Development Application "Detection of Growth and Development for New Born Until Two Years" Based on Android

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Abstract: ***The implementation of early detection in Indonesia rarely happens to know from the outset the conditions of development and growth of children. The low knowledge of parents makes it difficult to do early detection. For this reason, researchers will develop new software technology (applications) based on Android by smart phones that can automatically detect and obtain information on children's displays of 1-2 years. The purpose of this study is to produce applications for DGD NB-2 based on Android in accordance with the functions and procedures of development carried out and to produce applications DGD NB-2 based on Android which has a good level of validity so that it can be utilized in learning activities. This study uses the Ghirardini development model and the Information Management Resource Kit, which is a development of the ADDIE development model. Data collection instruments in the form of questionnaires are used to obtain data that includes: (a) Need Analysis, (b) Target Audience Analysis, (c) Reaction or user response, (d) Media expert, (e) Material expert, (f) Expert psychology, and (g) Practical Test by users. The data analysis technique used in this research is descriptive quantitative. The results showed that 1) The results of the validation of the application media expert were in the Very good category of 86%, 2) The results of the validation of the application material experts entered the Very good category, 87%, 3) the results of the application psychology expert validation are in the Very good category, 89%, 4) Validation of the entire application is in the Very good category 87.3%.***

Index Terms: Application Development, Detection of Growth And Development, Born Until Two Years

I. INTRODUCTION

A. Research Background

Indonesia is a large country with high potential for natural and human resources. The population in Indonesia is the fifth largest in the world. The potential of HR must be managed properly through training and education consistently and continuously since a baby is born and is balanced with fulfilling proper needs. This is expected to change Indonesia to be reborn - the next two years will become a more advanced country in the eyes of the world. Efforts to build quality of human resources should be right on target, starting from early childhood.

Early childhood experiences rapid growth and development starting from birth to 5 years. This period is often referred to as the "Golden Age" phase. At this time, it is very important to provide the right stimulus and detect the growth or development of children early if there is an abnormality. In addition to early detection can also minimize abnormalities in children's growth and development so that they can prevent permanent abnormalities. Detection of growth and development carried out covers the appropriate development aspects of the 2013 Curriculum for Early Childhood Education.

A mother must understand the necessity she needs when she is pregnant and understand her child's needs when she is born. During pregnancy, a mother becomes a determinant of fetal growth and development in her womb. In this phase, complete physical organ formation and the initial stimulus of a human being are formed. Mothers who understand the needs of the fetus will maintain all their behaviour from emotional behaviour, physical actions, health, and eating patterns for the purpose of appropriate fetal growth and development. After the fetus has reached the right time to be born, a mother should also have knowledge about the needs of a baby. Thus, there is no error in providing stimulus and can detect growth and development deviations in children, especially at 1000 days of a child's life.

Maternal and child health is a determinant of the quality of human resources. Therefore this period is referred to as a critical period, namely during pre-pregnancy, during pregnancy, and when breastfeeding her child. The period of 1000 days of a child's life is called a sensitive period. The period of a thousand days, which is 270 days during pregnancy and 730 days in the first life of the baby who was born. The development of the cells of the human brain at that time is very decisive, so that if a disturbance occurs in that period, it will have a permanent impact, cannot be repaired. According to Minister of Health, the term 1000 first days of life or the first thousand days began to be introduced in 2010 since the launch of the Scaling-up Nutrition Movement at the global level. This is a systematic effort involving various stakeholders, especially the government, business world, and the community to give special attention to pregnant women to children aged two years, especially food, health, and nutritional needs. Failure to grow in the first 1000 days of life, besides causing a disruption of physical growth, will also cause metabolic disorders, especially disorders of metabolism of fats, proteins

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and carbohydrates which in turn can trigger the emergence of diseases in adulthood, according to the Minister of Health broadcast by Center for Public Communication (2012). Many argue that physical size, including short body, fat and certain diseases, especially PTM, is caused mainly by genetic factors. The most important causative factor is the environment from conception to 2-year-olds, who can be changed and repaired. (WHO, 1997) (Barker, 1995).

The importance of understanding the needs of children from birth to the age of 2 years that can have an impact on further development should be understood for all parents. Whereas what happens to people in Indonesia is a lot of parents who do not understand the initial needs of a child both for the growth and development of their children. According to the Health Office (2014) said that the mother's unpreparedness in having children not only had an impact on her baby but had an impact on her own mother. According to one report, 85% of girls in Indonesia end their education after they get married (Evenhuis and Burn, 2012: 25). Educational institutions in Indonesia do not provide opportunities for education for pregnant women, so it breaks education for a mother who is at school level (Simanjuntak, 2015). Following the impact for a baby born mothers who are less than 19 years old have 30-40% increased risk of stunting for two years (Fall, 2012: 375).

