# DEVELOPMENT OF MOBILE EDUCATIONAL MATERIAL FOR NURSES: A PROCESS IMPROVEMENT STUDY

**Dr. Ayse OZKARAMAN**

ORCID: 0000-0002-0507-4100
Faculty of Health Sciences
Eskisehir Osmangazi University
Eskisehir, TURKIYE

**Dr. Ozlem KERSU**

ORCID: 0000-0003-3592-2892
Faculty of Health Sciences
Eskisehir Osmangazi University
Eskisehir, TURKIYE

**Dr. Fusun UZGOR**

ORCID: 0000-0002-4233-7774
Faculty of Fethiye Health Sciences
Mugla Sitki Kocman University
Mugla, TURKIYE

**Dr. Merve CAKIRLI**

ORCID: 0000-0003-0363-4642
Faculty of Health Sciences
Eskisehir Osmangazi University
Eskisehir, TURKIYE

**Dr. Ozer CELIK**

ORCID: 0000-0002-4409-3101
Faculty of Science
Eskisehir Osmangazi University
Eskisehir, TURKIYE

**Burcin DANACI**

ORCID: 0000-0001-9517-5441
Departmant of Social Facilities Economic Enterprise
Eskisehir Osmangazi University
Eskisehir, TURKIYE

**Dr. Mesut AYDEMIR**

ORCID: 0000-0002-2035-1292
Open Education Faculty
Anadolu University
Eskisehir, TURKIYE

## ABSTRACT

In the nursing profession, post-graduate in-service trainings are scheduled to increase efficiency and improve the quality of service. There are barriers to participation in training programs due to some reasons such as the intense work pace, incompatible shifts, a lack of personnel, the training program is not being at the knowledge and skill level of the personnel to be trained, the poor physical environment of the training environment. The purpose of this methodological study is to develop mobile training material to provide nurses working in university hospital with professional literature and also, to evaluate its visual design, reliability and the quality of information in the developed training material. The information quality, reliability, readability and visual design of the mobile training material developed for use on Android and IOS smartphones was assessed by 10 experts, twice, by means of the Discern Measurement Questionnaire and Visual Design Control Scale. After the first expert evaluation, the content was updated and a second evaluation completed. Content validity index (CVI) analyzes were performed. The Discern Measurement Questionnaire's total score for the training material configured for smartphones was calculated at 70.80 ±2.57 out of 75. CVI analysis results of the Discern Measurement Questionnaire and Visual Design Control Scale scales of the training material were found to be 0.75 and 0.78, respectively. According to Gagne's events of instructions, the information quality and the reliability of the training material configured for smartphones is high and this training material is validated.

**Keywords:** Educational material, Gagne's learning events, distance learning, mobile application, smartphone, nurse.

## INTRODUCTION

In our modern age, rapid changes and development in the fields of science and technology are accompanied by new and emerging information. One way to acquire new knowledge as a means of staying current with frequent change and development is through education. Education, which entails training individuals for a particular purpose, is carried out with the aim of "changing the behaviors of individuals in line with determined targets and developing individual abilities in various aspects"(Chaghari et al., 2017; Senviren, 2014). The Continuing Medical Education Accreditation Board emphasizes the importance of well-structured continuing education for healthcare professionals in delivering quality care to individuals as in other disciplines (American Association of Continuing Medical Education, 2017).

The nursing profession, which holds important positions in the healthcare industry, is based on theoretical-scientific knowledge and requires a range of practical skills (Taylan, Alan, and Kadioglu, 2012). Beginning with the fulfillment of physical needs, the nursing profession is an independent profession that also develops theories, makes holistic evaluations and bears social responsibilities together with constant development and changing technology (Goris et al., 2014; Taylan, Alan, and Kadioglu, 2012). Considering these aspects, the nursing profession has the power to induce significant change and transformation in the field of health. The continuity of education is something frequently emphasized from the very start of the profession up to the present as a way to maintain such power (Chaghari et al., 2017). The Ministry of Health in our country published a Ministry of Health In-Service Training Regulation dated 11/12/2009 and numbered B.10.0. SEG.0.7Ikinci00.03/15296, determining the procedures and principles of the in-service training program (Ministry of Health In-Service Training Regulation, 2016).

In the nursing profession, post-graduate in-service trainings are scheduled to increase efficiency and improve the quality of service, reduce errors and accidents and improve service presentation (Altin, 2013). These trainings contribute to greater success and productivity of the members of the profession in their duties and the outward display of a positive attitude (Senviren, 2014). A majority of nurses have identified the necessity of postgraduate compliance training in the studies conducted (Bugdayli and Akyurek, 2017; Chaghari et al., 2017; Kol, Ilaslan and Turkay, 2017). In addition to the numerous positive effects of training programs organized for nurses working after graduation, negative results can also be seen, including the training program is not being at the knowledge and skill level of the personnel to be trained, an unwillingness of personnel to learn, the poor physical environment of the training environment, a non-compliance with the

training materials by training subjects and a lack of evaluation at the end of each training. Furthermore, there are barriers to participation in training programs due to personal reasons such as the intense work pace necessary for health institutions, incompatible shifts and a lack of personnel (Senviren, 2014). In studies conducted on this subject, 33% of employees stated that they did not participate in training programs due to lack of available time (Bugdayli and Akyurek, 2017). In 2018 and 2019, 17 administrative and 12 occupational trainings were organized for nurses working in our institution, 59 lecturers took part in these trainings and each training event lasted an average of 45-60 minutes. The participation rate was limited to 32.1% due to reasons such as working overtime, being off duty and not wanting to spend a off day at the institution in training. In 2020 and 2021, in turn, trainings were organized on online platforms such as Zoom and Microsoft Teams instead of face-to-face training due to the Covid-19 pandemic. However, full participation still could not be ensured due to the change of workplace of nurses and extremely busy working hours as a result of the pandemic. Additionally, the number of events organized by the training unit was also limited. The trainings organized may cause, in addition to the time and labor losses of the trainers, a slight motivation, time and financial loss of the nurses coming to the hospital and spending a off day in training. For these reasons, the trainings should be organized in a way to prevent time, labor and financial losses while updating knowledge and increasing the motivation of nurses, thereby contributing positively to patient care.

