



# Implementation of Web-Based Case Midwifery Notes Documentation System (CMNotes) for Intra Natal Care

Cut Mutiah<sup>1\*</sup>, Abdurrahman<sup>2</sup>, Rayana Iswani<sup>1</sup>, Isnaini Putri<sup>1</sup>, Muhammad Nazar<sup>3</sup>

<sup>1</sup>Departement of Midwifery, Politeknik Kesehatan Aceh, Indonesia

<sup>2</sup>Departement of Nursing, Politeknik Kesehatan Aceh, Indonesia

<sup>3</sup>Department of Chemistry Education, Universitas Syiah Kuala, Banda Aceh, Indonesia

Received: January 28, 2023

Revised: March 25, 2023

Accepted: March 28, 2023

Published: March 31, 2023

Corresponding Author:

Cut Mutiah

[thea.kusnady@gmail.com](mailto:thea.kusnady@gmail.com)

DOI: [10.29303/jppipa.v9i3.3281](https://doi.org/10.29303/jppipa.v9i3.3281)

© 2023 The Authors. This open access article is distributed under a (CC-BY License)



**Abstract:** Case Midwifery Notes (CMNotes) is a digital-based documentation system designed to develop learning methods and interactive consultations between students and lecturers. CMNotes facilitates digital and comprehensive recording of patient data starting from assessment, diagnosis, plan of care, implementation to evaluation by applying Varney's management principles and SOAP documentation. This study aims to design produce a documentation system for midwifery care emphasized on the Intranatal care. The app was developed using php and html followed by hosting via wordpress. The data was collected using pssuq instrument (usability assessment), need analysis instrument and student responses questionnaire. 63 students from Midwifery student of Health Polytechnic Aceh were involved in the implementation of the system. The implementation results show that overall score of the system usability measured using PSSUQ is 2.87 indicating that the CMNotes system provides convenience and satisfaction for students in making documentation of childbirth care. Due to comments of users regarding the practicality of system, it is necessary to develop an Android-based CMNotes application to be able to fill in patient data more easily and effectively without the need of internet access.

**Keywords:** Android app; Digital documentation; Midwifery; Midwifery documentation; Technology; Web-based system

## Introduction

Midwifery documentation is essential for midwives in providing midwifery care because midwifery care provided to clients requires recording and reporting that can be used as a reference to demand responsibility and accountability for various problems that may be experienced by clients related to the services provided (Kerkin et al., 2018). Documentation is an authentic record or original document that can be used as evidence in legal matters (Tierney et al., 2018). Documentation in midwifery is evidence of recording and reporting owned by midwives in carrying out care records that are useful not only for the benefit of clients, but also midwives and the health team in providing health services based on accurate and complete written communication (Juwita et al., 2019). Apart from being a recording and reporting system, midwifery documentation is also used as information about the health status of patients in all

midwifery care activities carried out by midwives. In addition, documentation also acts as a collection, storage, and dissemination of information to maintain a number of important facts continuously at a time against a number of events (Dawson et al., 2018).

Currently, the documentation model of midwifery care used by most students is manual recording based on the Midwife's Practice Diary. This becomes impractical for several reasons, including taking longer time, risking data loss, piling up paper reports, and difficult data updating. Usually, the data that is filled out manually is incomplete due to time constraints and some items are often considered unimportant. Therefore, innovation in the field of midwifery medical records is necessary so that the recording process can be carried out more effectively and efficiently (Kim & Park, 2019). Web-based digital patient data recording methods can be an alternative to overcome the various limitations of manual recording.

## How to Cite:

Mutiah, C., Abdurrahman, A., Iswani, R., Putri, I., & Nazar, M. (2023). Implementation of Web-Based Case Midwifery Notes Documentation System (CMNotes) for Intra Natal Care. *Jurnal Penelitian Pendidikan IPA*, 9(3), 1320–1326. <https://doi.org/10.29303/jppipa.v9i3.3281>

Computerized recording systems are one of the most popular trends in the documentation of midwifery and nursing care (Ma et al., 2014). Many institutions are starting to build or buy computerized systems that support midwifery practice. Various groups in the health care industry use the term computer in various ways, one of which is computer-based patient records (CPR). Computer Based Patient Record (CPR) is a computer system that plays a role in concluding, storing processes, providing information needed in midwifery service activities, research, and education (Kerkin et al., 2018). This model contains all forms of clearly programmed notes. making it easier for practitioners in the diagnostic process and reducing traditional recording activities. The advantages of CPR are that records can be read clearly, records are always on hand, productivity of midwives improves, reduces damage to records, supports the process of midwifery care, reduces redundant documentation, midwifery records are well categorized, reports are printed automatically, documentation is in accordance with standards of midwifery care, and ensuring data availability.

