# Development of Interactive Multimedia *Computer-Assisted Learning* Method for Empowering Breastfeeding Mothers in Family Learning Centers

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**Abstract**

*The low achievement of exclusive breastfeeding is a public health problem worldwide. Exclusive breastfeeding coverage in Indonesia in 2023 was recorded at only 67.94%, down from 2022. One contributing factor is the lack of support for breastfeeding mothers. Various strategies can be implemented to enhance family involvement, one of which is education through a family center learning approach. One method that can be used in providing education is the computer assisted learning (CAL) method. Develop interactive multimedia with the CAL method that can be used in family center learning to empower breastfeeding mothers. ADDIE model, to produce CAL-based multimedia applications. The method used to collect data was questionnaires and data analysis using descriptive statistics. Computer Assisted Learning-based multimedia design named "Successful Family-Based Exclusive Breastfeeding" with a web page https://sites.google.com/view/asi-ekslusif. The results of the trial to experts were all experts stated "Worth using" with an average score of 3.64 material experts and 3.8 media experts. The results of the trial to the breastfeeding mother's family were the average appearance aspect of 3.8 which means very feasible, the average material presentation aspect of 3.9 which means very feasible and the average benefit aspect of 3.8 which means very feasible. Computer Assisted Learning-based multimedia design named "Successful Family-Based Exclusive Breastfeeding" is suitable for use in family center learning to empower breastfeeding mothers.*

## INTRODUCTION

Breastfeeding or lactation is defined as the process of giving breast milk directly from the mother's breast to the baby without using a bottle or other device. Breastfeeding plays an important role in preparing the next generation of a country. Breast milk is a natural and optimal source of nutrition for newborns (1).

Low achievement of exclusive breastfeeding is a worldwide public health problem. According to WHO 66.7% of infants are not exclusively breastfed and this figure has not changed in recent times (2). Exclusive breastfeeding coverage in Indonesia in 2023 was recorded at only 67.94%, down from 67.96% in 2022 (3,4). Mean while, in West Sumatra province, the percentage of exclusively breastfed infants has increased in the last 3 years, from 74.16% in 2021 to 78.64% in 2023 (5). Although there is an increase every year, it still has not reached the target set by the government.

The Ministry of Health aims to increase the exclusive breastfeeding target to 80% (6). Based on the profile of the Padang City Health Office, the achievement of exclusive breastfeeding has not reached the target set by the

government where the achievement of exclusive breastfeeding in Padang City has decreased in the last 4 years, from 80.1% in 2029 to 67.7% in 2022 (7).

Many factors affect the success of exclusive breastfeeding besides breastfeeding mother factors, family factors also determine the success of breastfeeding (8–10). Breastfeeding requires a stable emotional condition, because the mother's psychology greatly affects milk production, therefore the role of the family is needed in the breastfeeding process (11). Family Center Learning (FCL) is an educational approach that involves families in the learning process to support breastfeeding mothers. Research shows that family involvement can improve exclusive breastfeeding success by providing emotional and practical support. It also increases family awareness of the importance of breastmilk and their role in supporting breastfeeding mothers. However, the implementation of FCL in Indonesia still faces various challenges, such as limited access to information and lack of interactive learning media (12,13).

Advances in digital technology offer great opportunities to address these challenges. The development of interactive multimedia, such as computer-based applications or mobile devices, can be an innovative solution in supporting the empowerment of breastfeeding mothers. Interactive multimedia not only provides easily accessible information, but also enables an engaging learning experience through visual, audio and interactivity elements. The study by Till et al. (2023) showed that the use of interactive multimedia can improve information retention and motivation of participants in health education programs (14).

In Indonesia, the development of interactive multimedia for empowering breastfeeding mothers is still limited. Most educational programs still use conventional methods such as lectures or leaflets, which are less effective in attracting audience attention. In fact, technology-based approaches have the potential to reach more breastfeeding mothers, including in remote areas. By integrating FCL principles, interactive multimedia can be an effective tool to engage families in supporting the success of exclusive breastfeeding (4,15).

Many methods can be used in providing education through *family center learning,* one of which is the *computer assisted learning* (CAL) method. The *computer Assisted learning* (CAL) method is usually used in teaching and learning activities that are assisted by a set of computers or better known as information technology (16). CAL-based multimedia applications are expected to increase the knowledge of families and breastfeeding mothers about the importance of exclusive breastfeeding using visuals that are attractive, easy to understand, and easy to access.