Studies emphasize that Gagne's 9 events of instruction theory used in nursing education is effective, increases the knowledge level of nurses and nursing students and contributes to the retention of the knowledge (Miner et al., 2015; Woo, 2016). In addition, distance education and health experts draw attention to the benefit of Gagne's teaching theory in remote education applications (Buscombe, 2013; Woo, 2016). Gagne argued that events of instruction help to cause the desired behavior to be learned and that these events sometimes occurred spontaneously during the interaction of the student with the material. However, Gagne also emphasized that events of instruction should be carefully organized by the designer (Kumtepe et al., 2019; Lo & Hsieh, 2020). Gagne's teaching theory requires each instruction event to gain attention, stimulate, inform students of the objective, stimulate recall of previously learned information and skills for new teaching, present stimulating materials, provide guidance to students, elicit performance, provide feedback, assess performance and enhance retention and transfer (Bas, 2012). However, in a literature review using Cochrane, CINAHL, Pubmed, Google Scholar and Google search engines, no study was found on the effectiveness of a mobile training package structured by incorporating Gagne's events of instruction for nurses' education. It was also determined during searches made in the Google Play Store and Apple Store that there is no application available in the Turkish language that nurses could use to obtain professional information and update their professional knowledge.

## PURPOSE OF THE STUDY

This study was planned with the objective of developing mobile training material to provide nurses working in a university hospital with professional information, and a subsequent evaluation of content validity for quality, reliability of information and suitability of visual design. Accordingly, the questions of this research are:

1) Is the information contained in the mobile training material of good quality and reliability?
2) Is the mobile training material suitable in terms of visual design?
3) Is the mobile training material valid?

## METHOD

This methodological study is part of a larger study to determine the impact of mobile in-service training on the knowledge level of nurses working in a hospital in Turkiye and was carried out in two stages. First stage; the development of Turkish mobile training material, the second stage is the evaluation of the validity of the mobile training material in terms of information quality and reliability, and visual design suitability (Halain et al., 2022; Uysal et al., 2021; Uzgor, Ozkaraman & Korkmaz, 2020; Zamanzadeh et al., 2015).

## Development of the Mobile Training Material

In this stage, in order to determine the scope of the mobile training material necessary, meetings were held with nursing services managers of the affiliated university hospital to determine training needs of the nurses. As a consequence of these meetings, a content plan of the mobile training material was created (Figure 1). 8 experts in nursing and 3 experts in nursing education organized the mobile training material, abiding by the content plan determined according to Gagne's 9 events of instruction as follows:

1) *Gaining attention:* Nurses were informed of the objectives, targets and scope of the mobile training material. The text of the training material was organized using large fonts, images, contrasting colors and icons. In addition, interaction with the training material by nurses was planned by incorporating case studies, videos, games and filling in forms used in the field. High-impact videos shot by experts on the subject and uploaded to the address "www.youtube.com" were selected and used to attract interest and attention towards learning. Puzzles and matching games were also created for nurses to better learn and transfer information. Subjects that require extra emphasis to attract the attention of learners were expressed in different font styles, colors and characters.

2) *Informing learners of the objective:* In order to inform the nurses of the objectives, they were asked to complete each of the training material modules (6 pieces), and gain at least 70 points from 2 assessment tests consisting of 50 questions in the last module.

3) *Stimulating recall of prior learning:* Nurses were asked to fill in forms used in the hospital, which were then incorporated into the modules to help users recall information they had learned before. In addition, questions were asked prior to a PowerPoint presentation in order to facilitate nurses recalling subjects they had learned previously.

4) *Presenting the material:* PowerPoint presentations were prepared for the modules created within the scope of nurses' training material, which included the following information: job descriptions of employees, patient rights, procedures for identifying and verifying patient identification information, procedures for the safe transfer of patients, procedures for identifying situations that affect patient safety adversely, instructions for preparing patients for surgery, care instructions for patients under restriction, instructions for verbal order requests and rules to ensure patient privacy, waste management procedures, drug safety procedures, instructions for entrance-exit rules in intensive care units, the safety reporting system, emergencies and codes, transfusion safety procedures, drug applications and fluid therapy, wound care, catheter applications and care, evaluation of vital signs, death process instruction and diabetes and insulin applications (Figure 2). Images, animations and tables were also included in the presentations. Information was provided slowly, from the simple to the complex and from the known to the unknown. Additionally, active use of the interface created within the application was made possible by researchers in order to update the information, games, puzzles and videos in the PowerPoint presentations.

5) *Providing learning guidance:* In order to guide nurses throughout the application, forward and backward buttons were placed on each screen, and a feedback button regarding the completion of the subjects in each module and tips for solving puzzles was also included.

