literature	10	3.2
Conference/congress	7	2.2
Thesis	2	0.6
To engage in the any Metaverse-related activity during the undergraduate education		
Yes	9	2.8
No	308	97.2
To participate in the any Metaverse-specific training during the undergraduate education		
No participate	302	95.3
Face-to-face undergraduate education	7	2.2
Online undergraduate education	3	0.9
Congress/symposium	5	1.6
To believe that the Metaverse could benefit for undergraduate education		
Yes	104	32.8
No	204	64.4
No idea	9	2.8
The type of Metaverse education participating in		
No participate	302	95.3
Virtual reality	10	3.2
Augmented reality	4	1.2
Mixed reality	1	0.3
Self-assessment of knowledge about the Metaverse	**Mean±SD**	**Min.-Max.**
VAS score	2.75±1.99	1-10

*n is folded, SD, Standard deviation; Min., Minimum value; Max., Maximum value; VAS, Visual Analog Scale.

undergraduate education, 97.2% of the participants reported that they did not engage in any Metaverse-related activities and 95.3% did not participate in any Metaverse-specific training sessions. In this study, 64.4% of the participants believed the Metaverse would not benefit their undergraduate education. Participants' mean self-assessment score of their knowledge about the Metaverse was 2.75±1.99 on the VAS, ranging from 1 to 10 (Table 1).

The mean total score of the Metaverse Scale was 54.60±9.56. The mean scores for the subscales were as follows: Technology subscale, 25.97±4.80; Digitalization subscale, 10.18±2.57; Social subscale, 6.87±1.97; and Lifestyle subscale, 11.58±2.47. The Cronbach's α for the total scale was 0.92, with the subscale reliabilities being 0.89, 0.81, 0.83, and 0.92, respectively (Table 2). No statistically significant differences were detected in the total and subscale scores based on participants' gender, including Technology (Z=0.066; *P*=.94), Digitalization (Z=0.305; *P*=.76), Social (Z=0.759; *P*=.44), Lifestyle (Z=0.384; *P*=.70), and Total Scale (Z=0.263; *P* =.79) scores.

To predict the mean total scores of the Metaverse Scale, a multiple linear regression analysis was performed using age, grade, income status, and having heard of the Metaverse concept as the independent variables. The analysis revealed a statistically significant regression model (F=21.933, *P*=.001) with the independent variables accounting for 21% of the variance (R2=0.21) in the Metaverse Scale scores. Among the variables included in the model, age (β=0.180, P=.021) and having heard of the Metaverse concept (β=0.441, *P*=.001) were identified as significant predictors of the participants' mean total score on the Metaverse scale (Table 3).

Table 2. The Metaverse total Scale and Subscale Characteristics (n=317)

Metaverse Scale	Item No	Range of Score	Mean±SD	Min.-Max.	Cronbach α
Technology	1-5, 10, 13	7-35	25.97±4.80	16-35	0.89
Digitalization	9, 11, 12	3-15	10.18±2.57	3-15	0.81
Social	14, 15	2-10	6.87±1.97	2-10	0.83
Lifestyle	6-8	3-15	11.58±2.47	6-15	0.92
Total	1-15	15-75	54.60±9.56	34-75	0.92

SD, Standard deviation; Min., Minimum value; Max., Maximum value

Table 3. The Relationship between some Characteristics of the Participants and the Metaverse Scale Scores (n=317)

Variables	β_0	SE of β	β_1	t	*P*	95% CI of β		VIF	F	*P*	Model		
						Lower	Upper				R	R^2	Durbin-Watson
Constant	25.527	9.572	-	2.667	**.008**	6.693	44.362	-					
Age	1.153	0.497	0.180	2.317	**.021**	0.174	2.132	2.400					
Grade	-0.436	0.665	-0.051	-0.655	.513	-1.743	0.872	2.449					
Income Status	-0.081	0.750	-0.005	-0.107	.915	-1.557	1.396	1.002	21.933	**.001**	0.468	0.21	1.931
Previously heard of the Metaverse	8.717	1.006	0.441	8.666	**.001**	6.738	10.697	1.033					

β_0: Unstandardized regression coefficient; SE of β: Standard error of beta; β_1: Standardized regression coefficient; t: t test in independent groups Cl of β: Confidence Interval for beta; VIF: Variance inflation factor Coefficient; F: Simple Linear Regression Measurement Value; R: Coefficient of determination; R^2: Adjusted R square; *P*<.05.

DISCUSSION

Metaverse applications are attracting increasing attention in nursing education worldwide due to their innovative learning opportunities and educational contributions, and they are attaining a significant position within educational processes.[5,31] Although there is a growing interest in incorporating Metaverse applications into nursing education in our country, the laboratory infrastructure required for such practices has not yet been established at the desired level.[20] The Metaverse is reported to be a tool with the potential to enhance learning outcomes in nursing education by supporting multidimensional learning.[5] Ergin et al.[32] reported in a study conducted with nurses, 77.8% had heard of the Metaverse concept and 71.4% had knowledge about the Metaverse.