Based on the analysis, researchers need to develop interactive multimedia with the CAL method that can be used in *family center learning* to empower breastfeeding mothers. This development is expected to improve the knowledge, skills, and motivation of breastfeeding mothers and their families. Thus, this research contributes to efforts to increase exclusive breastfeeding coverage in Indonesia and support sustainable maternal and child health programs.

**METHODS**

Research and development (R&D) method. The development research model used is the ADDIE model. The stages of this research are potential problems, data collection, product design, design validation, design revision, product trial, analysis and report. Research using this method to produce CAL-based multimedia applications is expected to increase the knowledge of families and breastfeeding mothers about the importance of exclusive breastfeeding using visuals that are attractive, easy to understand, and easily accessible. At the development stage, testing was carried out with experts, namely 2 media experts and 2 material experts, then a small-scale test of 10 families / husbands of breastfeeding mothers at Mutiara Bunda Hospital.

**RESULTS AND DISCUSSION**

Based on the research that has been done, there is assessment data from material experts and media experts. Data from the assessment of *Computer Assisted Learning-based* **Multimedia** is as follows:
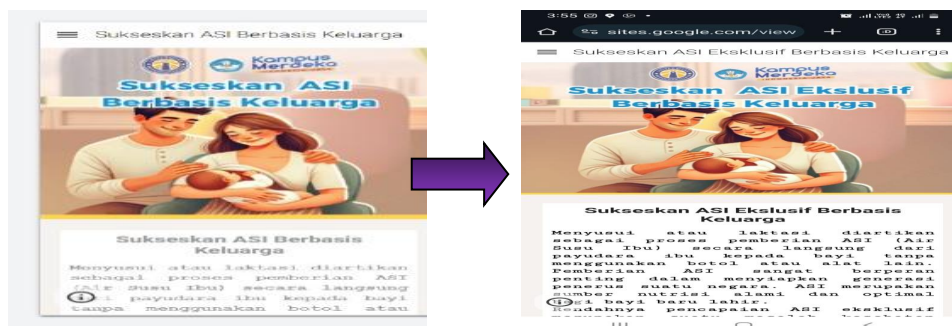
a. **Validation Stages**

   1) **Validation by Material Expert**

Data was obtained by providing an assessment sheet in the form of a questionnaire about the suitability of the material. The validation test was carried out by 2 material experts with an educational background of Master of Public Health and Megister of Midwifery where experts are lecturers of midwifery care courses in the puerperium and breastfeeding.  The assessment data can be seen in the following table:

**Table 1. Average Results of Material Aspect Assessment by Material Experts**

| No. | Statement | Expert Score I | | Average Score |
|---|---|---|---|---|
| | | Expert I | Expert II | |
| **Presentation and completeness of material** | | | | |
| 1 | Breast milk production | 3.00 | 4.00 | 3.50 |
| 2 | Exclusive breastfeeding | 3.00 | 4.00 | 3.50 |
| 3 | Correct Breastfeeding Technique | 3.00 | 3.00 | 3.00 |
| 4 | Expressed Breast Milk | 3.00 | 4.00 | 3.50 |
| **Device Usage** | | | | |
| 5 | The device can be operated easily | 4.00 | 4.00 | 4.00 |
| 6 | Every Video and game is easy to operate | 4.00 | 4.00 | 4.00 |
| 7 | Navigation buttons on the device work as per their function | 4.00 | 4.00 | 4.00 |
| | **Total Score** | | | 25.5 |
| | **Average Score** | | | 3.64 |

The results of the validation test with material experts, all of whom stated "Worth using with revisions" both experts said "the application is easy to use, interactive and innovative with games on the web, a little might be improved such as the color of the writing is a bit blurry, it should be clarified so that the spirit of reading it". based on these results that initially the writing was gray replaced with black.



**Image. Application writing before revision (left) with after revision (Right)**

The results of the material expert validation with the assessment reference obtained an average score of 3.64. then based on the aspect of material presentation in Computer *Assisted Learning-based* multimedia named **"Successful Family-Based Exclusive Breastfeeding"** can be categorized in **very feasible** criteria.