6) *Eliciting performance:* Exercises were created to apply what was learned from the application. Through these tasks, nurses were provided with the opportunity to see how much they had learned.

7) *Providing feedback:* An interface was created within the application in which researchers could check the completion status of each module by the nurses as well as nurses' answers to the evaluation questions. Nurses were also provided with feedback by means of this interface.

8) *Evaluation:* 50 questions consisting of two sections were prepared in accordance with the measurement and evaluation technique to determine the extent to which nurses had learned the targeted achievements. Questions were intended to be asked by repeating each group in two separate time periods, as a pre-evaluation and a final evaluation. Nurses were able to record their answers and then evaluate their own progress. In addition, researchers were provided with the opportunity to evaluate the answers to each question and the level of success via the interface of the application.

9) *Enhancing retention:* The mobile training material is a portable learning interface that can be used 24/7 by nurses. In addition, there is an opportunity to download presentations in the application to smartphones. These features can help when there is difficulty in recalling or when related health practices are forgotten, and also to ensure retention through repetition.

Budget support was provided to a University Scientific Research Project Unit (Project No: xxxxxx) for mobile use of the training material prepared by researchers by transferring the content to Android and IOS smartphones. At this stage, a mobile application was developed through collaboration with the software company.

In the mobile training material application, blue tones were preferred to represent institutionalism. Screen resolution set to 1334x750px as the base. The mobile training material has been responsively designed for use on phones with different screen sizes. SFProDisplayBold was used as the font to make the application more distinctive and catchier.



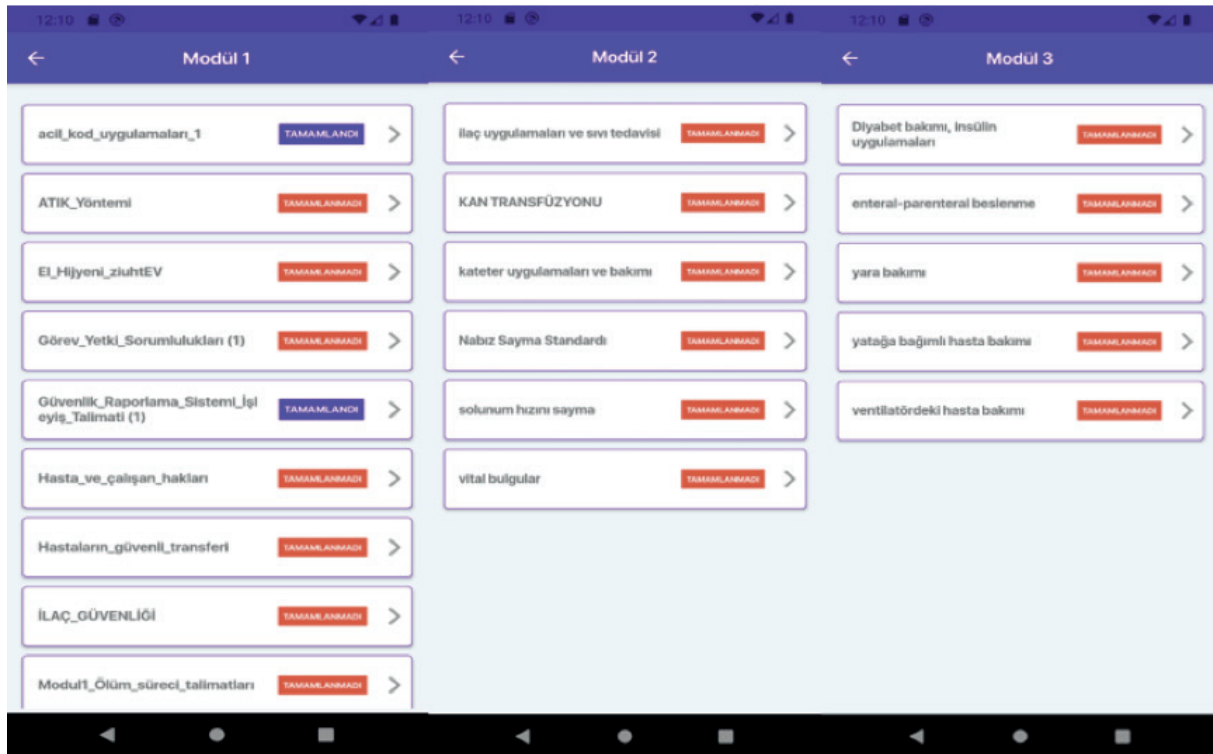**Figure 1.** Shows a screenshot of mobile app home page

**Figure 2.** Shows a screenshot of training modules

## The Interior of the Mobile Training Material

An interface has been developed for access to user information in mobile training material, whether or not users have completed modules, the completion times of the modules, the status of completing the pre-evaluation and post-evaluation questions, evaluating the changes in the answers given to the pre-evaluation and post-evaluation questions, to receive feedback on the use of mobile training material. With this interface, the movements of the users through the mobile training material were made traceable by the researchers. In addition, this interface, researchers can add new modules to mobile training materials and update the information and applications contained in existing modules.

