

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_611_22

Design, implementation, and validation of an application for childbirth preparation classes to improve the performance of midwifery students: Study protocol

Zahra Kiani¹, Mobina Moghasemi², Forouzan Elyasi³, Marjan Ahmadi Shirvani⁴, Zeinab Hamzehgardeshi⁴, Tahereh Tayebi⁵, Narges Sadat Motahari Tabari⁶, Hamidreza Azarfar⁷, Mahmood Moosazadeh⁸, Soghra Khani⁹

¹Midwifery and Reproductive Health Research Center, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran, ²Student Research Committee, School of Nursing and Midwifery, Mazandaran University of Medical Sciences, Sari, Iran, ³Psychiatry and Behavioral Sciences Research Center, Sexual and Reproductive Health Research Center, Addiction Institute, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran, ⁴Sexual and Reproductive Health Research Center, Mazandaran University of Medical Sciences, Sari, Iran, ⁵Department of Midwifery, School of Nursing and Midwifery, Mazandaran University of Medical Science, Sari, Iran, ⁶Department of Midwifery, School of Nursing & Midwifery, Mazandaran University of Medical Sciences, Sari, Iran, ⁷Information Technology Department, Vice-Chancellor in Research Affairs, Mazandaran University of Medical Sciences, Sari, Iran, ⁸Gastrointestinal Cancer Research Center, Non-Communicable Diseases Institute, Mazandaran University of Medical Sciences, Sari, Iran, ⁹Sexual and Reproductive Health Research Center, Diabetes Research Center, Mazandaran University of Medical Sciences, Sari, Iran

Address for correspondence:

Dr. Soghra Khani,
Sexual and Reproductive Health Research Center,
Diabetes Research Center,
Mazandaran University of Medical Sciences, Sari, Iran.
E-mail: khanisog343@gmail.com

Received: 29-04-2022
Accepted: 30-07-2022
Published: 28-04-2023

Abstract:

BACKGROUND: Childbirth preparation classes are incredibly useful for midwifery students as future medical personnel. Nowadays, given the outbreak of Covid-19 pandemic and as mobile applications are extensively welcomed, virtual space can be used for education in the area of childbirth preparation classes. Given the lack of an application for childbirth preparation classes, this study will be conducted to design, implement and validate such an application to improve the performance of midwifery students in the areas of pregnancy and safe delivery.

MATERIALS AND METHODS: The present study will be conducted in three phases. In the first phase, content will be provided to Information Technology experts based on the content of the national guidelines for physiological delivery in Iran, and the application will be designed and validated for the use of midwifery students, then develop app for other medical students, midwives and physicians. In the second phase, the assessment will be based on Kirkpatrick's model. In the third stage, develop app for other medical students, midwives and physicians based on the results of the first and second phase. SPSS version 17 will be used in this phase for analysis of data through descriptive and analytical tests.

CONCLUSION: Owing to the expansion of virtual space and the outbreak of Covid-19 pandemic, design, validation, and evaluation of an application for childbirth preparation classes is an exceptionally significant necessity which contributes to the process of educating midwifery students.

Keywords:

Midwifery, software design, software validation, students

Introduction

One of the main objectives of medical universities is to train capable medical students as medical personnel. Given the practice-based nature of midwifery, various skills should be developed in these students.^[1] Theorists of education believe that traditional education classes have lost their effectiveness compared to the past

and, because of depending on a specific place and time, they no longer can provide a real and appropriate context for learning. Virtual space has recently been considered in various settings for educational, sports, industry, entertainment, arts, and health purposes.^[2] It also is used in the area of healthcare for pain reduction,^[3] treatment,^[2,4] surgery,^[5] medical education,^[6] and so forth. In addition, educational applications

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Kiani Z, Moghasemi M, Elyasi F, Shirvani MA, Hamzehgardeshi Z, Tayebi T, *et al.* Design, implementation, and validation of an application for childbirth preparation classes to improve the performance of midwifery students: Study protocol. *J Edu Health Promot* 2023;12:137.