**2) Media Expert Validation**

Data is obtained by providing an assessment sheet in the form of a questionnaire about the suitability of the material. The validation test was carried out by 2 media experts with a Master of Computer Science educational background. The assessment data can be seen in the following table:

**Table 2. Average Results of Material Aspect Assessment by Media Experts**

| No. | Statement | Expert Score I | | Average Score |
|---|---|---|---|---|
| | | **Expert I** | **Expert II** | |
| **Presentation** | | | | |
| 1 | The cover design quality is attractive. | 4.00 | 4.00 | 4.00 |
| 2 | The combination of *background* color and text is clear. | 4.00 | 4.00 | 4.00 |
| 3 | The font size is easy to read. | 4.00 | 4.00 | 4.00 |
| 4 | The shape or typeface is easy to read. | 4.00 | 4.00 | 4.00 |
| 5 | The font size and spacing of the text are harmonious. | 3.00 | 4.00 | 3.50 |
| 6 | The font size and the image match. | 3.00 | 3.00 | 3.00 |
| 7 | The layout of the navigation buttons is appropriate. | 4.00 | 3.00 | 3.50 |
| **Device Usage** | | | | |
| 8 | The device can be operated easily | 4.00 | 4.00 | 4.00 |
| 9 | Every Video and game is easy to operate | 4.00 | 4.00 | 4.00 |
| 10 | Navigation buttons on the device work as per their function | 4.00 | 4.00 | 4.00 |
| | **Total Score** | | | **38** |
| | **Average Score** | | | **3.8** |

Based on the results of the validation test with media experts, it was stated that "It is feasible to use without revision". both experts said "the multimedia application is quite interactive, the video is quite informative and the device runs smoothly".

The results of the media expert validation with the assessment reference obtained an average score of 3.8. then based on the aspects of presentation and use in *Computer Assisted Learning-based* multimedia named **"Successful Family-Based Exclusive Breastfeeding"** can be categorized in **very feasible** criteria.


**b. Small Scale Trial Results**

Data collection in this small-scale trial was carried out using a questionnaire instrument. The questionnaire was used to obtain data in the form of family assessments of breastfeeding mothers about the quality of *Computer Assisted Learning-based* multimedia named **"Family-based Exclusive Breastfeeding Success".** In the small-scale trial, the object of the trial was the husband or closest family to the breastfeeding mother as many as 10 people at RSIA Mutiara Bunda. The aspects assessed in this small-scale trial were appearance, material presentation, and benefit aspects.

**1)  Appearance Test Results**

**Table 3. Appearance Test Results**

| No | Statement | Average Score |
|----|-----------|---------------|
| 1 | Text or writing on the media is easy to read | 3.6 |
| 2 | The images presented are clear or not blurry | 3.7 |
| 3 | The illustrations presented are appropriate (not too much and too little). | 3.6 |
| 4 | The device can be operated easily | 3.9 |
| 5 | Every Video and game is easy to operate | 3.9 |
| 6 | Navigation buttons on the device work as per their function | 3.9 |
| **Total Score** | | **22.6** |
| **Average Score** | | **3.8** |

The results of the trial with the assessment reference obtained an average score of 3.8. then based on the appearance aspects of the *Computer Assisted Learning-based* multimedia named **"**Successful Family-Based Exclusive Breastfeeding**"** can be categorized in **very feasible** criteria.

**2)  Test Results of Material Presentation Aspects**

**Table 4. Test Results of Material Presentation Aspects**

| No | Statement | Average Score |
|----|-----------|---------------|
| 1 | The material explained in this media is easy to understand | 3.8 |
| 2 | The explanation of the material is interactive | 4 |
| 3 | The questions in the game are in accordance with the material explained. | 3.7 |
| 4 | The illustrations used in the material are in accordance with the topic of the material | 4 |
| **Total Score** | | **15.5** |
| **Average Score** | | **3.9** |

The results of the trial with the assessment reference obtained an average score of 3.9. then based on the aspect of the presentation of the material in the Computer Assisted Learning-based multimedia named "Successful Family-Based Exclusive Breastfeeding" can be categorized in very feasible criteria.