The implementation of early detection in Indonesia rarely happens to know from the outset the conditions of development and growth of children. The coverage of detection of growth and development of children includes religious and moral, cognitive, physical motor, language, social-emotional, and artistic values. Early detection is done to determine the growth and development of children, whether it is appropriate or not by the stages of child development. During this detection only relates to growth, namely body weight and immunization held by the posyandu. Please note that early detection includes various aspects of a child's growth and development.

One technology that can be used to help mothers, health practitioners and educators in the field of early childhood is smartphone technology. Smartphone technology has evolved into a personal computer that can help carry out all forms of human activities in various fields, one of which is in the fields of education and health. Many applications have been developed to support both professions in the field (Heron & Smyth, 2010). The use of smartphones is inseparable from the nature and superiority that is owned as always active, very portable (brought by their users wherever they go), the smartphone provides on-demand communication in real-time, easy to use because it has a display or touch screen display, has multimedia quality complete and capable of operating with high speed and increasing, providing data services and computational power to document and improve data (Boulos, et., 2011)

Characteristics of Smartphones, which can contain various types of applications or programs, have been utilized for education and health. Programs refer to a collection of standalone software for certain functions and purposes and are usually optimized to run on mobile devices (Millar, 2013). According to the 2012 Mobile Health report published by the Internet & American Life Project Pew Research Center, 85% of adults in The US has a mobile phone; of them, 53% have their own smartphones. Half of the smartphone owners use their devices to get health information. One-fifth of smartphone owners have health and education applications on their devices (Duggan, 2012). Whereas in Indonesia, data from Kominfo (2017) shows that of Indonesia's population of 250 million, it is estimated that in 2018, there will be more than 100 million active smartphone users in Indonesia. With such a large number, Indonesia will become the country with the fourth largest active smartphone users in the world after China, India and America. One use of smartphones is in the fields of education and health.

The development of the use of smartphones with various types of applications and android in them can be utilized and provide medical, educational and psychological support for its users. During this time, the incorporation of medical or health applications and early childhood education is still rarely developed. There are still rare applications. Estimates for 2012 state that the number of applications related to health is not less than 40,000 but rarely related to early childhood development (Pelletier, 2012). Mobile application technology has several potential advantages for providing medical, psychological and educational advice that can be followed up, but also has limitations and potential problems associated with it.

This study will develop new software technology (applications) based on Android for smartphones that can automatically detect and obtain information on children's displays aged 1-3 years. This android application will collect data through questionnaire filling activities that will then provide a conclusion and advice on whether the child is normal, late, or has abnormalities in his development.

After development, the software is tested through the function testing phase by media experts and early childhood education experts to verify that the application meets the requirements guided by design, as expected, can be implemented with the same characteristics as programmed, and meet user needs. All data obtained by the application is programmed to transfer every day from the smartphone to the server to transfer files safely in realtime. This application was designed jointly by an interdisciplinary research team consisting of computer experts, psychologists, and early childhood education experts. This application is designed for phones that run the Android operating system (OS). The Android OS allows continuous raw data collection and processing from the cellphone's internal accelerometer.

The application developed has two main subsystems: "educational material about child development stimulation" and "child development detection." Child development detection is developed based on the book "Caring For Your Baby And Young Child: Birth To Age 5, (Shelov and Altmann, 2009), Bright Futures book: Guidelines For Health Supervision Of Infants, Children, And Adolescents,

Hagan, Judith, Shaw, and Duncan, (2008) and milestone checklist developed by the USA Department of Human and Human Services (2015). Detection of the development of birth age - 2 years is divided into several parts, namely the development of infants aged 0-2 months, 3-4 months, 4-6 months, 7-9 months, 10-12 months, 13-18 months, 19-24 months, and 25-36 months.

Based on this background, it can be seen that there are values and benefits of mobile services in supporting the development and care of newborns for mothers with well-designed applications and systems. This application will be developed and distributed and is expected to be more useful in the future.

B. Research Objectives

Based on the formulation of the problem, the research objectives are as follows:

1. Produce application calledDetection of Growth and Development for New Born Until Two Years (DGD NB-2) Android-based by the functions and procedures of development carried out
2. Produce application calledDetection of Growth and Development For New Born Until Two Years (DGD NB-2) Android-based, which has a good level of validity so that it can be utilized in learning activities.

