



Integrating Digital Technology into The Information Literacy (TIL) Model for Pregnant Women's Literacy Programs

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Abstract. Health information literacy is very important for pregnant women because maternal behavior affects the health of mothers and children. In fact, there is still an inability for pregnant women to find information related to pregnancy, resulting in a high maternal and child mortality rate. The purpose of this research is to develop a TIL (The Information Literacy) model assisted by digital technology in the literacy program for pregnant women. This research used the Research and Development (R&D) method. The sample in this study was pregnant women in the Rancaekek District, West Java. The instruments used in this study were questionnaire sheets, observation sheets, and tests. The research stages were determining potential and problems, collecting data, designing products, validating designs, revising designs, conducting product trials, and revising products based on trials. The data analysis technique used was descriptive quantitative. The results of the study showed that the Information Literacy (TIL) model assisted by digital technology developed for the pregnant women's literacy program was valid and able to improve the ability of pregnant women to relay information. Thus, this model can be used for pregnant women as an information-literate pattern to get various pregnancy-related information.

Keywords: Digital Technology, Pregnant Women Literacy Program, TIL Model.

1 Introduction

A normal pregnancy is a healthy and safe pregnancy for the mother and fetus. Normal pregnancy requires good preparation before pregnancy, proper care, a healthy lifestyle, and a supportive environment (WHO, 2022). Balanced nutrition and proper physical activity are the keys to an ideal pregnancy. Pregnant women are also recommended to eat a balanced nutritious diet and engage in light physical activity regularly to maintain their health and fetal development (Chalas, 2020). All can be achieved if pregnant women have enough knowledge about pregnancy and childbirth. The knowledge possessed can be used to make the right decisions and prepare for pregnancy, childbirth,

and postpartum. Lack of knowledge during pregnancy can lead to delays in seeking appropriate care that can harm the health of the mother and fetus (Shija et al., 2019).

One of the indicators for national health is healthy pregnancy (WHO). Unfortunately, pregnant women in Indonesia have minimal pregnancy knowledge. Data obtained from the Ministry of Health shows that Indonesia is ranked third in the highest mortality rate in ASEAN. Data from the Maternal Perinatal Death Notification (MPDN) shows that the maternal mortality number in Indonesia in 2022 reached 4,005 and in 2023 it increased to 4,129. Meanwhile, infant mortality in Indonesia in 2022 was as many as 20,882 and in 2023 it was recorded at 29,945. Indonesia's Ministry of Health revealed that maternal mortality was caused by eclampsia, while infant mortality was caused by low body weight and born prematurely (Ministry of Health Republic Indonesia, 2019).

Studies show that one of the solutions to meet the needs of pregnant women is to provide adequate information about pregnancy. Research conducted by Renkert and Nutbeam (2001), Kilaru et al. (2016), Nutbeam (2008), and Shieh and Halstead (2010) stated that pregnant women need information about pregnancy development, health, nutrition, fetal care, and preparation for childbirth. This information is processed and internalized into knowledge (Dalkir, 2011), which is then used by pregnant women as a guideline in undergoing pregnancy. This statement is reinforced by research data conducted in the period 2014 to 2023 (see for example Kilfoyle et al., 2016; Mackey & Jacobson, 2014; Miller & Carter, 2023).

Pregnancy information can be fulfilled through information literacy programs. Damaianti (2021) explained that various literacy functions are manifested in various types of literacy, one of which is information literacy. Zurkowski (in Damaianti, 2021) defines information literacy as the ability to use techniques and skills through information tools to produce information. However, in reality, there is still a low level of information literacy skills for pregnant women. Studies show that 60-70% of pregnant women have a low to moderate level of health information literacy (Smith & Jones, 2022), while Nuraini and Arifianto (2017) explained that 58.3% of pregnant women have a low level of health information literacy. In addition, Rahmawati et al. (2019) explained that 62.7% of pregnant women have difficulty finding and understanding health information from credible sources. Kurniasari and Rachmawati (2018) stated that 54.8% of pregnant women have a low ability to evaluate the accuracy of health information obtained from social media, while Pratiwi and Fatimah (2020) found that 59.2% of pregnant women have low digital literacy in accessing online health services.