**3)  Benefit Test Results**

**Table 5. Results of the Benefit Aspect Trial**

| No | Statement | Average Score |
|----|-----------|---------------|
| 1 | I can understand the material presented using this learning media easily | 3.7 |
| 2 | I find it easier to understand the breastfeeding process using this media | 3.8 |
| 3 | By using this media, I understand more about the importance of breastfeeding. | 3.7 |
| 4 | Through this media, I understand the importance of supporting mothers in the breastfeeding process. | 3.7 |
| 5 | Through this media, I understand the role of husband/family in the breastfeeding process. | 4 |
| **Total Score** | | **18.9** |
| **Average Score** | | **3.8** |

The results of the trial with the assessment reference obtained an average score of 3.8. then based on the aspect of the benefits of Computer Assisted Learning-based multimedia named "Successful Family-Based Exclusive Breastfeeding" can be categorized in very feasible criteria.
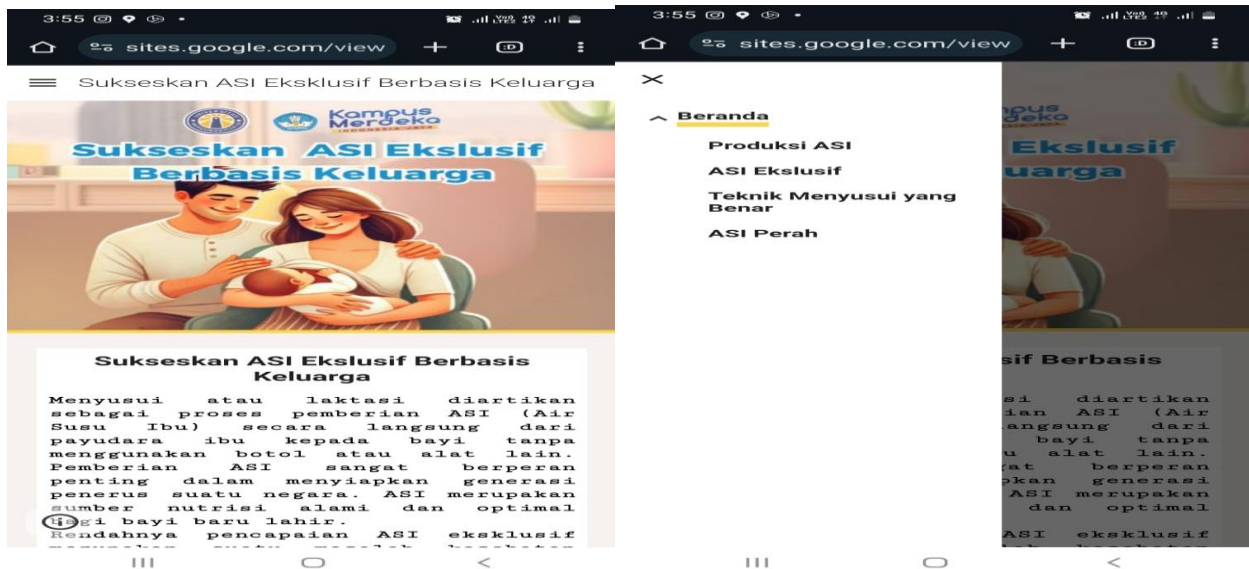
**c. Revision Result of Computer Assisted Learning-based Multimedia**

The results of the first stage of the implementation of research on the effectiveness of *family center* learning in empowering breastfeeding mothers based on interactive multimedia using the CAL method are to create a multimedia design based on *Computer Assisted Learning* named "Successful Family-Based Exclusive Breastfeeding" with a web page https://sites.google.com/view/asi-ekslusif .