In contrast, this study examining nursing students' knowledge, attitudes and behaviors regarding the Metaverse found that although six out of ten participants (63.1%) had heard of the Metaverse concept, over a quarter (77.0%) reported having no knowledge about the concept. Furthermore, participants' self-assessment scores of their Metaverse knowledge were notably low. Similar to the present study, in the research conducted by Sezer and Gul with 289 students from a faculty of health sciences, 70.6% of the participants reported having heard of the Metaverse concept, whereas 88.9% stated that their knowledge of the Metaverse was insufficient.[33]

Çetinkaya Uslusoy et al.[4] reported in their study that nursing education in the Metaverse environment improved academic achievement and learning motivation among students. However, in this study, the majority of participants (95.3%) reported not having received any Metaverse training during their nursing education, and more than half (64.4%) believed that the Metaverse would not benefit their undergraduate education. In the nursing faculty where this study was conducted, all students engage in skills training using 3D and augmented reality-supported high-fidelity simulators and virtual patients, effectively integrating Metaverse applications into their nursing education process. Despite this, it appears that most participants do not associate their skills training with the Metaverse concept and their awareness remains inadequate. The findings from this study suggest that while Metaverse technologies are integrated into nursing education through advanced simulations and virtual patients, there is a noticeable gap in students' understanding and recognition of the Metaverse concept. Despite the widespread use of Metaverse applications in practical training, students appear to lack awareness of how these tools fit within the broader Metaverse framework. This lack of awareness could be attributed to a disconnect between the technological applications used in training and the conceptual understanding of the Metaverse. The results are in contrast with those reported by Ergin et al.[32] where nurses demonstrated a higher level of awareness and knowledge about the Metaverse. This disparity might be because knowledge of the Metaverse often becomes more pronounced in professional practice environments rather than educational settings. Nurses, having been exposed to the concept through professional development or work-related applications, might have a more nuanced understanding than students who encounter these technologies primarily as part of their educational curriculum. Therefore, it is recommended that nursing educators enhance awareness of Metaverse-supported training among students to support their professional development.

Increasing scores on the Metaverse Scale and its subscales indicate higher levels of knowledge, attitudes, and awareness among participants regarding the Metaverse.[8] In the present study, the total and subscale scores of the Metaverse Scale for participants were at moderate levels, consistent with findings reported in the literature.[33-38] Eventually, it was considered that the participants generally had a moderate level of the Metaverse knowledge, attitude and awareness. However, they were not sufficient in describing the role and importance of the Metaverse practices in nursing education. To address this gap, it is recommended that targeted training be provided to enhance students' knowledge, attitudes, and awareness of the Metaverse, particularly in both general and professional contexts. Such educational interventions would help students keep pace with modern developments and better integrate the Metaverse technologies into their future practice.

Previous studies on the Metaverse indicated that sociodemographic characteristics significantly influence participants' levels of knowledge, attitudes, and awareness regarding the Metaverse.[29,30] In the literature, characteristics, such as age, gender, marital status, class, and income status were reported as sociodemographic factors about the Metaverse.[29,30] In the present study, however, only the age factor was found to have a significant relationship with Metaverse scores among the sociodemographic characteristics analyzed. This finding suggests that age may play a more prominent role in shaping individuals' knowledge and attitudes towards the Metaverse. It is noted that this study's regression model could be limited by the inclusion of sociodemographic variables with normal distribution characteristics, which might have influenced the outcomes.

However, in the studies conducted by Ergin et al.[32] with nurses, Avcı Isık and Karçıga Ustunaki with students of the faculty of health sciences,[38] Savaş et al.[30] reported that hearing the concept of Metaverse influenced knowledge, attitude and awareness of the Metaverse. Similar to the literature, in this study, hearing about the Metaverse concept was evaluated as a factor about Metaverse knowledge, attitude and awareness. Given these insights, it is recommended to expand educational efforts related to the Metaverse. Implementing targeted knowledge, attitude, and awareness training from the first year of nursing education could be particularly beneficial. By integrating Metaverse-related content early in the curriculum, nursing students can develop a more comprehensive understanding of the technology, which may enhance their ability to utilize Metaverse tools in their professional practice effectively. This proactive approach can ensure that students are well-prepared to adapt to and leverage emerging technologies in their future careers.

Limitations

This study was conducted at a single university, which limits the generalizability of the results to other populations. To enhance the external validity of the results, future research should involve larger, more diverse samples and be conducted in various educational and geographical settings. Additionally, a natural limitation of the regression model used in this study is the inclusion of

sociodemographic variables with normal distribution characteristics.