Several electronic recording systems have been implemented, including the Academic Electronic Health Record (AEHR) used by the Faculty of Bachelor of Science in Nursing (BSN). The results of his study indicate that students who use AEHR can build their knowledge by learning from clinical cases, analyzing evidence-based clinical problems, learning collaboratively, being rich in technology, and improving competence. In addition, AEHR can provide an opportunity for clinical instructors to directly review cases obtained by students (Jenkins et al., 2018). Another work developed by (Craswell et al., 2021) named ieMR was found to be acceptable and positive toward the use of the system by midwives and childbearing women in Australia.

Here in, we report the successful implementation of Case Midwifery Notes (CMNotes) as a web-based documentation of midwifery case report in a midwifery study program, Aceh health polytechnics, Indonesia. CMNotes is a digital-based documentation system designed to develop learning methods and interactive consultations between students and lecturers as well as clinical supervisors (Mutiah et al., 2021). CMNotes facilitates digital and comprehensive recording of patient data starting from assessment, diagnosis, plan of care, implementation to evaluation based on Varney's management principles and Subjective Objective Analysis Planning (SOAP) documentation. The concept of CMNotes documentation begins with the Maternal Maternity assessment format considering the competence of midwives in intranatal care and is continued to be developed in other assessment formats as needed (Altameem, 2011).

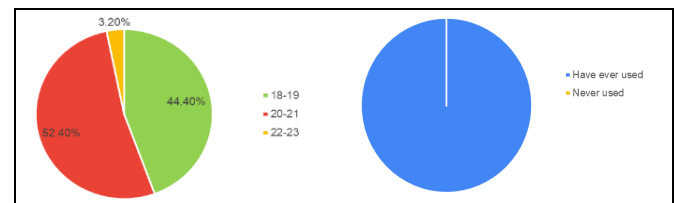
As digital technology utilization in every sector increase by time to time including in health sector, it is important to make such as an effort to migrate the manual documentation to digital mode of documentation in order to provide more reliable and handy documentation system in midwifery sector by introducing web based CMNotes. The system is expected to provide complete but easy to use as intra natal care documentation system.

**Method**

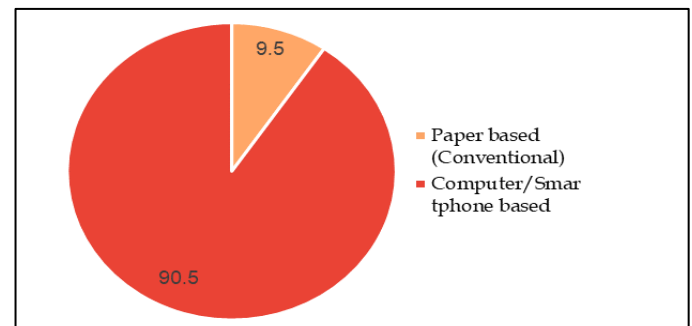
This work is based on the research and development deploying the model of AD-DIE which starts from need analysis either the curriculum and the computer-based system, design, development, implementation, and evaluation. This paper focus on the implementation of the system in the real classroom of midwifery students at Aceh health polytechnic located in the city of Langsa. The students who enrolled in the course of childbirth care were asked to fill both the need analysis questionnaire, their characteristics and preferences in childbirth documentation, and the PSSUQ.

*Respondent demographic and characteristics*

63 students aged between 18 and 23 years from a health polytechnic of Aceh, Lang-sa took part in the implementation of the system. The characteristics of students involved in this study was predetermined prior to the implementation of the system, including their ability to operate a computer or a system, preferences in documenting a midwifery case, and experience of using a web-based system.