Fostering information literacy among pregnant women can be done by developing a model that is easily accessible and searchable. Increased knowledge about pregnancy, greater participation in health care, and better self-care behaviors during pregnancy are indicators of good health literacy (Kilfoyle et al., 2016). Health literacy of pregnant women helps increase their knowledge and awareness of needs and risks during pregnancy (Ministry of Health of the Republic of Indonesia, 2019). One of the models that can improve the literacy of pregnant women is The Information Literacy (TIL) Model. Hidayah (2017) explained that the TIL Model includes the development of principles, settings, stages of activities, development steps, and evaluation. This model was chosen

because it provides a framework for identifying, accessing, evaluating, and using information effectively. The TIL model also teaches how to find relevant sources of information (Bruce, 1997) as well as assess the quality and relevance of information (Mackey & Jacobson, 2014).

The TIL model that will be developed will be combined with digital literacy so that pregnant women can easily improve information literacy related to pregnancy knowledge. Digital technology is information technology that prioritizes computer/digital-based activities rather than using human labor (Muhamad, 2019). Information literacy is needed to understand digital technology related to information and communication (Hidayat & Khotimah, 2019). Rahmah and Wijayanti (2019) explained that the TIL model supported by digital technology makes it easier for pregnant women to access relevant and reliable information. The information can be obtained through online sources such as government websites and health organizations. TIL model functions as a tool for pregnant women in carrying out literacy activities, while digital technology, such as websites, functions as a forum to get literacy guidance and as a source of information.

Several studies investigated digital technology assisted in developing health information literacy. Smith and Jones (2022) evaluated existing digital health literacy interventions for pregnant women and found it has the potential to improve health literacy. In addition, Miller and Carter (2023) revealed that integrating digital information literacy skills into the material of health education programs is important in increasing literacy skills. It highlights, however, the need for a more holistic approach to teaching information literacy, which includes not only technical skills but also critical thinking and information evaluation.

This current study fills the gaps in the literature by not only applying TIL but also adapting and developing the model to improve health information literacy for Indonesian pregnant women. Moreover, this research also combines the well-established Information Literacy (TIL) Model with the latest digital technology. This model is expected to be a reference in the development of information literacy programs in other health fields, as well as strengthen the role of digital technology as the main supporting tool in public health education. Therefore, the purpose of this research is to develop a TIL model assisted by digital technology in the literacy program for pregnant women.

2 Method

The purpose of this study was to produce The Information Literacy (TIL) Model assisted by digital technology in the literacy program for pregnant women. Therefore, this research is included in research and development (R&D) because this research produces a product in the form of a digital technology-assisted TIL model. The Research and Development (R&D) method is research used to produce, develop or refine, validate products, and test the effectiveness of these products, (Sukmadinata, 2012; Sugiyono, 2016; 2022). The design used in this study followed steps starting from potential and problems, data collection, product design, design validation, and design revision, to product trials, product revision, usage trials, product revision, and finally

mass products. However, in this study, it was only carried out until the seventh stage, namely product revision after product trials.

The population in this study was pregnant women in West Java province with a population of 90 people. The sample in this study was pregnant women in the Rancaekek District, West Java, totaling 26 people. Using the purposive sampling technique, the sample was chosen by considering their low level of education. This is because the survey results show that the problem of low information literacy is a low level of education. The instruments used in this study were questionnaires, observations, and tests. Questionnaires were used to see potential problems, design validation, and responses after using the model with indicators. Observation was used for the shortcomings and advantages of the model when used with indicators. The test was used to measure the information literacy skills of pregnant women with indicators. The data analysis technique used was the descriptive data analysis technique.

3 Findings and Discussion

3.1 Potential Problems and Literacy Needs Analysis for Pregnant Women

Sugiyono (2016) stated that in developing a product, there are steps that must be taken, starting from potential and problems, data collection, product design, design validation, design revision, to product trial, product revision, use trial, product revision, and mass product. However, this current study only started from the beginning to the seventh stage, namely product revision.