C. Component and Product Specifications

1) Technology Specifications

The product produced in this study is an application, Detection of Growth and Development for New Born Until Two Years (DGD NB-2) Android-based. So the technology specifications are as follows:

1. This application is designed for phones that run the Android operating system (OS). The Android OS allows continuous raw data collection and processing from the cellphone's internal accelerometer.
2. Mobile Teen software is written in Java and targets Android version 4.1 Jelly Bean-6.0 Marshmallow. The application developed has two main subsystems: "educational material about child development stimulation" and "child development detection." Detection of child development is developed based on the book"Caring for Your Baby and Young Child: Birth To Age 5, (Shelov and Altmann, 2009), buku Bright Futures: Guidelines For Health Supervision Of Infants, Children, And Adolescents, Hagan, Judith, Shaw, and Duncan, (2008) dan milestone checklist developed byDepartment of health and human service USA (2015).
3. The application contains Detection of the development of birth age - 2 years divided into several parts, namely the development of infants aged 0-2 months, 3-4 months, 4-6 months, 7-9 months, 10-12 months, 13-18 months, and 19 -24 months.

2) Utilization Specifications

1. This application can be used personally by parents, education practitioners, and health practitioners in the Google Play store
2. This application can run well on android smartphones with a minimum OS 4.1 Jelly Bean and 2 Giga RAM.

II. LITERATURE REVIEW

A. Detection of Early Childhood Growth and Development

The term growth and development are different but interrelated and cannot be desecrated. Growth is related to the changes in size, number or dimensions at the level of cellular, organ and individual. Growth can be measured in units. Development is an increase in the ability of the structure and function of the body that more complex. The development is related to the process of purifying cells, tissues, and organs, which develop as a function so that each of them can achieve its function perfectly. (Seotjiningsih, 1998; Tanuwijaya, 2003). This initial phase of development will determine the development of the next phase. Growth and development require assessments to find out the progress of development according to the stages of age.

Assessment of growth and development can be done as early as possible since the child is born. Early detection is an effort of selection that is carried out comprehensively to find out the problems of growth and know the inhibiting factors and supporting growth and development. Such problems that arise can be known through the early detection, so that prevention efforts, stimulus, healing and recovery can be given with a clear indication at a critical period of the growth process. Those efforts are given by the age of the development of children. Thus the optimal growth and development achieved (general director team of the health development community, 1997).

B. Parenting Education

Parenting education activities for parents are very important. Knowledge of how to care the children properly will affect the children's behavior as well as related to the essential aspects of children's growth and development. When parenting skills are given effectively to the parents, the parents usually have experience and abilities as good parents (Trunzo, 2006). Training in parenting skills is designed to teach five basic parenting skills that are useful for children starting to learn to speak to adulthood (Bailey, Perkins & Wilkins, 1995). Parents influence the behavior of children, and so do children affect the parents' behaviour. This training helps parents to change children's behaviour by teaching adults about how to change their own behavior. Based on the training provided, parents will find new ways of parenting. In addition, parents will also see how much the skills' benefit gained in changing conditions at home (Bailey, Perkins & Wilkins, 1995).

C. Application

The definition of the application comes from English, namely "To Applicate," which means applying or applied. However, the meaning of applications, in general, is a program package that has been made and can be used.

While the meaning of the application is: "*computer programs made to help humans in carrying out certain tasks"*(Nugroho, 2004). Computers are related to applications which consist of several functional units to achieve the objectives of data processing, namely: (1) Parts that read data (input data), (2) Parts that manage data (control processing unit), (3) The part that issued the results of data processing (Output data). al, the application can be called as a unit of software which is created to serve the needs of several activities such as trading systems, games, community services, advertising, or all processes that are almost done by humans (Pramana, 2005).

D. SmartPhone

The smartphone is the next generation of mobile computing that will encourage convergence between communication, computers, and the use of electronic devices, the three distinct characteristics of traditional industries with fairly low interoperability. In the end, a smartphone is likely to become a universal mobile terminal by bringing an integrated functionality coupled with mobility and network access everywhere.

Basically, a Smartphone looks like a small computer network in the form of a cell phone. The first generation version of cell phones, despite their large size, can hardly offer anything other than making phone calls. Then, due to the tremendous advances in semiconductor technology, cell phones are generally equipped with much more powerful processors, larger storage media, LCDs, and screens that make it possible to perform several local computing tasks. The general mobile phone applications are collectively referred to as PIM applications. These include calendar, contact person, agenda, and calculator functions. The ability to access data networks is basically very limited to this mobile technology.