**Figure 1.** Age of Participants and their Experiences of using a Web-based Application



**Figure 2.** Documentation mode as selected by respondents

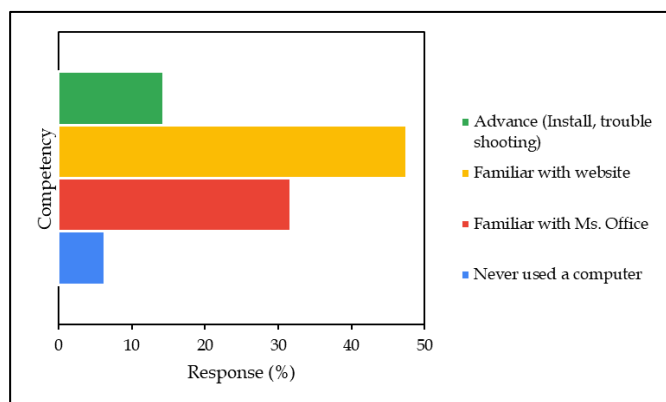


Figure 3. The ability participants in operating computers

Figure 1, 2 and 3 illustrate the demographic and the characteristics of respondents. More than a half of students aged between 20 and 21 years old, yet the students aged between 22- and 23-year-old only 3.2% of respondents. Furthermore, all students have used a web-

based application, but we did not explore further about system that students used before. When asked about the documentation mode they preferred, vast majority of students would rather choose the computer or smartphone-based documentation system.

Research instruments

The Post-Study System Usability Questionnaire (PSSUQ) with minor modification was used to explore the user experience after using the CMNnotes system. The PSSUQ is a 19-item standardized questionnaire widely used to measure users’ per-ceived satisfaction of a website, software, system, or product at the end of a study. PSSUQ originated from an internal IBM project called System Usability Metrics (SUMS) in 1988. The first version of the questionnaire consisted of 18 items, while the one used in this study is the version 2 which equipped by 19 questions modified by adding the space for users to give comments for each item.

Table 1. Modified PSSQ Questionnaire

Subscale	PSSUQ Question
Ease of use	Overall, I am satisfied with the ease of using this system
	The system is easy to operate
	I can complete maternity patient data effectively by using this system
	I can complete obstetric documentation, especially delivery quickly by using this system
	I can complete maternity obstetric documentation efficiently by using this system
Information quality	I feel comfortable using this system
	It is easy to learn how to use this system
	I believe I can increase my productivity by using this system
	The system provides error warnings and guidance to correct the error
	Whenever I make a mistake in using this system, I can fix it easily and quickly
User interface	The manual for using the system provides clear information
	I can get the information I need easily
	The information generated by the system is easy to understand
	The resulting information helps effectively in completing my tasks/goals
	The information displayed is well organized
	The interface used in this system is attractive
	I feel happy using the interface on this system
	This system has all the functions and capabilities I expected
	Overall, I am satisfied with this system

Due to modifications, the questionnaire was revalidated and retested for its reliability by using Cronbach alpha test as depicted in Table 2.

Table 2. Validity and reliability score of modified PSSUQ

Sub scale	Validity (%)	N	Items	Alpha
Ease of use	100	63	8	0.979
Information quality	100	63	7	0.974
User interface	100	63	4	0.951

All items are valid and reliable which are confirmed by the alpha score over 0.9 for individual subscale of the questionnaire. According to (Taber, 2018), a

questionnaire is considered to be reliable when the alpha value is greater than 0.6. The validity and reliability of the instrument are tabulated in Table 2.

Statistical Analysis

Statistical analysis was performed by using Cronbach’s alpha test. The item was considered reliable when alpha > 0.6. IBM SPSS Statistic ver. 25 was used as an ana-lyzing software.

Ethical Clearance

This research has passed ethical clearance from the Research Ethics Commission of the Faculty of Nursing, University of North Sumatra No: 2318/VI/SP/2021.