In identifying the potential problems, the team read the literature on information literacy for pregnant women. Based on the reading, it was found that there are several problems and needs of pregnant women in Indonesia. First, not all pregnant women can access pregnancy information. This is due to the lack of facilities, low education, not finding reading sources, limited literacy skills, and difficulties in understanding information. Utami and Nurdiah (2020) explained the main challenges faced by pregnant women in rural areas in accessing health information, including the long distance from health facilities, low education, and culture and myths that are still strong. Second, the literacy ability of pregnant women is still limited. The low literacy level of pregnant women is caused by the low knowledge and education of pregnant women and their partners, lack of questions, and still believing in myths. The level of health literacy of pregnant women in Indonesia still needs to be improved, especially in the ability to access and criticize health information from various sources (Andajani & Nurhayari, 2019). Third, online applications or resources are needed to find pregnancy information for pregnant women. One of the efforts to improve the health literacy of pregnant women is to provide online information sources that are easily accessible and contain credible, complete information, and presented with interesting visualizations such as infographics (Rahmadiana, 2020). In addition, features that are needed and must be present on the website, namely pregnancy development, explanations in which there

are infographics, maternal and fetal health information that is credible and accurate sources, and nutritional needs. In developing maternal and child health applications or websites, it is important to provide complete and accurate information about pregnancy development, nutritional needs, and explanations accompanied by infographics or visualizations to facilitate understanding (Ministry of Health Republic Indonesia, 2020). Finally, an effective way to overcome the problem of low literacy levels among pregnant women, namely holding frequent meetings, socialization/counseling, cross-sectoral cooperation, and making a display on the website. To reach pregnant women more effectively, health information should be presented in an attractive form, for example through an interactive and easy-to-understand website or application (Lusiana et al., 2019).

Departing from these initial potential problems, the team obtained the data from the Health Office in the provincial chapter of West Java and the municipal chapter of Bandung Regency. In addition, data was obtained from midwives and doctors based on responses to questionnaires from nine questions about health.

3.2 Design and Validation of the Digital Technology-assisted TIL Model in the Pregnant Women Literacy Program

After the problems and needs are obtained, then the team designed the model and product. Product design is the activity of designing a TIL model with syntax, namely task definition, strategies for finding information, location and access, information use, synthesis, and evaluation. The web is used to set necessary information about pregnancy. The designed model has a structure, namely orientation, syntax, reaction principles, social systems, and supporting systems. The components of the model include the syntax, the social system, the principles of reaction, the support system, and the instructional and nurturant effects (Joyce et al., 2015). Each learning model has components that include: (1) orientation, (2) syntax, (3) reaction principles, (4) social systems, and (5) support systems (Trianto, 2010).

Inside the structure is the syntax of the designed TIL model. The syntax of the TIL model assisted by digital technology in the information literacy program for pregnant women consists of task definition, information search strategies, location and access, information use, synthesis, and evaluation. The model and syntax are set in online form, namely in the form of a web view. The features provided on the Web include the homepage, key features, the gallery, and the Frequently Asked Questions (FAQ). In the home menu, the website cover feature is provided, a joining column, information content on how to be literate, 4-T infographic content, a website user testimonial column, website program development team profile content, interaction columns, and location information. The main menu is available, namely the pregnancy menu, health menu, nutrition menu, and pregnancy problem menu. Furthermore, a gallery menu is available, namely implementation planning, and evaluation. Finally, the Frequently Asked

Question (FAQ) Content menu contains a list of questions and answers. The main pages that must be on a website include: the home page, about page, gallery page, and FAQ page (Kyrnin, 2022). Common features found in many successful websites include: a home page, a main content area, a multimedia gallery, and an FAQ page (Brinck et al., 2002). Fig. 1 shows an illustration of the web display, which is called Bumil Literacy (Literacy for Pregnant Women).



Fig. 1. The web view of the digital-based TIL model.