In this study, it was evaluated that although students often utilize the Metaverse applications during their professional education process, they are not sufficiently qualified at the level of knowledge, attitude, awareness and behavior about the concept of the Metaverse. It is assessed that students also need common training about the Metaverse to link their practices during their education with the Metaverse and to support their own individual improvement. It is suggested that further studies focus on the effect of training on the Metaverse on participants' knowledge, attitudes, awareness and behaviors. Future studies may benefit from exploring a broader range of sociodemographic variables and considering different analytical approaches to address this limitation.

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REFERENCES

1. Argan M, Tokay Argan MT, Dinç H. Take me to other universes! Metaverse event experience of users. *Journal of Internet Applications and Management*. 2022;13(1):33-53. https://doi.org/10.34231/iuyd.1123136
2. Yılmaz F, Mete AH, Türkön BF, et al. Metaverse ecosystem and technologies in the future of healthcare: Applications, opportunities, and challenges. *EHTA*. 2022;6(1):12-34. https://doi.org/10.52148/ehta.1082705
3. Hwang GJ, Chien SY. Definition, roles, and potential research issues of the metaverse in education: An artificial intelligence perspective. *Comput Educ: Arti. Intell.* 2022;3:100082. https://doi.org/10.1016/j.compedu.2023.104868.
4. Çetinkaya Uslusoy E, Aydinli A, Durna F. Enhancing learning motivation and academic achievement in nursing students through metaverse-based learning: A randomized controlled study. *Jpn J Nurs Sci*. 2024;21(3):e12594. https://doi.org/10.1111/jjns.12594
5. De Gagne JC, Randall PS, Rushton S, et al. The use of metaverse in nursing education: An umbrella review. *Nurse Educ.* 2023;48(3):E73-E78. https://doi.org/10.1097/NNE.0000000000001327
6. Cho MK, Kim MY. The effect of virtual reality simulation on nursing students' communication skills: A systematic review and meta-analysis. *Front Psychiatry*. 2024;15:1351123. https://doi.org/10.3389/fpsyt.2024.1351123
7. Güler O, Savaş S. All aspects of metaverse studies, technologies and future. *GJES.* 2022;8(2):292-319. https://doi.org/10.30855/gmbd.0705011
8. Suleymanogulları M, Ozdemir A, Bayraktar G, et al. Metaverse scale: Study of validity and reliability. *ASR.* 2022;3(1):47-58. http://dx.doi.org/10.29228/anatoliasr.25
9. Damar M. What the literature on medicine. nursing. public health midwifery and dentistry reveals: An overview of the rapidly approaching metaverse. *JMV*. 2022;2(2):62-70. https://doi.org/10.57019/jmv.1132962
10. Nahi AA, Ghaib AA, Ali AAAA. Metaverse applications and its use in education. In International Multidisciplinary Conference, Integrated Sciences and Technologies. 2023:61-80. https://doi.org/10.1007/978-3-031-51716-7_5
11. Petrigna L, Musumeci G. The Metaverse: A new challenge for the healthcare system: A scoping review. *J Funct Morphol Kinesiol*. 2022;7(3):63. https://doi.org/10.3390/jfmk7030063
12. Söyler S, Averbek GS. Health technologies and metaverse: Potential implications and current obstacles. *Int Anatol Acad Online J.* 2022;8(2):118-146. https://dergipark.org.tr/tr/download/article-file/2527516
13. Wang G, Badal A, Jia X, et al. Development of metaverse for intelligent healthcare. *Nat Mach Intell.* 2022;4(11):922-929. https://doi.org/10.1038/s42256-022-00549-6
14. Zhang X, Chen Y, Hu L, et al. The metaverse in education: Definition, framework, features, potential applications, challenges. and future research topics. *Front Psychol.* 2022;13:1016300. https://doi.org/10.3389/fpsyg.2022.1016300
15. Sharma M, Sharma S. A holistic approach to remote patient monitoring, fueled by ChatGPT and Metaverse technology: The future of nursing education. *Nurse Educ. Today*. 2023;131:105972. https://doi.org/10.1016/j.nedt.2023.105972