## Result and Discussion

Midwifery is an internationally recognized profession with practitioners throughout the world. A Midwife according to (Varney et al., 2004) is referred as a person who, having been regularly admitted to a midwifery educational program, duly recognized in the country in which it is located, has successfully completed the prescribed course of studies in midwifery and has acquired the requisite qualifications to be registered and/or legally licensed to practice midwifery. A midwifery must be capable of giving the necessary supervision, taking care, and advising the women during pregnancy, labor, and the postpartum period, conducting deliveries on her own responsibility, and taking care of the newborn and the infant. This care includes preventative measures, the detection of abnormal conditions in mother and child, the procurement of medical assistance and the execution of emergency measures in the absence of medical help. This definition of a midwife and her sphere of practice has been officially approved by the International Confederation of Midwives, the International Federation of Gynaecology and Obstetrics, and indeed the World Health Organization (Karlsdottir et al., 2018; Roache & Kelly, 2018).

To complete the responsibility and tasks leaning on the midwives, practicality in taking notes and documentation of each step taken during the pregnancy care is very much necessary and crucial in this current situation. CMNotes was introduced as a computer-based system that allows the students to not only document the pregnancy but also evaluate four crucial period of women pregnancy by using paperless work (Juwita et al., 2019). The system provides all necessary information needed by midwifery students to evaluate and monitor the pregnancy period. In addition, this system was designed to be integrated with a lecturers or field supervisors, they can monitor and assess students works through the system and give necessary comments or suggestions. The system flow chart is depicted in Figure 4.

Figure 4 illustrates the CMNotes system live cycle when a user starts the system. When the users start to login, they will be required to input the username, i.e Student's number or teacher registration number and password which will allow the users to view their brief profile. Student user will be able to fill in the basic data of patient such as name, age, sex, etc. followed by adding the Intra Natal Care (INC) data, previous pregnancy data, and all 4 period of patient pregnancy record. When all data submit-ted to the instructor or lecturer, they will have an opportunity to evaluate the data prior to approval. But if the data submitted by students are incorrect of incomplete, lecturers could ask students to revise and resubmit the data for reevaluation.

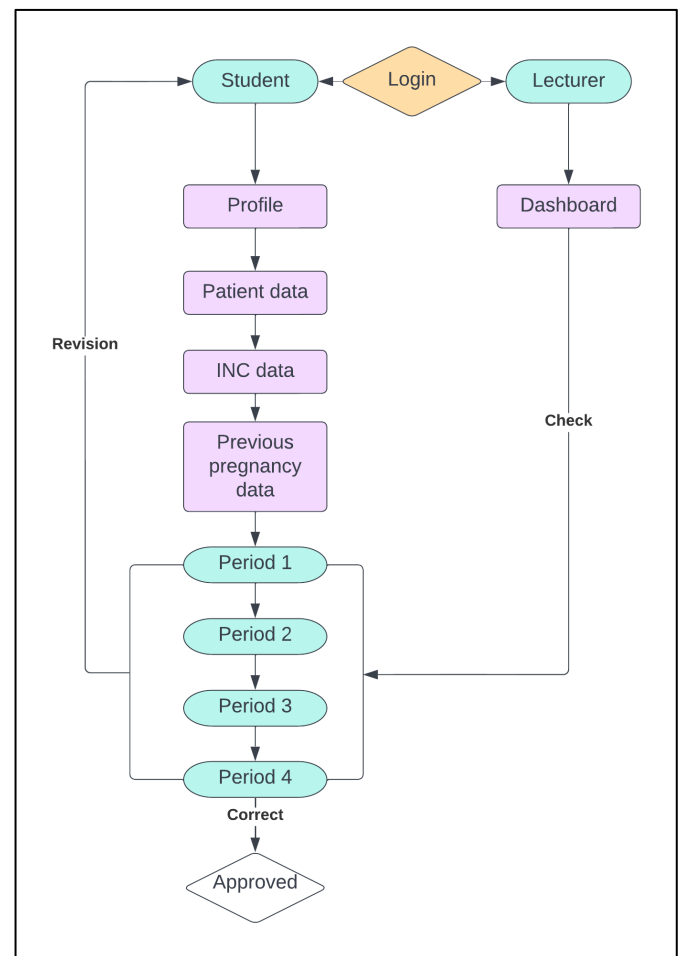


Figure 4. Flowchart of system live cycle

After implementing CMNotes in the classroom for several meetings, students were distributed usability questionnaires to be answered according to the students' experience in using this system. User experience is very important for a system because it determines whether a system still needs further improvements or is ready for mass release. The results of the usability measurement using the PSSUQ instrument can be seen in Figure 5.