The website consists of 5 pages, namely the homepage, Breastfeeding Products, Exclusive Breastfeeding. Correct Breastfeeding Techniques and Expressed Breast Milk. On each page there is a small explanation of the material, educational videos and games. Educational videos on the web are not just videos of material but are also equipped with sound about the explanation of the material so that the target can see and hear directly. In addition to educational videos on the web, educational games are also presented after each video material with the aim that the target remembers more about the material he has seen and heard.
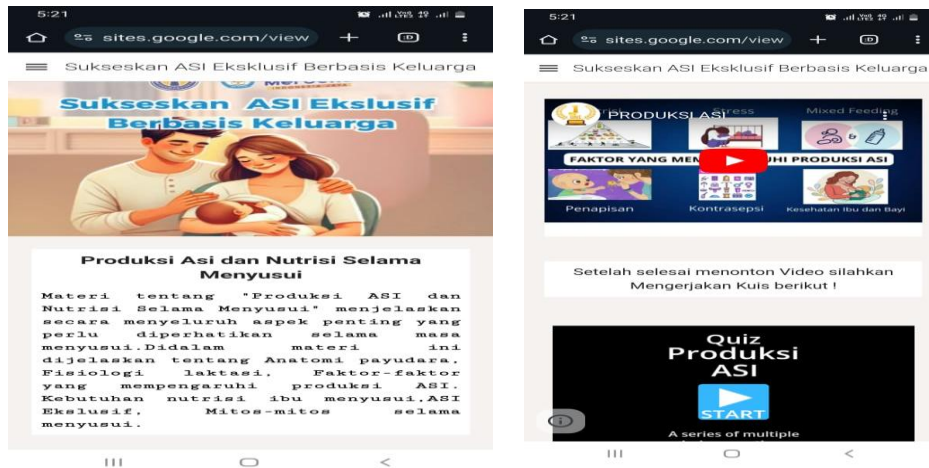
The design of the **"Family-based Exclusive Breastfeeding Success"** website is as follows:
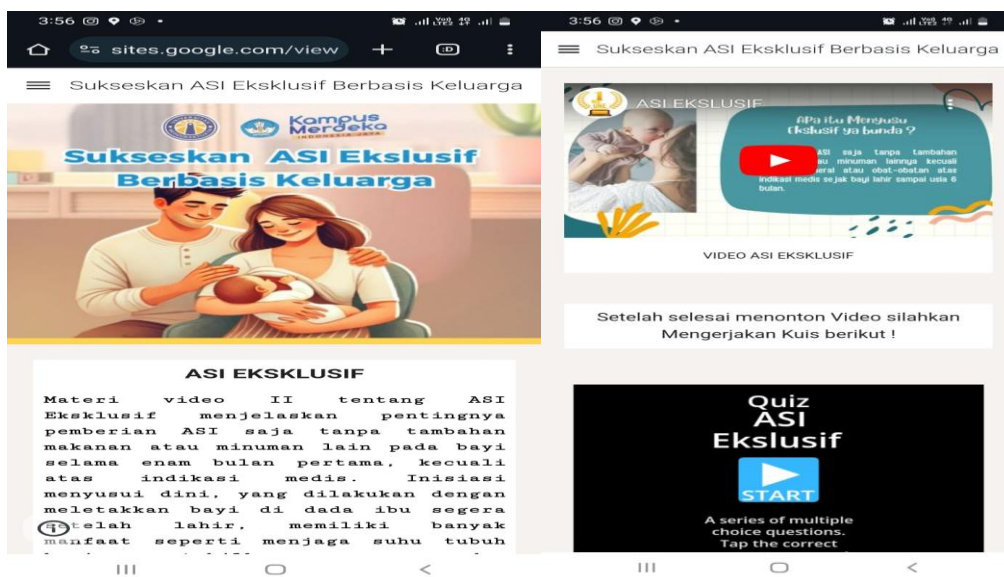
**1) Home**



The homepage explains the importance of exclusive breastfeeding. One of the approaches that can be taken to increase exclusive breastfeeding coverage is by empowering the community, which aims to empower the community both individually, families and community groups. Families have a very important role in health services, one of which is in increasing the achievement of exclusive breastfeeding. Many ways can be done to improve the role of families in empowering breastfeeding mothers, one of which is education through the *family center learning* approach.
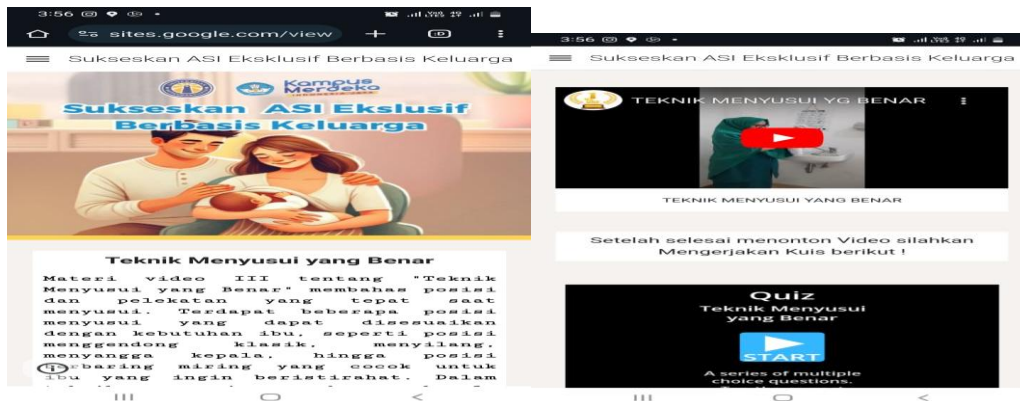
**2) Breast milk production**