## Data Collection and Analysis

The mobile training material configured for smartphones was evaluated in terms of information quality, information reliability, readability and visual design by 10 experts (nursing education specialists, distance education specialists, nurses, computer engineers) using Discern Measurement Questionnaire and Visual Design Control scale. Changes were made in the content in line with the opinions received from the experts after an initial evaluation. The content was then evaluated for the second time by the same experts in terms of information quality, reliability, readability and visual design. At the end of the second evaluation, CVI was calculated using a 5-point likert scale ranging from 1 to 5 (no, partially, yes) for the Decern Measurement Questionnaire. In this study, it is recommended that the minimum CVI value for the Discern Measurement Questionnaire be 0.50. A 3-point likert scale ranging from 1 (very good) to 3 (weak) was used for the Visual Control scale and the CVI was calculated. For Visual Design Control, it is recommended that the minimum CVI value be 0.30 (Lynn, 1986).

### The Scale

*Discern measurement Questionnaire (Quality Criteria for Consumer Health Information):* This is a scale used to evaluate the reliability and information quality of training material. It was developed by Charnock et al. (Charnock et al., 1999) and translated into Turkish by Gokdogan et al. in our country (Gokdogan, 2003).

278

The questionnaire consists of a total of 16 questions; the first eight (1-8) measure information reliability and the next 7 (9-15) gauge quality of the information. The last question (16) provides an overall general evaluation of the material. A minimum of 15 and a maximum of 75 points can be obtained from the first 15 questions in the measurement questionnaire. The 16th item is evaluated separately. A low score indicates low information quality and reliability of the material while a high score indicates that these features are exceptional (Lynn, 1986).

*Visual design control scale:* The scale, developed by Smaldino et al. (2005), consists of 24 items including integrity, arrangement, verbal elements, strikingness, software and multimedia use (Smaldino et al., 2005). The scoring of the scale is as follows: 3 = very good, 2 = acceptable and 1 = poor. In a study by Korucu et al., the internal consistency reliability coefficient of the scale was found to be 0.93 for the entire scale (Korucu et al., 2016).

### Ethics Approval and Written Informed Consents Statements

Prior to starting the study, written permission dated XXX and numbered XXX was obtained from the institution where the study was conducted and from the relevant ethics committee.

## FINDINGS

### Distribution Of the Information Quality and Information Reliability Scores of the Mobile Training Material

The first and second evaluation mean scores of the experts according to the Discern measurement questionnaire regarding information quality and reliability of the training material configured for smartphones are presented in Table 1.

The highest mean scores given by the experts in the first evaluation were for the 1st, 2nd and 6th items (4.90±0.31), and the lowest mean score was attributed to the 13th item (2.30±1.56) in the Discern measurement questionnaire. The mean value of the 16th question, in which a general evaluation of the reliability and quality of the training material was made, was 4.10 ±0.56 out of five. On examination of the results of the second evaluation, the highest mean scores were in the 1, 2, 3, 4, 6, 10, 12, and 14th items (5.00 ±0.00), and the lowest mean scores were in the 5th and 7th items (3.90 ±0.31). The general evaluation score was calculated as 4.90 ±0.31 out of 5 (Table 1).

In the first evaluation of the training material configured for smartphones with the Discern measurement questionnaire, the mean score was 64.00 ±5.64 out of 75. The mean score of the information quality from the Discern measurement questionnaire sub-dimensions was recorded as 36.4 ±3.56, and the mean score of information reliability as 27.6±3.83. The results obtained from the first evaluation indicated that the information quality and reliability of the training material configured for smartphones was adequate. According to the Discern measurement questionnaire, which was used to determine the reliability and quality of the training material configured for smartphones, it was determined that the opinions obtained from experts were statistically moderately in agreement with each other (Kendall's W= 0.459, p<0.001) (Table 1).

According to the second evaluation results, the Discern measurement questionnaire score of the training material configured for smartphones was 70.80 ±2.57 out of 75. The mean score of the information quality from the Discern measurement questionnaire sub-dimensions was determined as 37.3 ±0.94, and the mean score of the information reliability as 33.5 ±1.71. According to results obtained from the second evaluation, the information quality and reliability of the training material configured for smartphones was high. According to the Discern measurement questionnaire, the statistical agreement of the opinions of experts was moderate (Kendall's W= 0.664, p<0.001) (Table 1).

**Table 1.** Distrwibution of the mean scores of the Discern Measurement Tool items of the mobile training material

| Discern Measurement Tool Question Items | mean±sd | |
|---|---|---|
| | First evaluation | Second evaluation |
| Is its objective clear? | 4.90 ± 0.31 | 5.00 ± 0.00 |
| Are the objectives achievable? | 4.90 ± 0.31 | 5.00 ± 0.00 |
| Is it relevant to the subject? | 4.80 ± 0.42 | 5.00 ± 0.00 |
| Are the resources stated clearly? | 4.60 ± 0.84 | 5.00 ± 0.00 |
| Is the date of the reported or used information stated clearly? | 4.60 ± 0.84 | 3.90 ± 0.31 |
| Is it impartial and consistent? | 4.90 ± 0.31 | 5.00 ± 0.00 |
| Does it provide details on additional information or supportive resources? | 4.20 ± 0.63 | 3.90 ± 0.31 |
| Are uncertain aspects mentioned? | 3.60 ± 1.26 | 4.50 ± 0.52 |
| Does it describe how each treatment is administered? | 4.60 ± 0.69 | 4.80 ± 0.42 |
| Does it describe the benefits of each treatment? | 4.80 ± 0.42 | 5.00 ± 0.00 |
| Does it describe the risks of each treatment? | 4.60 ± 0.69 | 4.60 ± 0.51 |
| Does it describe what will happen in the absence of treatment? | 4.10 ± 0.87 | 5.00 ± 0.00 |
| Does it describe how treatment options affect the quality of life? | 2.30 ± 1.56 | 4.60 ± 0.51 |
| Has the possibility of the presence of more than one treatment option been explained? | 4.30 ± 0.67 | 5.00 ± 0.00 |
| Does it provide support for the patient in making decisions? | 2.90 ± 1.72 | 4.50 ± 0.70 |
| General evaluation | 4.10 ± 0.56 | 4.90 ± 0.31 |