E. Android

Android is the first platform which is truly open and comprehensive for mobile devices. All existing software can run a mobile device without thinking about ownership constraints that hinder innovation in mobile technology (Meier, 2008). In another definition, Android is a subset of software for mobile devices that includes operating systems, middleware, and core applications released by Google. Moreover, the Android SDK (Software Development Kit) provides Tools and APIs needed to develop applications on the Android platform using the Java programming language. Android was developed together between Google, HTC, Intel, Motorola, Quallcomm, TMobile, and NVIDIA which are members of the OHA (Open Handset Alliance) make an open standard for the mobile devices (Mulyadi, 2010).

III. METHODOLOGY/MATERIALS

A. Research Design

This study uses the Ghirardini development model and the Information Management Resource Kit (IMARK) (2011). The reason for using Ghirardini Model is because the model has products and systems based products, and has structural and systematic steps in developing the android applications. This is by the objectives development of this study, namely developing the DGD NB-2 application that has good validity. The ADDIE development model according to Ghirardini (2011) can be seen in figure 3.1 as follow:

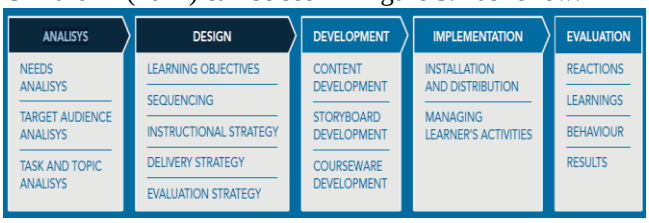

Fig 1. Ghirardini's ADDIE development model (2011)

B. Data Collection Techniques and Research Instruments

To obtain the expected data, a data collection instrument in the form of a questionnaire sheet is used which includes: (a) Need Analysis, (b) Target Audience Analysis, (c) Reaction or the users response, (d) Media expert, (e) Material experts, (f) Psychologists, and (g) Practical Tests by users.

C. Data Analysis Techniques

The data analysis technique used in the current study is descriptive quantitative of the results of validity tests, including:

1) The Validity Of DGD NB-2 Application

Data obtained from the validation questionnaire towards the experts were analyzed by the percentage by using a formula. The formula for processing validation data towards the experts is adapted to modifications (Akbar, 2012: 49) is as follows: a product development is considered to be valid and feasible to use if it has a validity level above 70% so that it is suitable to be used in learning (Akbar & Sriwiyana, 2011: 147)

$$Vm = \frac{TSe}{TSh} x100\%$$

$$Vp = \frac{TSe}{TSh} x100\%$$

$$Vd = \frac{TSe}{TSh} x100\%$$

$$Vt = \frac{Vm + Vp + Vd}{3} = \cdots \%$$

Note:

Vm = validity of the material/content expert
Vp = validity Psychologist
Vd = validity of media experts
TSe = total empirical score achieved (based on expert judgment)
TSh = expected total score
Vt = Total/combined validity
100% = constants

Interpretation is a reading of the analysis of respondents' data. As a guideline for interpretation, the criteria in table 1 are applied

Table 1. Validity Criteria for DGD NB-2 Applications

Interval	Criteria	Level of validity
1.	86% - 100%	Very valid (can be used without revision)
2.	70% - 85%	Quite valid (can be used with revisions)
3.	60% - 69%	Invalid (cannot be used)
4.	0% - 59%	Very invalid (not feasible)

(source: adapted from Akbar & Sriwiyana, 2011: 147)

2) Practical Test (Applying)

The practicality data of the application material based on application obtained from the field trial by using a questionnaire. Application data is in the form of user response questionnaire. The application data for application material will be analyzed by descriptive percentage by using a formula as follows:

$$A = \frac{TSEV}{S - max} x100\%$$

Note:

A = Applying

TSEV = total empirical score

S – max = expected maximum score

100% = constants

S - max = 100% =

(source: adapted from Akbardan Sriwijaya, 2011:208)

Furthermore, the interpretation and decision making regarding the quality of product development is given by using the product application criteria below:

Table 2. Kriteria Keterterapan Materi aplikasi

No	Criteria	Level of validity
1.	86% - 100%	Very good (can be used without revision)
2.	70% - 85%	Good enough (can be used with revisions)
3.	60% - 69%	Poor (cannot be used)
4.	0% - 59%	Not good (forbidden to use)

(source: adapted from Akbardan Sriwijaya, 2011:147)

IV. RESULTS AND FINDINGS

A. Analysis

The analysis section provides guidance on how to develop the contents of the DGD NB-2 application based on the analysis of user needs, how user characteristics are viewed from various aspects such as knowledge, location, and resources so that the objectives and themes of the material can be determined in the third step. will be presented. Users in this development research are parents, especially mothers or prospective mothers who have children between the ages of 0-2 years.