provide rich resources which can be an opportunity for the growth of learners and is considered a collaborative environment where learners and instructors can search and explore a variety of issues.^[7]

Based on sustainable development goals, virtual education is a way of empowering people in society. Virtual education now encompasses various educational settings and is the basis of success in 21st-century education. Virtual education is a driving force for development and innovation in developed and developing countries and is considered as the mainstream of upheaval in the area of higher education.^[8] It can be used in many areas such as presentation, content sharing, communication between students and instructors, creation and presentation of lectures, academic research, administrative support, and student registration.^[9]

In the Fifth Development Plan and in the section of general population policies, special emphasis has been placed on ensuring the reproductive health of society where the role of midwifery students is undoubtedly important. The most important missions of medical universities include student education and social accountability based on national policies, especially in the area of health and treatment. One of the ongoing programs in Iran's Health Transformation Plan is to encourage vaginal delivery by implementing childbirth preparation education programs. Based on this program, pregnant women receive education in the areas of childbirth and pregnancy care, nutrition and exercise during pregnancy and postnatal period, correct way of breastfeeding and postpartum care.^[10] Given the fact that most of the trainings to pregnant women are provided by midwives, the education of midwifery students in these areas is crucially important during their studies.^[11] Thus, they have a key role in transmitting information to pregnant women and their correct education can lead to the success of this program. Moreover, childbirth preparation classes during the study period will provide students with a positive attitude, thereby leading to their correct performance; this can eventually lead to the training of educated medical staff that ensure the health of mother and baby.^[12,13]

In addition, education in the area of vaginal delivery and overcoming the fear caused by it has a long history. Dick-read, a British gynecologist was a pioneer in this regard and believed that excessive pain during the process of vaginal delivery is caused by fear. He also opines that this fear can be mitigated by providing practical training and raising one's awareness. With an emphasis on providing information to women to reduce their pain, Read's method became the basis for childbirth preparation classes in the 1940s.^[14,15]

The outbreak of Covid-19 has negatively affected childbirth preparation classes, that is, because of the threats of Covid-19, pregnant women are less willing to participate in these in-person classes. It has similarly affected the proper education of midwifery students.^[16,17] Given the recent widespread interest of people in virtual space and the spread of smartphones in societies, the use of mobile applications for specific purposes has received much attention, as virtual space can be used for the design of an application for childbirth preparation classes. Various studies have shown that the use of educational videos in virtual space has been more effective than traditional education in improving the knowledge of students.^[18-20] For example, Phillips *et al.*^[21] conducted a study entitled "the virtual maternity clinic" for midwifery students. Based on their results, this application had a significant role in improving the performance of students and led to their satisfaction. Chang *et al.*^[22] investigated the effect of video-based virtual reality on nursing students' learning performance in childbirth education training and found that the effect of virtual education on students' performance was greater than traditional education. Designing a prenatal care application, Carrilho *et al.*^[23] indicated that this application led to the satisfaction of the users and increased their ability in performing their duties. Similar results were obtained in another study which had designed a mobile application for postnatal urinary incontinence prevention.^[24] According to other studies, the use of educational videos and virtual space complement traditional education.^[25] There are similar findings in Iran as well. Rahimi *et al.*^[26] designed a preeclampsia management application which improved the management of preeclampsia and led to more satisfaction in midwives. Khatooni *et al.*^[27] also showed that the use of application could effectively improve the practical skills of medical students and promote their performance. According to the foreign and domestic literature of the research, no application has been hitherto designed with regard to childbirth preparation classes for midwives and midwifery students. Despite the significance of such an application in the education of midwives and midwifery students, the lack of it is felt in the Iranian Midwifery Curriculum. This study aims to design this application for the first time in Iran. Moreover, to reduce anxiety in pregnant women, some programs have often been designed and implemented through e-learning whose results have been positive. However, these programs are not systematic and deal with anxiety reduction programs in few separate sessions without prior planning.^[28] In addition, such programs are usually deprived of evidence-based information, counseling, and facilitating practical skills. Given the existence of a written program for childbirth preparation classes in Iran, virtual space can be used to design an application for improving the knowledge

of midwifery students as the future medical staff. According to the knowledge of the research team and searching in valid scientific information sources, no study was found in the field of designing and validating an application for childbirth preparation classes to improve the performance of midwifery students. As such, the aim of this study is to design and validate an application for childbirth preparation classes to improve the performance of midwifery students. Through increasing the abilities of the midwifery students, the results of the study will hopefully lead to the promotion of health indicators in society. The main purpose is to study design, implementation, and validation of an application for childbirth preparation classes to improve the performance of midwifery students.