After the design is done, the next step is to validate the design. The pre-designed model must be validated to see the validity or correctness of the model. The validity test of the TIL model was carried out by three expert validators, namely one faculty in the mid-wifery department, one IT lecturer, and one senior midwife on duty at the health center. There are six indicators used to measure validation, namely visual design aspects, navigation aspects, technical aspects, material aspects, TIL model aspects, and language aspects. The indicators used to measure the validation of financial literacy media include visual design aspects, navigation aspects, technical aspects, and material aspects (Wahyuningsih, 2017). The validation results showed that the average value of the model validation developed was 92, which means a very valid category. The advice given by the expert validators is that the size of the main letters is too small, the material menu on the website should be more applicative, and less colorful display, and clearer captions of pictures so that they are easy to read.

3.3 Digital Technology-Assisted TIL Model in the Pregnant Women Literacy Program

The website-assisted TIL model was developed with the aim of improving literacy skills for pregnant women, so that each stage of the model is directed at literacy activities tailored to the needs of pregnant women. The implementation of digital technology-assisted TIL model training in information literacy programs for pregnant women is carried out in the following orders. First, start by introducing the TIL model that will be used and explaining the benefits of using the model later by pregnant women who were the 26 participants of the research. After the model was introduced, the next step was to apply the TIL model syntax assisted by digital technology in the information literacy program for pregnant women. The syntax implementation of the model developed is as follows. Stage 1: Task Definition, Stage 2: Strategy for Finding Information, Stage 3: Location and Access, Stage 4: Use of Information, Stage 5: Synthesis, and Stage 6: Evaluate.

During the definition stage, pregnant women were instructed to open the website page that had been shared through the WhatsApp group. Furthermore, pregnant women were assigned to determine the need for information they wanted to search for on the website page. In the next stage, the strategy stage of seeking information, the participants were informed how to understand the menu contained in the Bumil Literacy website. Menus available on the web that can be accessed include pregnancy menus, health menus, nutrition menus, or pregnancy problem menus. Some of them are directed to other links such as Halo_Doc pages, info_ibu_hamil, and the official website of the health office.

Thirdly, the location and access, participants found the location/access related to the information needed. This activity was carried out with the aim of facilitating knowledge of pregnant women regarding the nutritional needs that must be met by pregnant women. The next step, the stage of information use, was to ask the participants to discuss the information they read with the closest people. This activity was used by researchers to conduct questions and answers with pregnant women regarding the information they had read. This stage aims to be able to make pregnant women able to conceptualize and plan the information read through the website to be implemented in daily life as needed.

After that, in the synthesis stage, the participant pregnant women independently measure themselves on the information obtained to maintain the growth and development and birth of future babies. The measurement was related to the information obtained whether it had met the needs or not. In the research, this process of measuring oneself is conveyed orally in turn. Some participants conveyed a synthesis of understanding related to the information they read. For example, participants took turns moving forward to answer questions given by researchers about information they had read on the web. This was done to see how well the literacy of information obtained by pregnant women was.

In the final stage, the evaluation stage, the participants reflect on literacy program training activities through the website-assisted TIL model. Two things were done in this activity. First, the participants filled out knowledge test questions that are available on the reflection section website. Second, the participants were asked to fill out a response questionnaire which is also available on the website. After the trainee clicked the yellow button, the participant would immediately enter the test question page that had been provided. The questions are 10 in total and are related to the information contained in the article read in the 3rd stage of location and access.

Based on the analysis of the responses given by pregnant women after using the TIL model assisted by digital technology, it is found that this developed model was quite effective. The effectiveness of the development of the TIL model assisted by digital technology in information literacy programs for pregnant women is seen from the test result which showed that the participants were able to use the information on the web. Based on the data analysis, the average score of the participants was 77 (good). In detail, the information literacy of pregnant women can be seen in Fig. 2.