**Table 2.** Distribution of mean scores of the information quality and reliability of the mobile training material

| Evaluation time | | N | Mean±sd | Min | Max | Kendall's W | p |
|---|---|---|---|---|---|---|---|
| **First** | Information quality | 10 | 36.4±3.56 | 29 | 40 | 0.463 | <0.001 |
| | Information reliability | 10 | 27.6±3.83 | 20 | 33 | 0.448 | <0.001 |
| | **Total** | 10 | 64.00±5.64 | 49 | 71 | **0.459** | **<0.001** |
| **Second** | Information quality | 10 | 37.3±0.94 | 35 | 38 | 0.881 | <0.001 |
| | Information reliability | 10 | 33.5±1.71 | 31 | 35 | 0.297 | 0.002 |
| | **Total** | 10 | 70.80±2.57 | 66 | 73 | **0.664** | **<0.001** |

## Distribution of the Visual Design Scale Scores of the Mobile Training Material

When the first evaluation result of the experts was examined in Table 3, the experts expressed a "very good" opinion for the "integrity" sub-dimension, while they indicated an "acceptable" score for the "arrangement", "strikingness", "verbal elements" and "software" sub-dimensions. The experts gave a "poor" rating to these statements due to the absence of sound and music in the training material. The visual design control scale total score was calculated as 50.20 ±9.36 out of 72. According to the visual design control scale, the expert opinions were determined to be moderately concordant (Kendall's W= 0.607, p<0.001) (Table 3).

When the results of the second evaluation of the experts were examined, it was found that the experts gave a "very good" rating to all sub-dimensions of the Visual Design Control Scale except for the multimedia use. The visual design control scale total score was totaled as 64.40 ±5.92 out of 72. According to the visual design control scale, the opinions of the experts were moderately concordant (Kendall's W= 0.672, p<0.001) (Table 3).

### Mobile Training Material Validity Analysis Results

In the CVI analysis conducted to investigate the validity of the mobile education package in the study, both scales were evaluated on an item-by-item basis and on the sum of the items, and their results were given in Table 4 and Table 5. According to Lynn (1986), in the evaluation made by 10 experts using a five-point Likert assessment questionnaire, For the information validity of the training material, a minimum CVI value of 0.50 is recommended. It is recommended to be 0.30 for visual design validity using a triple Likert assessment questionnaire.16 In the analysis conducted for the validity of the information in this study, the I-CVI for each item from 0.0 to 1.0, while the S-CVI is 0.75 for (Table 4). According to these results, it can be said that the information validity of the mobile training material has an acceptable CVI value.

In the analysis conducted for the validity of visual design in the study, the I-CVI for each item ranged from 0.0 Dec 1.0, while for the S-CVI it was 0.78 (Table 5). According to these results, it can be said that the visual design validity of the mobile training material has an acceptable CVI value.

**Table 3.** Distribution of the Visual Design Scale mean scores of the mobile training material

| Items | N | mean±sd | |
| --- | --- | --- | --- |
| | | **First evaluation** | **Second evaluation** |
| **INTEGRITY** | | | |
| Alignment | 10 | 2.50±0.52 | 2.90±0.31 |
| Image | 10 | 2.60±0.51 | 2.90±0.31 |
| Balance | 10 | 2.60±0.51 | 2.90±0.31 |
| Style | 10 | 2.60±0.51 | 2.90±0.31 |
| Color chart | 10 | 2.60±0.51 | 2.90±0.31 |
| Color suitability | 10 | 2.50±0.52 | 2.90±0.31 |
| **Total** 10 | | **2.56±0.49** | **2.90±0.31** |
| **ARRANGEMENT** | | | |
| Proximity | 10 | 2.00±0.81 | 2.70±0.48 |
| Orientation | 10 | 2.20±0.63 | 2.90±0.31 |
| Image and background color contrasts | 10 | 2.30±0.48 | 2.90±0.31 |
| Compatibility | 10 | 2.30±0.48 | 2.90±0.31 |
| **Total** | | **2.20±0.53** | **2.85±0.31** |
| **VERBAL ELEMENTS** | | | |
| Font | 10 | 1.70±0.82 | 2.80±0.42 |
| Font size and spacing | 10 | 1.70±0.82 | 2.50±0.52 |
| **Total** | | **1.70±0.78** | **2.85±0.31** |
| **STRIKINGNESS** | | | |
| Striking | 10 | 2.20±0.42 | 2.90±0.31 |
| Pattern | 10 | 2.20±0.42 | 2.90±0.31 |
| Interaction | 10 | 2.20±0.63 | 2.90±0.31 |
| **Total** | | **2.20±0.44** | **2.90±0.31** |
| **SOFTWARE-RELATED COMPONENTS** | | | |
| Drawing attention/Increasing motivation | 10 | 2.30±0.48 | 2.80±0.42 |
| Ease of Use | 10 | 2.20±0.63 | 2.90±0.31 |
| Ensuring active participation | 10 | 2.30±0.48 | 2.80±0.42 |
| Feedback effectiveness | 10 | 2.20±0.63 | 2.80±0.42 |
| Incorporation of Relevant and Understandable Documentation | 10 | 2.10±0.56 | 2.90±0.31 |
| **Total** | | **2.16±0.56** | **2.84±0.32** |