Materials and Methods

Study design

The present study will be conducted in three phases (1) design and validation of the app for childbirth preparation classes to improve the performance of midwifery students; (2) student evaluation for midwifery students in quasi-experimental study; and (3) develop app for other medical students, midwives, and physicians.

Study settings

The sampling will be performed by the researcher in the nursing and midwifery school of the Mazandaran University of Medical Sciences in Sari after obtaining the approval of the ethics committee of the National Strategic Center for Medical Education and submitting a written letter of introduction to Mazandaran University of Medical Sciences in the 2022 year.

Study population

The study population included midwife students, midwives, and physicians.

Setting up the collaborative model (the intervention)

First, an initial call will be done in the relevant faculty to inform those who are interested in participation that includes an e-mail address for the registration of the initial information. Then, the eligible individuals will be divided into two groups of control and intervention based on the inclusion criteria and using a random method. NCSS and PASS 11 software will be used for random allocation of the participants into the groups. The objectives of the research will be explained to the participants and they will be assured about the confidentiality of the information. Next, in the intervention process, the subjects will be divided into the intervention (using a mobile-based application) and control groups, and it will be attempted that no contact

happen between the subjects of the two groups. The intervention group will receive the researcher-made application, and the control group will install a placebo application unrelated to the purpose of the study, downloaded from the Play Store on the Android platform. The researcher will install the application in person on the smartphone of the subjects of both groups, and if the samples are not accessible, WhatsApp or Instagram messengers will be used to send the application. The researcher will have a special contact number for this research so that she can help the subjects in case of any problem. During the intervention process, there will be a "Contact Us" section in the application so that the subject will be able to contact the researcher if necessary and ask possible questions. After receiving the latest training, the application will be automatically disabled. The evaluation steps before the intervention, immediately after the intervention and follow-ups will be sent to the subjects of the both groups via an electronic link in the application. An identical gift will be provided for the subjects of both groups for participating in the study, which will be given to them after the follow-up stage. The procedure is summarized in Figure 1.

Phase 1

Based on the content of the national guidelines for physiological childbirth and the best evidence available in the summaries and national and international guidelines, information will be provided to information technology experts and the application will be designed for midwifery students in the following five steps:

(1) Conceptual modeling: The content of the application will be defined and how to use it will be presented to the audience; (2) Design of the application: the list, images, and access structures will be determined; (3) Design of the connection lines; (4) Implementation: using a smart software, all contents of the previous steps will be translated into computational language (24); and (5) After the design, the validity of the content compiled in the application, will be reviewed qualitatively in a panel of experts including gynecologists, reproductive and sexual health, midwives, midwifery counselor, medical education specialist, psychologist, psychiatrist, physiotherapist, and software engineer.

Data analysis of the first part: Given the fact that the content of the application is validated qualitatively by the panel of experts, statistical software will not be used at this stage.

Phase 2

Learning and the effect of education will be evaluated in a quasi-experimental manner by using Kirkpatrick evaluation model [Figure 2] to examine the reaction, learning, behavior, and results^[29] of midwifery students