On this page there is a summary of Breast Milk Production, Educational videos and Educational games. The educational video explains about "Breast Milk Production and Nutrition During Breastfeeding" explains thoroughly the important aspects that need to be considered during the breastfeeding period. This material explains about breast anatomy, lactation physiology, factors that affect breast milk production. Nutritional needs of breastfeeding mothers, exclusive breastfeeding, myths during breastfeeding.
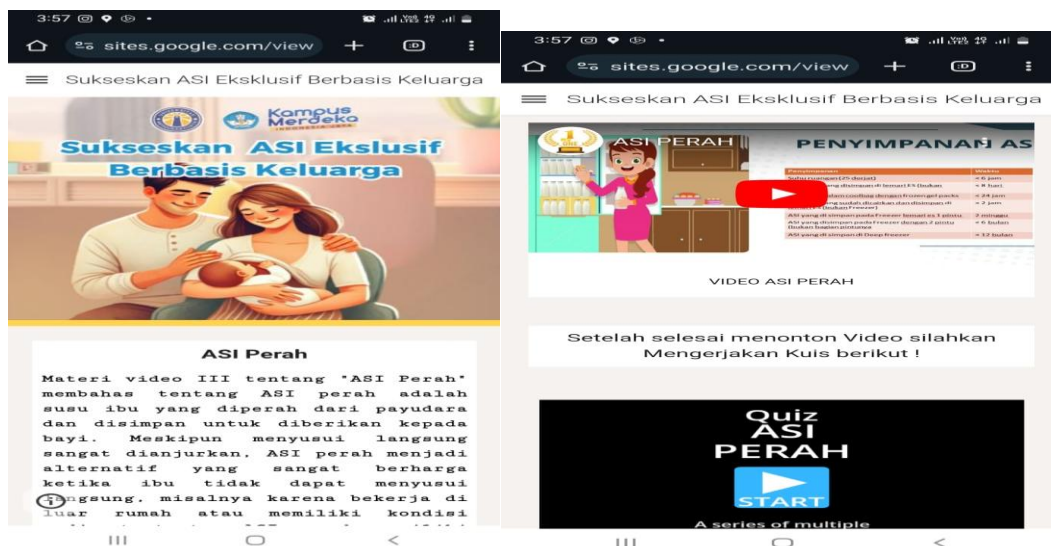
**3) Exclusive breastfeeding**



On this page are summaries of exclusive breastfeeding, educational videos and educational games. The educational video on Exclusive Breastfeeding explains the importance of giving only breast milk without any other food or drink to babies for the first six months, except for medical indications. Early breastfeeding initiation, which is done by placing the baby on the mother's chest immediately after birth, has many benefits such as maintaining the baby's body temperature, stabilizing breathing, and strengthening the bond between mother and baby. Exclusive breastfeeding is easy to digest, supports optimal growth, brain development, and increases the baby's immune system. In addition to the benefits for the baby, breastfeeding also benefits the mother, such as accelerating uterine recovery, reducing the risk of breast cancer, saving costs, and can serve as a natural method of contraception through the Method of Amenorrhea Lactation (MAL).

**4) Correct Breastfeeding Technique**



On this page there is a summary of the Correct Breastfeeding Technique, an educational video and an educational game. The educational video explaining "Correct Breastfeeding Techniques" discusses the correct position and attachment when breastfeeding. There are several breastfeeding positions that can be adjusted according to the mother's needs, such as the classic cradling position, crossing, supporting the head, to the side lying position which is suitable for mothers who want to rest. In the correct breastfeeding technique, the baby's head and body should form a straight line, the baby's face is facing the breast with the nose parallel to the nipple, and the baby's body is brought closer to the mother. Proper attachment includes the baby's mouth wide open, chin touching the breast, most of the areola entering the baby's mouth, and the baby sucking in a slow rhythm. Breastfeeding is done as often as the baby needs, about 8-12 times a day. In the educational video, there is not only theory, but also a live demonstration by the research team of the correct breastfeeding technique.