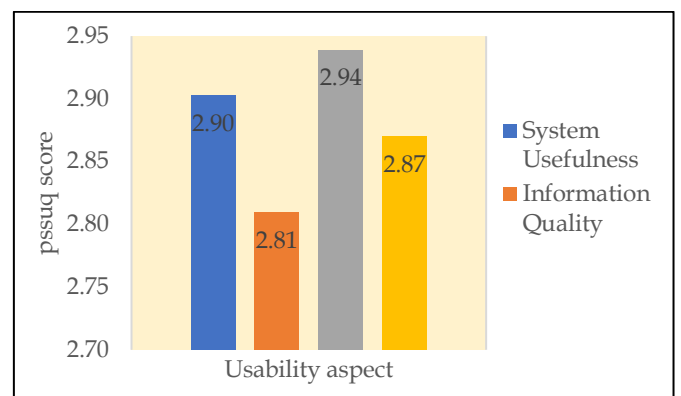


Figure 5. PSSUQ Score of the CMNotes system

The evaluation results indicates that the information quality of the system was found to be



optimal with the lowest PSSUQ score, while the interface quality scored quite close to 3 but overall, the system performance is outstanding due to lower score of the PSSUQ. The students found that the system is useful for their subject of mid-wifery documentation as shown by the lower score given for the question number three to five respectively "I can complete maternity patient data effectively by using this system"; "I can complete obstetric documentation, especially delivery quickly by using this system; "I can complete maternity obstetric documentation efficiently by using this system". This is a very essential part of the system that fit the needs of students in comprehending the course. Furthermore, the information provided by the system scored the lowest indicating better quality compared to the other subscales.

When asked about the information clarity provided by the system, students gave the lowest overall score for the item number 11 and 12 (2.66) indicating that the system of CMNotes provide information needed by student effectively and comprehensive-ly. However, the interface quality scored the highest among subscales of the questionnaire especially the item number 17: " I feel happy using the interface of this system" (Score=3.00), this score is the highest compared to other items. Therefore, the comments and suggestions of students at the end of the questionnaire which will be explained later in this article is dominated by the user interface problems.

PSSUQ is the most widely used and cited questionnaire for measuring the perception of the user experience of a system or website besides SUS(Madan & Dubey, 2012; Nazar et al., 2020b; Nielsen & Molich, 1990). The PSSUQ score determine how ease and friendly is the system in terms of usefulness, the quality of information provided, and the user interface (UI). The questionnaires use a seven-point response scale with lower scores indicating better performance. In addition to the original items, we added the blank space at the end of the questionnaire to let the respondents give the suggestions or comments for the future development of the system as tabulated in Table 3.

The system was developed using php and html which is compatible with most devices including laptop, personal computer, tablet, or smartphone. However, internet access is needed each time the system is used. Therefore, some users suggested that the system should be upgraded to be an Android app thus provide more practical use because some users having problems with internet access when operating the system (Haßler et al., 2016). Switching the system from web based to app based would require further work and a complete redevelopment of the system (Banu & Vijayakumar, 2013; Oyedele et al., 2013; Sheikh et al., 2013). Some advantages that we could achieve if the system upgraded to an Android application are including

practicality improvement, web hosting is no longer required, and the user could avoid internet access while using the system because it only requires one time installation (Liu & Yu, 2011; Nazar et al., 2020a).

**Table 3.** Users comments toward the implementation of CMNotes system

User comment
The system should be upgraded to an Android app for more practical use
Some features should be updated
Update should be made to increase its practicality
Some non-essential data of patients should be removed
The system is good, but some explanation should be added to guide the user more effectively
The system is fun to use, but internet connectivity sometimes become a problem
The system was very useful for me in documenting the data
I hope this system should be introduced to wider audience
I am happy with this system and useful for me while doing my job
The system provides an easier way for students in recording patients' data
Internet connection problem
The system should be upgraded to an app that requires no internet to access
I hope the system is distributed and known by many people