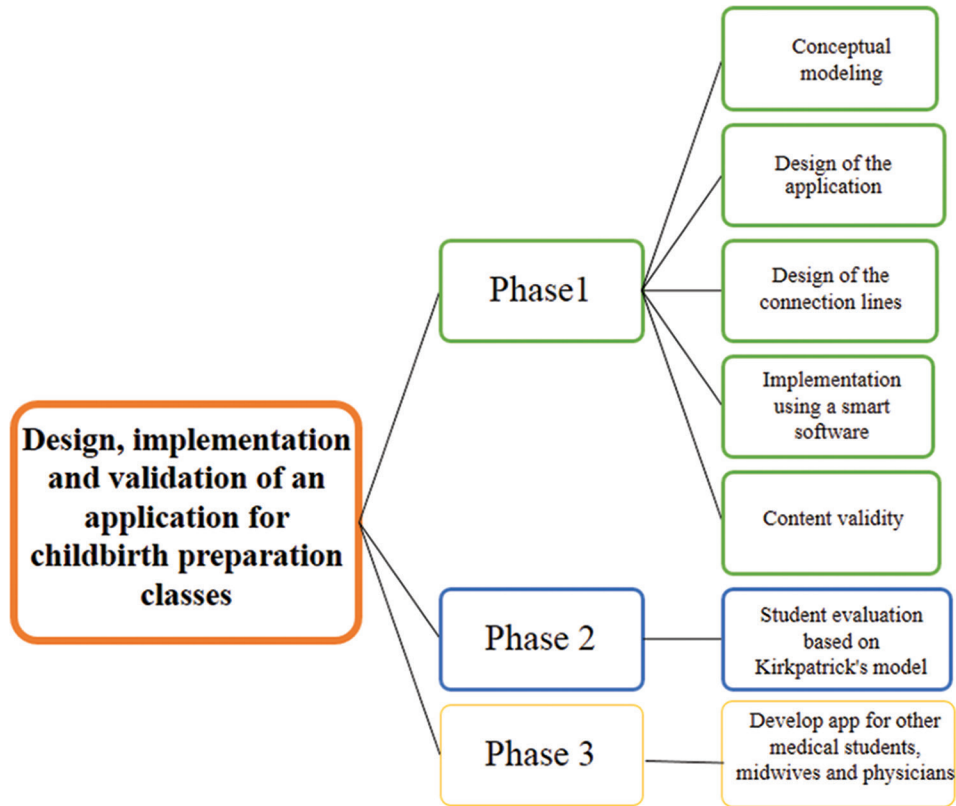


Figure 1: Stages for the design, implementation, and validation of the application for childbirth preparation classes

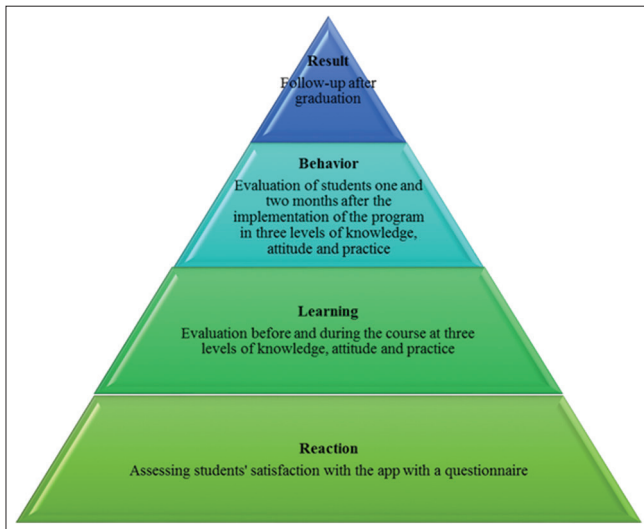


Figure 2: Kirkpatrick evaluation model^[29]

in the Mazandaran University of Medical Sciences with the help of a previously conducted research.

Reaction: This level measures participants' reaction to or feeling about education.^[29] When designed and validated, the application will be sent to a number of midwifery students to be used by them and, then, they will be asked to complete an electronic questionnaire of student satisfaction after the end of the course.