| MULTIMEDIA USE | | | |
|---|---|---|---|
| Audio | 10 | 1.00±0.00 | 1.00±0.00 |
| Music | 10 | 1.00±0.00 | 1.00±0.00 |
| Video | 10 | 1.00±0.00 | 2.40±0.96 |
| Didactic Games | 10 | 2.20±0.63 | 3.00±0.00 |
| | Total | 1.30±0.15 | 1.85±0.24 |
| Total Score | 10 | 50.20±9.36 | 64.40±5.92 |
| Kendall's W | 10 | 0.607 | 0.672 |
| P | 10 | <0.001 | <0.001 |

**Table 4.** The relevance ratings on the Discern Measurement Tool by ten experts

| Item | Expert 1 | Expert 2 | Expert 3 | Expert 4 | Expert 5 | Expert 6 | Expert 7 | Expert 8 | Expert 9 | Expert 10 | Agreement | I-CVI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q1 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q2 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q3 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q4 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q5 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 3,00 | 4,00 | 0 | 0.0 |
| Q6 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q7 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 3,00 | 4,00 | 0 | 0.0 |
| Q8 | 5,00 | 5,00 | 5,00 | 5,00 | 4,00 | 4,00 | 4,00 | 4,00 | 4,00 | 5,00 | 5 | 0.50 |
| Q9 | 5,00 | 5,00 | 4,00 | 4,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 8 | 0.80 |
| Q10 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q11 | 5,00 | 4,00 | 4,00 | 4,00 | 5,00 | 5,00 | 5,00 | 5,00 | 4,00 | 5,00 | 6 | 0.60 |
| Q12 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q13 | 4,00 | 5,00 | 4,00 | 4,00 | 5,00 | 5,00 | 5,00 | 5,00 | 4,00 | 5,00 | 6 | 0.60 |
| Q14 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 10 | 1.0 |
| Q15 | 4,00 | 4,00 | 5,00 | 4,00 | 5,00 | 5,00 | 5,00 | 5,00 | 3,00 | 5,00 | 6 | 0.60 |
| Q16 | 5,00 | 5,00 | 4,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 5,00 | 9 | 0.90 |
| Proportion relevance | 0.75 | 0.75 | 0.63 | 0.63 | 0.81 | 0.81 | 0.81 | 0.81 | 0.62 | 0.88 | **S-CVI/Ave** | **0.75** |
| The average proportion of items judged as relevant across the ten experts | | | | | | | | | | | **0.75** | |
| **Cronbach Alpha: 0.85** | | | | | | | | | | | | |

**Table 5.** Distribution of the Visual Design Scale mean scores of the mobile training material

| Item | Expert 1 | Expert 2 | Expert 3 | Expert 4 | Expert 5 | Expert 6 | Expert 7 | Expert 8 | Expert 9 | Expert 10 | Agreement | I-CVI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q1 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q2 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q3 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q4 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q5 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q6 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q7 | 2,00 | 3,00 | 3,00 | 2,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 7 | 0.70 |
| Q8 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q9 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q10 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q11 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 8 | 0.80 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q12 | 2,00 | 3,00 | 3,00 | 2,00 | 2,00 | 2,00 | 3,00 | 3,00 | 2,00 | 3,00 | 5 | 0.50 |
| Q13 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q14 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q15 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q16 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q17 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q18 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 2,00 | 8 | 0.80 |
| Q19 | 2,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 8 | 0.80 |
| Q20 | 3,00 | 3,00 | 3,00 | 2,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 9 | 0.90 |
| Q21 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 10 | 1.0 |
| Q22 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 0 | 0.0 |
| Q23 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 0 | 0.0 |
| Q24 | 1,00 | 1,00 | 1,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 3,00 | 7 | 0.70 |
| Proportion relevance | | | | | | | | | | | **S-CVI/Ave** | **0.78** |
| The average proportion of items judged as relevant across the nine experts | | | | | | | | | | | | **0.78** |
| **Cronbach Alpha:** | **0.94** | | | | | | | | | | | |

## DISCUSSIONS AND CONCLUSION

With new and developing technology, many activities performed in daily life can be performed without time or place restrictions. In our country, the Ministry of Health has created and implemented web-based training programs (WTEP) in hospitals. While technology-supported continuous trainings are maintained on the web, developments in this field have also led to the concept of mobile learning (Ozdamar Keskin and Kilinc, 2015).

The most important indicator of the development of mobile devices is the presence of operating systems developed for mobile platforms. The operating systems with the widest use are Android, within the body of Google, iOS developed by Apple and Windows Mobile operating system produced by Microsoft (http://ab.org.tr/ab14/bildiri/227.pdf). It can be predicted that with the download of training applications configured to these operating systems to mobile devices, nurses will participate in trainings at any place and time, gain new knowledge and skills and reflect this new knowledge in patient care. However, it should be noted that mobile learning like WTEP may also have some disadvantages, including more effort and time required by trainers for structuring a training program and more effort required by health education personnel. Trainings made in this manner are not created individually, technical requirements may not be fully met and health personnel may not want to use WTEP or mobile applications (Yildirim, 2009). For these reasons, it is recommended that every detail of structured distance training be planned carefully. In this study, which was intended as a process improvement, mobile training material for nurses was developed over 24 months, necessitating more trainer effort and technical support. In order to attract the attention and interest of the target group for which the training was planned, and to develop a partnership in achieving the purpose of the training, firstly meetings with nurse managers in the hospital were held to determine the specific training needs of nurses, and content was created accordingly. Subsequently, mobile training material was developed and technical support was obtained for the transfer of content to Android and IOS smartphones by a software company under the guidance of a distance education specialist.