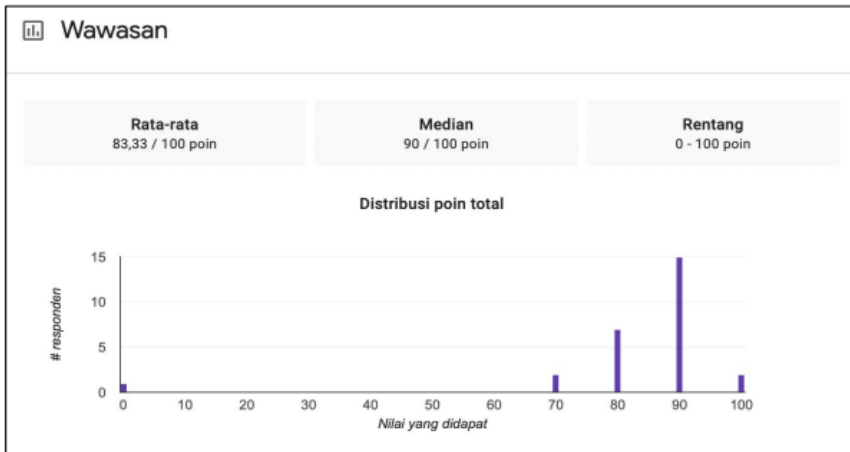


Fig. 2. Average score of information literacy based on TIL digital technology-assisted model.

As seen in Figure 2, the average score obtained is in the good scale category. This shows that the ability to use information literacy of pregnant women using the technology-assisted TIL model is very good. So, it can be concluded that the development of the TIL model assisted by digital technology in the information literacy program for pregnant women has succeeded in improving the ability of pregnant women to relay information. With this model, pregnant women can get information related to pregnancy very completely and easily. However, it also reveals that the literacy ability of pregnant women varies, ranging from high, medium, and low scores. The results of the analysis showed that the highest score was related to provocative information. For example, in questions related to information on the impact of malnutrition on the fetus, the results showed that 100% of pregnant women answered correctly.

An interesting finding related to information is the participants' memory of numbers. For example, the participant's answer to question number (8) related to the amount of folate that must be consumed during pregnancy. Of the 26 participants, only 23.1% correctly answered that the recommended amount of folate during pregnancy was 600-800 micrograms. A high error rate indicates confusion or lack of understanding, so more emphasis needs to be placed on the information.

The result of the findings, therefore, underscores the solution for improving information literacy. More specifically, it tried to overcome the low information literacy problem faced by pregnant women from low economic and educational backgrounds in the Indonesian context as pointed out by Kurniasari and Rachmawati (2018) and Rahmawati et al. (2019). It also confirms Smith and Jones (2022) as well as Miller and Carter (2023) which highlight the potential of a digital-assisted model to improve information literacy. With more and more access to technology, even to people from lower economic and educational backgrounds in Indonesia, it is likely that this TILL model can be developed for the next steps of R&D: use trial, product revision, and mass production.

Although the model developed has been able to solve the problems experienced by pregnant women, there are still shortcomings in this study. The synthesis stage on syntax has not been carried out properly due to the limitation of reporting time. Based on the data analysis that has been carried out, it can be concluded that the TIL model assisted by digital technology in the information literacy program developed is valid, practical, and effective for pregnant women to obtain knowledge related to pregnancy needs

4 Conclusion

Based on the results of the study, the following conclusions were obtained. First, the needs of pregnant women in finding information about pregnancy include, namely that not all pregnant women can access pregnancy information, pregnant women's literacy skills need to be improved, applications or online resources are needed to find pregnancy information, information that is needed and must exist in, and effective ways to be able to overcome the problem of low literacy levels of pregnant women, one of which is to make a pregnancy information display on the website. Second, the designed model has a structure, namely orientation, syntax, reaction principles, social systems, and supporting systems. Inside the structure is the syntax of the TIL model that is designed. The syntax of the digital technology-assisted TIL model in the information literacy program for pregnant women consists of task definition, strategies for seeking information, location and access, information use, synthesis, and evaluation. The validation results show that the average value of the model validation developed, which is 92 with a very valid category. Third, the implications of the TIL model in the field include several stages: first, pregnant women record the information needed; second, understanding the menu on the Bumil Literacy website; third, finding the location of

information access; fourth, discussing information with the closest people; fifth, self-measurement of the information obtained; and sixth, reflecting on literacy training activities using the TIL model.

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