Web-based applications are applications that can be developed using HTML, PHP, CSS, JS languages that require a web server and browser to be able to run it such as Chrome, Firefox or Opera which will be able to provide comfort in using web-based applications properly but not excessive. Web-based applications have several advantages, including: 1) the system usually does not require large specifications to run, 2) the system does not require a related license to use it. 3) The system can be run with various operating systems (OS) such as Windows, Linux, Mac, etc.(Meenakshi, 2013) in other words, has high and wide compatibility, and 4) The system can be viewed and viewed whenever and wherever you are, but must be constantly connected to a stable internet network. However, web-based systems are highly dependent on the availability of a good and stable internet network to be able to access a project that will be created (Huang & Fang, 2023). In addition, a web system also requires a good network security system so that the work created will be better and last for a long period of time so that additional costs are needed for hosting and cyber security services (Othman et al., 2020). Therefore, upgrading the CMNotes system from a web-based system to a stand-alone application without an internet connection is needed.

## Conclusion

The web-based delivery care documentation system application (CMNotes) has met the expectations

desired by users to digitally documenting and assisting both students and lecturers in care decision making. The overall PSSUQ score (2.81) indicates that the system is user friendly and easy to use, the user interface is classified as good quality, and the information provided by the system is optimally useful for students in comprehending the midwifery care documentation. Most users suggest that the system should be upgraded to a mobile app version due to internet connection concern and practicality.

## Acknowledgments

We would like to acknowledge the ministry of health for the research funding contract number: LB.02.01/3530/2021.

## References

- Altameem, T. (2011). Contextual Mobile Learning System for Saudi Arabian Universities. *International Journal of Computer Applications*, 21(4), 21–26. <https://doi.org/10.5120/2499-3377>
- Banu, S., & Vijayakumar, K. (2013). an Ide for Android Mobile Phones With Extended Functionalities Using Best Developing Methodologies. *International Journal of Computer Networks & Communications*, 5(4), 131–145. Retrieved from <https://airccse.org/journal/cnc/5413cnc11.pdf>
- Craswell, A., Kearney, L., McAtee, J., Hadland, M., Smyth, W., & Nagel, C. (2021). Impact of Electronic Medical Records within the Maternity Environment: An Ethnographic Exploration of Midwifery Practice. *Studies in Health Technology and Informatics*, 284, 528–530. <https://doi.org/10.3233/SHTI210788>
- Dawson, K., Forster, D. A., McLachlan, H. L., & Newton, M. S. (2018). Operationalising caseload midwifery in the Australian public maternity system: Findings from a national cross-sectional survey of maternity managers. *Women and Birth*, 31(3), 194–201. <https://doi.org/10.1016/j.wombi.2017.08.132>
- Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*, 32(2), 139–156. <https://doi.org/10.1111/jcal.12123>
- Huang, H. M., & Fang, Y. W. (2023). The effectiveness of designing and evaluating i-STAR applications in pediatric nursing courses. *Heliyon*, 9(1), e13010. <https://doi.org/10.1016/j.heliyon.2023.e13010>
- Jenkins, A., Eide, P., Smart, D., & Wintersteen-Arleth, L. (2018). Implementing Electronic Health Records in Nursing Education. *International Journal of Nursing Student Scholarship*, 5, 1–28. Retrieved from <https://journalhosting.ualgary.ca/index.php/ijn>
- ss/article/view/56869
- Juwita, J., Ahmad, M., Syarif, S., Mappaware, N. A., Prihantono, P., & Bahar, B. (2019). Recording Data Labour With Documentation Midwifery Based On Word Electric Browser (WEB). *Global Journal of Health Science*, 11(5), 149. <https://doi.org/10.5539/gjhs.v11n5p149>
- Karlsdottir, S. I., Sveinsdottir, H., Kristjansdottir, H., Aspelund, T., & Olafsdottir, O. A. (2018). Predictors of women's positive childbirth pain experience: Findings from an Icelandic national study. *Women and Birth*, 31(3), e178–e184. <https://doi.org/10.1016/j.wombi.2017.09.007>
- Kerkin, B., Lennox, S., & Patterson, J. (2018). Making midwifery work visible: The multiple purposes of documentation. *Women and Birth*, 31(3), 232–239. <https://doi.org/10.1016/j.wombi.2017.09.012>
- Kim, J. H., & Park, H. (2019). Effects of Smartphone-Based Mobile Learning in Nursing Education: A Systematic Review and Meta-analysis. *Asian Nursing Research*, 13(1), 20–29. <https://doi.org/10.1016/j.anr.2019.01.005>
- Liu, J., & Yu, J. (2011). Research on development of android applications. *Proceedings - 2011 4th International Conference on Intelligent Networks and Intelligent Systems, ICINIS 2011*, 69–72. <https://doi.org/10.1109/ICINIS.2011.40>
- Ma, L., Gu, L., & Wang, J. (2014). Research and development of mobile application for android platform. *International Journal of Multimedia and Ubiquitous Engineering*, 9(4), 187–198. <https://doi.org/10.14257/ijmue.2014.9.4.20>
- Madan, A., & Dubey, S. K. (2012). Usability Evaluation Methods: a Literature Review. *International Journal of Engineering Science and Technology*, 4(2), 590–599.
- Meenakshi. (2013). Importance of ICT in Education. *Journal of Research & Method in Education*, 1(4), 3–8. Retrieved from <https://www.iosrjournals.org/iosr-jrme/papers/Vol-1%20Issue-4/B0140308.pdf>
- Mutiah, C., Emilda, A. S., & Abdurrahman, A. (2021). Prototype Design Of Case Midwifery Notes (Cmnotes) Website-Based Of Maternity Care At Program Study Diploma III Midwifery Langsa. *Jurnal Kesehatan Indra Husada*, 9(2), 43–50. Retrieved from <https://ojs.stikesindramayu.ac.id/index.php/JKI> H/article/view/323
- Nazar, M., Aisyi, R., Rahmayani, R. F. I., Hanum, L., Rusman, R., Puspita, K., & Hidayat, M. (2020a). Development of Augmented Reality application for learning the concept of molecular geometry. *Journal of Physics: Conference Series*, 1460, 012083. <https://doi.org/10.1088/1742-6596/1460/1/012083>
- Nazar, M., Zulfadli, Z., Oktarina, A., & Puspita, K.