16. Suh I, McKinney T, Siu KC. Current perspective of metaverse application in medical education. Research and Patient Care. *Virtual Worlds.* 2023;2(2):115-128. https://doi.org/10.3390/virtualworlds2020007
17. Jeon H, Shin H, Woo J. User experience and interface assessment for metaverse platforms on nurses and nursing students: A cross-sectional study. *Nurse Educ Today.* 2024;139:106222. https://doi.org/10.1016/j.nedt.2024.106222
18. Sarıkoç G. Use of virtual reality in the education of health care workers. *HEAD*. 2016;13(1):11-15. https://doi.org/10.5222/HEAD.2016.243
19. Zhao J, Lu Y, Zhou F, et al. Systematic bibliometric analysis of research hotspots and trends on the application of virtual reality in nursing. *Front Public Health.* 2022;10:906715. https://doi.org/10.3389/fpubh.2022.906715
20. Yurttaş A, Kabak T. Metaverse and nursing education. *JGEHES*. 2023;5(3):442-451. https://doi.org/10.51123/jgehes.2023.105
21. Ahn MK. The development and effects of metaverse-based core nursing skill contents of vital signs measurements and subcutaneous injections for nursing students. *J Korean Acad Soc Nurs Educ.* 2022;28(4):378-388. https://doi.org/10.5977/jkasne.2022.28.4.378
22. Ryu H, Lee H, Yoo HJ. Development of a metaverse online learning system for undergraduate nursing students: a pilot study. *Nurse Educ.* 2024;49(2):E74-E79. https://doi.org/10.1097/NNE.0000000000001509
23. Papanastasiou G, Drigas A, Skianis C, et al. Virtual and augmented reality effects on K-12, higher and tertiary education students' twenty-first century skills. *Virtual Real.* 2019;23:425-436. https://doi.org/10.1007/s10055-018-0363-2
24. Şenyuva E. Reflections on nursing education of technological developments. *FNJN.* 2019;27(1):79-90. https://doi.org/10.26650/FNJN322556
25. Chang CY, Sung HY, Guo JL, Chang, B. Y., Kuo, F. R. Effects of spherical video-based virtual reality on nursing students' learning performance in childbirth education training. *Interact Learn Environ.* 2019;30(3):400-416. https://doi.org/10.1080/10494820.2019.1661854
26. University of Health Sciences, Gulhane Faculty of Nursing, 2022-2023 Education Programme. https://ghf.sbu.edu.tr/egitim/hemsirelik-programi/egitim-programi-arsivi Access date: 20 April 2023.
27. University of Health Sciences, Gulhane Faculty of Nursing, The Clinical Simulation Education Laboratory. https://ghf.sbu.edu.tr/egitim/simulasyon-egitimi/klinik-simulasyon-egitim-laboratuvari Access date: 25 April 2023.
28. Raosoft sample size programme. http://www.raosoft.com/samplesize.html Access date: 18 April 2023.
29. Çakır Z, Gönen M, Ceyhan MA. Investigation of metaverse awareness of students of faculty sports sciences. *BESBD*. 2022;17(2):406-418. https://doi.org/10.33459/cbubesbd.1179009
30. Savaş BÇ, Karababa B, Turan M. Metaverse knowledge level: An investigation on physical education and sport teacher candidates. *Int J Sport Psychol.* 2022;4(1):18-29. https://doi.org/10.51538/intjourexerpsyc.1140511
31. Rasoli SE, Alavi SMH, Akhoondian MJ. Effect of the metaverse on the design and implementation of nursing curricula: A narrative review. *J Nurs Rep Clin Pract*. 2025;4(1):38-48. https://doi.org/10.32598/JNRCP.2503.1252
32. Ergin E, Yalcinkaya T, Cinar Yucel S. Nurses' knowledge of, attitudes towards and awareness of the metaverse, and their future time perspectives: A cross-sectional study. *BMC Nurs.* 2024;23(1):414. https://doi.org/10.1186/s12912-024-02048-y
33. Sezer H, Gül A. Health sciences students' perspectives on metaverse and digital technology use: Cross-sectional descriptive study. *BMC Nurs.* 2024;23:656. https://doi.org/10.1186/s12912-024-02309-w
34. Coşkun AB, Elmaoğlu E. Examining the impact of adolescents' metaverse perception on E-health literacy and perceptions of healthy living. *Arch Phys Glob Res.* 2023;26(2):11-16. https://doi.org/10.5604/01.3001.0054.3961
35. Yaman Z, Elmaz Z. The relationship of university students' attitudes and awareness towards metaverse with postmodern consumption understanding and digital literacy. *KSU J Soc Sci.* 2023;20(3):854-863. https://doi.org/10.33437/ksusbd.1358356
36. Görkem Z, Başarmak U. Examining the knowledge, attitudes, and awareness of teacher candidates towards the metaverse: A case study of Kırşehir province. *KUJINAS*. 2024;2(1):19-31. https://dergipark.org.tr/tr/pub/kujinas/issue/86045/1503371
37. Neşe A, İlter SM, Bakır E. Investigation of nursing students' knowledge and attitudes regarding the metaverse. *Göbeklitepe International Journal of Medical Science*, 2024;7(17):13-23. https://doi.org/10.5281/zenodo.13987843
38. Avcı Işık S, Karçığa Üstünakı İN. Investigation of metaverse knowledge attitude and awareness levels of students studying in the faculty of health sciences of a university according to variables. *Acıbadem Univ. Sağlık Bilim. Derg.* 2024;15(3):305-316. https://doi.org/10.31067/acusaglik.1417551