Studies (Buscombe, 2013; Woo, 2016) emphasize that the mobile training packages will be beneficial when structured considering the disadvantages of learning with mobile devices and situations that can motivate learning in adult education. In this regard, healthcare professionals and distance education experts often bring up the usefulness of Gagne's teaching theory (Buscombe, 2013; Woo, 2016). In addition, studies emphasize that distance e-learning is effective in health education, positively affects success and increases self-efficacy levels of health employees (Casebeer et al., 2010; Du et al., 2013; Ozturk and Dinc, 2014). In this study, the mobile training material was arranged according to Gagne's 9 events of instructions in order to motivate nurses to acquire new professional knowledge. Within the scope of the study, the information quality of the

mobile training material was 37.3 ±0.94, information reliability was 33.5 ±1.71 and the total evaluation score was 70.80 ±2.57 with a good level. It was determined that the 10 expert opinions were moderately concordant for information quality and reliability (Kendall W = 0.664). The Kendall W coefficient is a value used to show the level of agreement among many experts who evaluate a situation according to an ordinal scale. According to the Kendall W, "0 point" indicates the lack of concordance among experts and "1 point" indicates a full concordance. The score varies between 0 and 1 (Meijering, Kampen & Tobi, 2013).

In the evaluation of the validity of educational materials, the content validity index (CVI) is used (Halain et al., 2022). The value of CVI varies according to the number of experts evaluating it and the scale. CVI analysis evaluates the content validity of the questionnaire on an item-by-item basis (I-CVI) and at the scale level (S-CVI). I-CVI is calculated by dividing the number of experts who give the "very relevant" rating for each item by the total number of experts, and the fact that I-CVI > 0.79 indicates that the items are related (Zamanzadeh et al., 2015). Lynn (1986) states that the number of experts evaluating the CVI value varies according to the likert type of the scale being evaluated. in the evaluation conducted by 10 experts using a five-likert evaluation questionnaire, it is recommended that the CVI value of the educational material be at least 0.50 for information validity. Halain et al., reported that an educational information web page designed for family members who have relatives in the Intensive Care Unit (ICU) they developed has acceptable CVI values (0.83) and was validated in terms of content and relevance (Halain et al., 2022).

According to the evidence, 16,28,29 in this study, it can be said that the validity of mobile educational material is acceptable with I-CVI 0.0-1.0 for each item and 0.75 for S-CVI in the analysis conducted for the information validity of mobile educational material according to DISCERN measurement questionnaire.

At the end of evaluations made for the visual design suitability of the mobile training material in the study, the following had "very good" levels: integrity 2.90 ±0.31, arrangement 2.90 ±0.31, verbal elements 2.85 ±0.31, strikingness 2.90 ±0.31, software-related components 2.84 ±0.32 and multimedia use 1.85 ±0.24. On the other hand, expert opinions were moderately compatible with each other in terms of the visual suitability of the mobile training material (Kendall W=0.672). Lynn (1986) emphasizes that the CVI value of a questionnaire evaluated by 10 experts using the triple likert evaluation questionnaire is 0.30. In our research, it can be said that the visual design validity of the mobile educational material evaluated by 10 experts using the likert-type Visual Design Scale of 3 is acceptable (S-CVI: 0.78).

According to the evidence (Halain et al., 2022; Lynn, 1986; Zamanzadeh et al., 2015) in this study, it can be said that the validity of mobile educational material is acceptable with I-CVI 0.0-1.0 for each item and 0.78 for S-CVI in the analysis conducted for the visual design validity of mobile educational material according to Visual Design Scale measurement questionnaire.

Following these stages, permission was received from both the Google Play Store and Apple Store authorities to ensuring the use of the mobile training material developed for nurses on Android and IOS smartphones. The mobile application was indexed and made available in both stores (Fig. 1). The mobile training material developed over two years in line with the results obtained is now suitable and ready to be used by nurses.

The mobile training material developed during the research process was prepared in Turkish. This situation prevents the use of this mobile training package in countries where different languages are spoken.

In the orientation trainings of nurses who have just started to work, Turkish mobile training material, developed to enable working nurses to update their professional knowledge and practices, is ready to be used on phones with proven Android and IOS operating systems, installed on application stores. Nurses can use this educational material without any time and space restrictions by obtaining permission from researchers.

## BIODATA and CONTACT ADDRESSES of AUTHORS
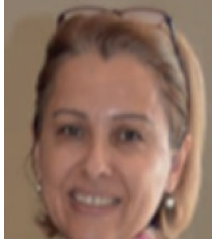
**Assoc. Prof. Ayse OZKARAMAN** is a Associate Professor of Department of Nursing at Health Sciences Faculty, Eskisehir Osmangazi University. Dr. Ayse Ozkaraman gained his Ph.D. in Nursing at September, 2014. Her academic interest areas are nursing, chronic disease, educational futures, open and distance learning, She has over than 15 journal articles published in international indexes, over than 15 international book chapters and other national and international articles, papers submitted to international meetings.