- (2020b). Development of Android-Based Interactive Learning Applications to Help Students in Learning Electrolyte and Nonelectrolyte Solutions. *Jurnal Pendidikan Sains Indonesia*, 8(1), 39–54. <https://doi.org/10.24815/jpsi.v8i1.16047>
- Nielsen, J., & Molich, R. (1990). Heuristic evaluation of user interfaces. *Conference on Human Factors in Computing Systems-Proceedings*, 249–256. <https://doi.org/10.1145/97243.97281>
- Othman, N., Khairuz, M., Bin, S., Soe, T., & Jamaludin, S. (2020). Practique Clinique et Investigation The Impact of Electronic Gadget Uses with Academic Performance among Secondary School Students. *Research Article*, 2(2), 56–60. Retrieved from <https://www.tridhascholars.org/pdfs/the-impact-of-electronic-gadget-uses-with-academic-performance-among-secondary-school-students-PCI-02-1015.pdf>
- Oyedele, V., Rwambiwa, J., & Mamvuto, A. (2013). Using Educational Media and Technology in Teaching and Learning Processes: A Case of Trainee Teachers at Africa University. *Academic Research International*, 4(1), 292–300. Retrieved from [http://www.savap.org.pk/journals/ARInt./Vol.4\(1\)/2013\(4.1-30\).pdf](http://www.savap.org.pk/journals/ARInt./Vol.4(1)/2013(4.1-30).pdf)
- Roache, B., & Kelly, J. (2018). A research method to explore midwives' views of national maternity service reforms. *Women and Birth*, 31(3), e216–e221. <https://doi.org/10.1016/j.wombi.2017.09.014>
- Sheikh, A. A., Ganai, P. T., Malik, N. A., & Dar, K. A. (2013). Smartphone : Android Vs IOS. *The Standard International Journals*, 1(4), 141–148. <https://doi.org/10.9756/SIJCSEA/V1I4/0104600401>
- Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48(6), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Tierney, O., Sweet, L., Houston, D., & Ebert, L. (2018). A historical account of the governance of midwifery education in Australia and the evolution of the Continuity of Care Experience. *Women and Birth*, 31(3), e210–e215. <https://doi.org/10.1016/j.wombi.2017.09.009>
- Varney, H., Kriebs, M. J., & Geger, L. C. (2004). *Varney's Midwifery*. In *アジア経済* (4th ed.). Jones and Bartlett Publishers.