The Student Satisfaction Questionnaire consists of five questions as follows: How much did the users like the program? How much were they satisfied with it? How much did they learn new content? How much did the program attract their attention? and how useful was the information. Students will answer five questions based on a 5-part Likert scale of very low (1), low (2), medium (3), high (4), and very high (5), where the scores range from 5 and 25. At the end, they will be asked an open question that what is their suggestion to improve the application? The validity of the questionnaire will be qualitatively evaluated by a panel of experts in medical education, midwifery, and reproductive health. To evaluate the stability of the tool, 20 eligible persons will complete the questionnaire twice and at intervals of 14 days, and the intraclass correlation coefficient (ICC) will be calculated. The reliability coefficient of >0.7 will be acceptable.^[30] Cronbach's alpha coefficient will be examined at the end of the study for the evaluation of the internal consistency.

Learning: This level evaluates that how much the participants have learned from the education and how their knowledge, attitude and skills have improved.^[29] Knowledge, attitude and practice of the participants will be evaluated before, during and after the course using pre- and posttest method and by means of

questionnaire. Part of the practice will be evaluated by means of videos recorded by the students themselves and sending them through the application, and informed consent of the students will be obtained for these videos. All evaluations will be done by two female evaluators trained in the area of childbirth preparation classes (professors from the team of the physiological delivery training core of the Mazandaran University of Medical Sciences). Kappa coefficient will be calculated between the evaluators and a higher than 0.7 coefficients are accepted, and in case of disagreement between the evaluators, the third evaluator will be used. The validity of the questionnaire at this stage will be qualitatively reviewed by a panel of experts in medical education, midwifery and reproductive health. For evaluating the stability of the tool, 20 eligible persons will complete the questionnaire twice and at intervals of 14 days, and the ICC will be calculated. The reliability coefficient of >0.7 will be acceptable.^[30] Cronbach's alpha coefficient will be measured at the end of the study for the evaluation of the internal consistency.

Behavior: This level refers to the transfer of training and the continuation of changes in the practice or attitude of the participants.^[29] Moreover, the evaluation will be repeated at appropriate times (1 and 2 months after implementation) to ensure the existence of behavioral changes. The questionnaire of the previous stage and film recording will be used for evaluation.

Results: The fourth stage of this model is the review of the results to determine the final effectiveness and appropriateness of educational programs over time.^[29] At this stage, the students will be followed up after graduation to see whether or not they use the trainings of childbirth preparation classes in the clinic.

Phase 3

Develop app for other medical students, midwives and physicians based on the results of the first and second phase.

Inclusion criteria

Inclusion criteria for midwifery students: Iranian nationality, consent to participate in the study, fluency in Persian, midwifery students in the 5th and higher semesters, having a smartphone with Android operating system and the ability to use it.

Noninclusion criteria:

Noninclusion criteria for midwifery students: History of participation in childbirth preparation classes and any psychiatric illness recorded in the students' health record.

Sample size

To determine the sample size, first a pilot study will be conducted with 20 participants in each group and, using the following formula, the sample size will be calculated separately in all two groups. The confidence interval and the test power will be 95% and 0.8 respectively.

$$n = n_1 = n_2 = \frac{[z_{1-\frac{\alpha}{2}} + z_{1-\beta}]^2 (SD_1^2 + SD_2^2)}{(\mu_1 - \mu_2)^2}$$

Data analysis

SPSS version 17 will be used for data analysis in the second part. Descriptive statistics of percentage, mean, and standard deviation as well as graphs will be used. In the analytical statistics section, statistical tests of *t*-test, Chi-square, subgroup, and adjusted analyses and repeated measures analysis of variance will be used.

Ethical consideration

This project has been approved with ethics code of IR.NASRME.REC. 1400.362. Informed consent will be obtained from all participants of the project. Those who have participated in the production of the scientific product are known as its owners and their names will be mentioned when the results are published. Educational researchers adhere to the highest possible and reasonable standards in research, education, practice, service provision, and do not accept any grants, contracts, consultations, or collaborations with individuals or organizations that do not comply with ethical standards. The project will impose no cost on the participants and their information will also remain confidential. The educational researchers of this project will avoid any situation that leads to conflict of interest, and will do educational research, practice it and provide service only within their area of competence and based on the educations they have received, the skills they have acquired or the appropriate professional experience. Ethical standards will be observed in the process of publishing, reviewing, and editing of scientific materials. The researchers consider the right of each participant to withdraw from the study for any reason and at any time, and inform them about this right. All participants will be informed about the aim of the study and written informed consent will take from each participant.