Ayse OZKARAMAN
Faculty of Health Sciences, Department of Nursing
Address: Eskisehir Osmangazi University, Meselik Campus, 26040, Odunpazari, Eskisehir, Turkiye
Phone: +90 2222393750/1548
E-mail: aozkaraman@ogu.edu.tr
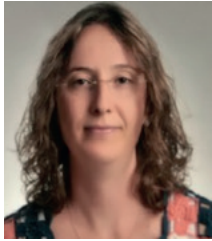
**Asst. Prof. Ozlem KERSU** works as an assistant professor at Eskisehir Osmangazi University. She completed her doctorate program in Surgical Diseases Nursing in 2020. She is interested in issues; surgical diseases nursing, critical care nursing, nursing care quality, breast cancer prevention, patient or employee health and safety, ergonomics in healthcare facilities and ergonomic arrangements for healthcare professionals. There are scientific studies in quality of life of surgical nurses, ergonomics in critical care nursing, nursing care quality, nursing practices in surgical diseases nursing, breast cancer prevention in women.

Ozlem KERSU
Faculty of Health Sciences, Department of Nursing
Address: Eskisehir Osmangazi University, Meselik Campus, 26040, Odunpazari, Eskisehir, Turkiye
Phone: +90 2222393750/1548
E-mail: ozlem_8420@hotmail.com

**Dr. Fusun UZGOR** is a Dr. Research Assisstant at Faculty of Fethiye Health Sciences, Mugla Sitki Kocman University. Dr. Fusun Uzgor gained her Ph.D. in nursing at September, 2023. Her academic interest areas are internal medicine nursing, chronic diseases, hemodialysis, anti TNF drugs, mobile applications,.oncology nursing. She has articles and book chapters on chronic diseases and nursing care in national and international indexes, papers submitted to international meetings. She has supported projects by Universtiy, The Scientific and Technological Research Council of Turkiye and Other Official Institutions.

Fusun UZGOR
Faculty of Fethiye Health Sciences, Department of Nursing,
Address: Mugla Sitki Kocman University, Faculty of Fethiye Health Sciences, 48300 Fethiye, Mugla
Phone: +90 2522111000
E-mail: efsunyldz949@gmail.com

**Dr. Merve CAKIRLI** is a Dr. Research Assisstant at Faculty of Health Sciences, Eskisehir Osmangazi University. Dr. Merve Cakirli gained her Ph.D. in Department of Child Health and Disease Nursing at August, 2023. Her academic interest areas are child health, newborn, social pediatrie, artificial intelligence in health. She has articles and book chapters on pediatric nursing in national and international indexes, papers submitted to international meetings. She has 4 supported projects by Universtiy and The Scientific and Technological Research Council of Turkiye.

Merve CAKIRLI
Faculty of Health Sciences, Department of Nursing,
Address: Eskisehir Osmangazi University, Meselik Campus, 26040, Odunpazari, Eskisehir, Turkiye
Phone: +90 2222393750/1528
E-mail: mcakirli@ogu.edu.tr

**Assoc. Prof. Ozer CELIK** is a Associate Professor of Department of Mathematics-Computer. Dr. Ozer Celik gained his Ph.D. in mathematics-computer department at 2019. His academic interest areas are Computer Science, Computer Vision, Artificial Intelligence, Computer Learning and Pattern Recognition, Engineering and Technology. He has over than 15 journal articles published in international indexes.
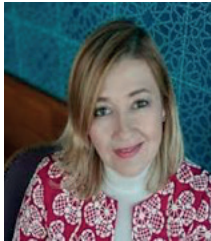
Ozer CELIK
Faculty of Science, Department of Mathematics and Computer Science,
Address: Eskisehir Osmangazi University, Meselik Campus, 26040, Eskisehir, Turkiye
Phone: +90 222 2393750
E-mail: ozer@ogu.edu.tr

**Burcin DANACI** works as a manager in Eskisehir Osmangazi University Departmant of Social Facilities Economic Enterprise. She worked as a nurse between 1992-2013. Between 2014-2021, he served as the Health Care Services manager of Eskisehir Osmangazi University Health, Practice and Research Hospital. She has been teaching patient and employee safety courses at the undergraduate level since 2014. She has interests in and has studies in the fields of patient and employee safety and nursing.

Burcin DANACI
Departmant of Social Facilities Economic Enterprise,
Address: Eskisehir Osmangazi University, Meselik Campus, 26040, Eskisehir, Turkiye
Phone: +90 222 2393750
E-mail: bdanaci7@ogu.edu.tr

**Assist. Prof. Mesut AYDEMIR** is an assistant professor at Open Education Faculty, Distance Education Department, Anadolu University. Asst. Prof. Mesut Aydemir gained his Ph.D. in Distance Education Department in 2019. His academic interest areas are online learning, recognition of prior learning, e-learning technology, enhanced learning, blended learning, distance learning, Instructional Technology, ICT in Education, mobile learning, teaching materials, social media in education, computer supported collaborative learning, andragogy,virtual collaboration. He has articles on e-learning, open and distance education in national and international indexes, papers submitted to international meetings. He has many supported projects by Universtiy and The Scientific and Technological Research Council of Turkiye, Erasmus+.

Mesut AYDEMIR
Open Education Faculty, Distance Education Department,
Address: Anadolu University, Yunus Emre Campus, 26470, Tepebasi, Eskisehir, Turkiye
Phone: +90 0222 335 05 80/2050
E-mail: mesutaydemir@anadolu.edu.tr

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