**5) Expressed Breast Milk**



On this page are summaries of the correct breastfeeding technique, educational videos and educational games. The educational video explains "Expressed Breastmilk" Expressed breastmilk is mother's milk that is expressed from the breast and stored for feeding to the baby. Although direct breastfeeding is highly recommended, expressed breastmilk is an invaluable alternative when a mother is unable to breastfeed directly, for example due to working outside the home or having certain medical conditions. Expressed breastmilk has the same nutritional content as directly fed breastmilk, is rich in antibodies that protect the baby from various diseases, and is easily adapted to the

baby's needs. The process of expressing and storing expressed breast milk must be done properly to maintain its quality and hygiene.

## DISCUSSION

Effective breastfeeding education requires a person-centered approach that emphasizes self-directed learning, is experience-oriented, needs-relevant, and breastfeeding mother- or family-centered. *Computer Assisted Learning* (CAL) can be an effective tool to support breastfeeding education if designed with these principles in mind. *Computer Assisted Learning* (CAL) allows families as learners to learn at their own pace and time, utilizes past experiences with case studies and simulations, is tailored to individual needs, and facilitates active learning through interactive features. Research shows that the application of adult learning principles in educational programs, such as Bina Keluarga Balita (BKB) and equivalency programs, increases the effectiveness of these programs. Thus, *Computer Assisted Learning* (CAL) designed with adult learning principles in mind can be an effective tool to improve breastfeeding mothers' knowledge and skills, and support successful breastfeeding practices (17,18).

Interactive multimedia using the *Computer Assisted Learning* (CAL) method named **"Successful Family-Based Exclusive Breastfeeding"** with the web page https://sites.google.com/view/asi-ekslusif is a tool in *family center learning* activities in empowering breastfeeding mothers. *Family center learning* is a family-centered education that aims to empower breastfeeding mothers in improving exclusive breastfeeding outcomes. Previous research states that socialization has often been carried out by health workers but has not been optimal. This is due to the focus on breastfeeding mothers and props that are less supportive and attractive (19).

According to Oktaviani's research in 2021, one of the factors for not achieving exclusive breastfeeding is due to low knowledge of the breastfeeding process (20) . Interactive multimedia using the *Computer Assisted Learning* (CAL) method named **"Successful Family-Based Exclusive Breastfeeding"** is designed to increase knowledge through education or family counseling about the breastfeeding process starting from breast milk production, exclusive breastfeeding, correct breastfeeding techniques and expressed breast milk.

The advantage of this multimedia is that in using it there are 2 senses involved, namely seeing and hearing. Counseling provided using audio-visual media makes it easier for participants to understand the material presented because it is equipped with images or photos that seem real to make respondents easy to understand (21). This multimedia not only presents interesting and interactive material but provides games to further increase the knowledge of people who use it.

This multimedia is not only accessible to families but can be accessed by everyone because increasing exclusive breastfeeding achievements involves not only families but also communities. One of the approaches that can be taken to increase exclusive breastfeeding coverage is by empowering the community. This aims to empower the community both individually, families and community groups (8).

## CONCLUSION

The *Computer Assisted Learning-based* multimedia design named **"Successful Family-Based Exclusive Breastfeeding"** is suitable for use in *family center learning* to empower breastfeeding mothers. The designed interactive multimedia increases mothers' knowledge and skills in breastfeeding while involving families in supporting the success of exclusive breastfeeding. By combining interactivity, audio, and visual elements, it effectively increases motivation to

learn, information retention, and overall family participation. The use of interactive multimedia in Family Center Learning (FCL) can potentially address the lack of knowledge related to breastfeeding.

Integration of Computer Assisted Learning (CAL) into national breastfeeding programs can be achieved through the development of interactive digital education modules, provision of online consultation platforms with lactation experts, use of virtual simulations for breastfeeding technique practice, integration with existing maternal and child health services, and public education campaigns through social media. Application of adult learning principles, Computer Assisted Learning (CAL) can improve breastfeeding mothers' access to quality information and support, ultimately improving the success of exclusive breastfeeding practices nationwide. Thus, the development of this interactive multimedia is a strategic step in supporting the empowerment of breastfeeding mothers and families as part of a more responsive and innovative health system.

## ACKNOWLEDGMENT

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