Discussion

This study will for the first time design an application for childbirth preparation classes to improve the practice of midwifery students. The results will be used to target, prioritize, and allocate material and human resources and facilities to educate midwifery students, especially during the Covid-19 pandemic to increase

the ability and satisfaction of midwifery students, promote vaginal delivery and maintain maternal and infant health. Education process is in fact the creation of appropriate opportunities for learning in all areas of education (e.g., knowledge, attitude, and practice), as a proper education that meets the needs of society is one of the most important challenges in medical sciences.^[1] One of the ongoing programs in Iran's Health Transformation Plan is to encourage vaginal delivery by implementing childbirth preparation education programs. In preparation classes, the focus is on the human aspects in such a way that the person is known as active and feels empowered. These classes have three parts: (1) Providing evidence-based information; (2) counseling, and (3) facilitating practical skills.^[31] Accordingly, the education of midwifery students during their studies is incredibly important^[11] as they have a key role in transmitting information to pregnant women and their proper education will lead to the success of national programs and maternal and infant health as well.^[12] In addition, childbirth preparation classes during the study period can ultimately lead to the education of trained medical staff in this area to improve the mother-infant health.^[13] Education causes measurable changes in the student for performing clinical care. Through evaluation, education can determine the extent of students' achievement of clinical goals and, hence, the students will have a high-quality performance at the time of graduation if their necessary skills are at a standard level.^[32] This can be examined only by evaluating their performance. This provides information about the students' performance which can be used in promoting them, grading them, and even deciding on the content of the curriculum.^[33] Given the fact that a key duty of the medical students is to promote health indicators, they can contribute to the promotion of these indicators in society only when they are successfully educated.^[34] The use of virtual space in teaching changes thought patterns, enriches existing educational models, introduces new technology-based educational models and offers new learning methods in which the learner plays an active role. Such an education emphasizes selfregulation, independence, flexibility and interaction. Learning without time and space limitations, multimedia access, and easy access to educational content are among the advantages of virtual education which distinguish it from traditional learning.^[35]

Limitation and recommendation

One of the limitations of the research was conducting the first stage of research in Covid-19, and lack of access to some researchers and students. Future research should focus on conduct research at the national level and get opinions at a wider level and focus on the impact of such collaborations in improving health outcomes at the community level.

Conclusion

Owing to the outbreak of Covid-19 in the world, virtual education has gained more popularity and many educational classes all around world are held virtually. Because of the Covid-19 pandemic, the lack of an application for childbirth preparation classes is felt for midwifery students. Conducting this project, we are going to help these students and promote the health of society.

Acknowledgements

We would like to express our sincere gratitude to the National Agency for Strategic Research in Medical Education, the Vice Chancellor for Education of Mazandaran University of Medical Sciences, professors and midwifery students of Mazandaran University of Medical Sciences who will help us conduct this project. All methods were performed in accordance with the National Agency for Strategic Research in Medical Education relevant guidelines and regulations as approved by received with the ethical code IR.NASRME.REC.1400.362.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Author contributions

All authors have had substantial intellectual contribution to this protocol. ZK, ZHG, and SK conceived the design of the study. ZK, ZHG, SK, MAS, FE, TT, NSMT, MM, HA, and MM wrote the first and final drafts of the protocol. ZK, ZHG, and SK contributed to the drafting process of the protocol. All authors have contributed to revising the protocol for intellectual content. All authors have read and approved the final manuscript and given final approval for the manuscript to be published.

Financial support and sponsorship

This research has been approved by the National Strategic Center for Medical Education in Iran. The proposal has been approved with No. 4000236. All expenses of the project will be paid by the funder. Dr. Soghra-khani, as the main researcher of the project, will report the process and results of design, validation, data collection and interpretation of the findings to the funder.

Conflicts of interest

There are no conflicts of interest.

References

- Kim S-J, Choi S-H, Lee S-W, Hong Y-S, Cho H. The analysis of self and tutor assessment in the skill of basic life support (BLS) and endotracheal intubation: Focused on the discrepancy in assessment. *Resuscitation* 2011;82:743-8.
- Naeij E, Khani S, Firouzi A, Moosazadeh M, Mohammadzadeh F. The effect of a midwife-based counseling education program on sexual function in postmenopausal women: a randomized controlled clinical trial. *Menopause*. 2019;26(5):520-30
- Smith V, Warty RR, Sursas JA, Payne O, Nair A, Krishnan S, *et al.* The effectiveness of virtual reality in managing acute pain and anxiety for medical inpatients: Systematic review. *J Med Intern Res* 2020;22:e17980.
- Knaust T, Felnhofer A, Kothgassner OD, Höllmer H, Gorzka R-J, Schulz H. Virtual trauma interventions for the treatment of post-traumatic stress disorders: A scoping review. *Front Psychol* 2020;11:2877.
- Lungu AJ, Swinkels W, Claesen L, Tu P, Egger J, Chen X. A review on the applications of virtual reality, augmented reality and mixed reality in surgical simulation: An extension to different kinds of surgery. *Exp Rev Med Devices* 2021;18:47-62.
- Woon APN, Mok WQ, Chieng YJS, Zhang HM, Ramos P, Mustadi HB, *et al.* Effectiveness of virtual reality training in improving knowledge among nursing students: A systematic review, meta-analysis and meta-regression. *Nurs Educ Today* 2021;98:104655.
- Kordi M, Rashidi Fakari F, Mazloun SR, Khadivzadeh T, Akhlaghi F. Comparison between the efficacy of web-based, simulation and conventional training on knowledge and skills retention of midwifery students in management of postpartum hemorrhage. *The Iranian Journal of Obstetrics, Gynecology and Infertility*. 2014;16 (89):8-14.
- Dotters-Katz SK, Chuang A, Weil A, Howell JO. Developing a pilot curriculum to foster humanism among graduate medical trainees. *J Educ Health Promot* 2018;7:2.
- Mir MA, Chattopadhyay D, Vathulya M, Mago V, Maurya RK, Kapoor A, *et al.* The prospective study of change of perception of postgraduate students on objective structured clinical examination in burns and plastic surgery. *J Educ Health Promot* 2022;11:144.
- Mehrabadi M, Masoudifar M, Parvizi A, Rakhshani MH, Mortazavi F. Effects of childbirth preparation classes program based on national guideline on fear of childbirth in pregnant women: A randomized clinical trial. *Iran J Obstet Gynecol Infertil* 2020;23:58-68.
- Fakari FR, Kordi M, Mazloom SR, Khadivzadeh T, Tara M, Akhlaghi F. Comparing the Effect of Traditional, Web based and Simulation Training on Midwifery Students' Clinical Competence in Postpartum Hemorrhage Management. *Journal of Mazandaran University of Medical Sciences (JMUMS)*. 2015;25 (123)
- Blair JE, Mayer AP, Caubet SL, Norby SM, O'Connor MI, Hayes SN. Pregnancy and parental leave during graduate medical education. *Acad Med* 2016;91:972-8.
- McCann AR. *Prenatal Education: Examining Issues of Maternal Knowledge and Preparedness for Infant Care*: Michigan State University; 1997.
- Nolan ML, Hicks C. Aims, processes and problems of antenatal education as identified by three groups of childbirth teachers. *Midwifery* 1997;13:179-88.
- Bergström M, Kieler H, Waldenström U. Effects of natural childbirth preparation versus standard antenatal education on epidural rates, experience of childbirth, and parental stress in mothers and fathers: A randomized controlled multicenter trial. *BJOG* 2009;116:1167-76.
- Hamzehgardeshi Z, Yazdani F, Rezaei M, Kiani Z. COVID-19 as a threat to sexual and reproductive health. *Iran J Public Health* 2020;49(Suppl 1):136-7.
- Rashidi Fakari F, Rashidi Fakari F, Kiani Z, Ghazanfarpour M. Vulvovaginal self-care under the shadow of the Covid-19 pandemic. *Arch Sex Behav* 2021;50:2797-8.
- Devi B, Khandelwal B, Das M. Comparison of the effectiveness of video-assisted teaching program and traditional demonstration on nursing students learning skills of performing obstetrical palpation. *Iran J Nurs Midwife Res* 2019;24:118.
- Yoo M, Son Y, Kim Y, Park J. Video-based self-assessment: Implementation and evaluation in an undergraduate nursing course. *Nurs Educ Today* 2009;29:585-9.
- Ma H, Bo W, Liu J, Jian D, Xie Y. Video Feedback Teaching Method in Teaching of Abdominal Physical Examination. *Frontier and Future Development of Information Technology in Medicine and Education*: Springer; 2014. p. 2707-13.
- Phillips D, Duke M, Nagle C, Macfarlane S, Karantzas G, Patterson D. The virtual maternity clinic: A teaching and learning innovation for midwifery education. *Nurs Educ Today* 2013;33:1224-9.
- Chang S-C, Hsu T-C, Chen Y-N, Jong MS-y. The effects of spherical video-based virtual reality implementation on students' natural science learning effectiveness. *Interact Learn Environ* 2020;28:915-29.
- Carrilho JM, Oliveira IJR, Santos D, Osanan GC, Cruz-Correia RJ, Reis ZSN. Pregnant users' perceptions of the birth plan interface in the "my prenatal care" app: Observational validation study. *JMIR Form Res* 2019;3:e11374.
- Saboia DM, Vasconcelos CT, Oriá MO, de C Bezerra K, Neto JAV, de M Lopes MH. Continence App: Construction and validation of a mobile application for postnatal urinary incontinence prevention. *Eur J Obstetr Gynecol Reprod Biol* 2019;240:330-5.
- Kelly M, Lyng C, McGrath M, Cannon G. A multi-method study to determine the effectiveness of, and student attitudes to, online instructional videos for teaching clinical nursing skills. *Nurs Educ Today* 2009;29:292-300.
- Rahimi MS, Fahami F, Najimi A. The effectiveness of training through mobile on the practice of midwives in the management of pre-eclampsia. *Biomed Pharmacol J* 2017;10:781-6.
- Khatooni M, Alimoradi Z, Samiei-Seiboni F, Shafiei Z, Atashi V. The impact of an educational software designed about fundamental of nursing skills on nursing students' learning of practical skills. *J Clin Nurs Midwife* 2014;4:9-16.
- Hajesmaeel-Gohari S, Sarpourian F, Shafiei E. Virtual reality applications to assist pregnant women: A scoping review. *BMC Pregnancy Childbirth* 2021;21:249.
- Kirkpatrick DL. *The Four Levels Of Evaluation. Evaluating Corporate Training: Models and Issues*: Springer; 1998. p. 95-112.
- DiIorio CK. *Measurement in Health Behavior: Methods for Research and Evaluation*. John Wiley & Sons; 2006.
- Hassanzadeh R, Abbas-Alizadeh F, Meedyda S, Mohammad-Alizadeh-Charandabi S, Mirghafourvand M. Assessment of childbirth preparation classes: A parallel convergent mixed study. *Reprod Health* 2019;16:160.
- Spendlove Z, Best R. Innovation in assessment: Building student confidence in preparation for unfamiliar assessment methods. *Br J Midwife* 2018;26:180-4.
- Dolatshahi M, Sohrabi S, Kazemi N, Mahmoudi S. The effect of portfolio on nursing students' learning and satisfaction from clinical evaluation. *J Med Educ* 2019;18:211-8.
- Davies A, Rolfe G. *Issues in Developing an Educational and Professional Portfolio. Children and Young People's Nursing*. Routledge; 2016. p. 327-48.
- Talebian S, Mohammadi HM, Rezvanfar A. Information and communication technology (ICT) in higher education: Advantages, disadvantages, conveniences and limitations of applying e-learning to agricultural students in Iran. *Procedia Soc Behav Sci* 2014;152:300-5.