1) Need Analysis

The needs analysis activity is carried out to determine the extent of the gap or gap that exists between the knowledge and skills possessed by the user and the application objectives to be achieved. In the needs analysis, questionnaires are distributed to 30 prospective users or mothers. From the results of this need analysis, it can be seen that the requirements of this application are very high. The results of the needs analysis can be seen as follows:

Table 3. Results of Analysis of Needs for Each Item Question

No	Item	Average
1	The level of knowledge of mothers about child development, especially "Early detection of children development aged 0-2 years."	1.47
2	Availability of reference resources for studying material related to child development	1.57
3	Have a lot of free time to learn things related to child development, especially "Early detection of children development aged 0-2 years."	1.40
4	Instructors or resource persons who are willing to provide routine guidance	1.40
5	Support from institutions (Community Health Center) to study material related to child development	1.30
6	Availability of learning media to study material related to child development	1.50
7	The existence of supportive study groups to study children's development	1.93
Average		1.50

Based on the table above, it can be seen that from 7 (seven) questions related to needs analysis 6 of them are in the very need category and one question in the need category. Overall the level of needs is at an average of 1.50 and in the very need category. Based on the eight indicators of the need for support from Institutions (Community Health Center) to learn the material related to the development of the main factors in developing the DGD NB-2 application.

While the needs analysis based on individual scores can be known as follows:

Table4. Results of Analysis of Individual Needs

No	Interval	Category	Total	Percentage
1	3.25-4	No need	0	0%
2	2.5-3.24	Lack of Need	0	0%
3	1.75-2.49	Need	2	7%
4	1-1.74	Really need	28	93%

Based on the needs analysis, it can be seen that most of the respondents stated that they needed 28 people or 93% and needed 7% or 2 people. So it can be concluded that prospective users really need this application.

2) Target Audience Analysis

In analyzing target users/audiences, it is necessary to identify various factors that can be used as design references for the development of DGH NB-2 applications. The results of the target user analysis can be seen in the following table:

Table 5. Target User Analysis

No	Item	Average
1	User perceptions related to product development suitability (DGD NB-2 application) with the demands of mother's needs.	3.47
2	User interest to learn about NB-2 DGD application	3.57
3	User skills in operating electronic equipment (HP) supporting the NB-2 DGD application	3.23
4	Compliance with the utilization of DGD NB-2 application material with free time	3.37
5	Availability of internet network	3.03
6	The level of ownership of the user hardware (smartphone)	3.37
7	User understanding of similar applications	3.53
	Average	3.37

Based on the table above, it can be seen that out of 7 (seven) questions related to the analysis of target users, 6 of them are in the very capable category and one question in the able category. Overall the value of the needs level is at an average of 3.37 and is in the very capable category. Based on the eight characteristics of the user, the user's interest in learning the DGD NB-2 application has the highest score.

While the needs analysis based on individual scores can be known as follows:

Table 6. Results of Analysis of Individual Needs

No	Interval	Category	Total	Percentage
1	3.25-4	Very capable	26	87%
2	2.5-3.24	Capable	3	10%
3	1.75-2.49	Unable	1	3%
4	1-1.74	Very inadequate	0	0%

Based on the analysis of the characteristics of these users, it can be seen that the majority of respondents stated that they were very capable of 26 people or 87% and capable of 10% or 3 people. Based on the results of the analysis of the target audience, it can be seen that it is in the very capable. Thus which means that the user uses and implements the DGD NB-2 application.

3) Task And Topic Analysis

The development of tasks and topics used in developing the contents of the DGD NB-2 application in the material "Early detection of the development of children aged 0-2 years" was analyzed and developed based on theoretical studies from various sources of books and research results, especially published journals. This is done to produce a detailed, accurate and relevant material design. References used are selected and reduced from various credible sources and adapted to users developed by each campus. The topic and material framework developed was also adapted to the characteristics of the audience, specifically related to the initial ability and duration of usage. As for the task analysis phase and application material theme, it contains the following steps:

a) Identifying Tasks

The development of this application was developed based on complete, latest references, and sourced from credible studies. This is related to the function of a developer who has scientific responsibility in disseminating the correct information and will be a reference for mothers. For this reason, in this case, some identification of tasks that must contain activities:

Identify theoretical studies, empirical studies, and juridical studies sourced from sources that are clear, credible and up to date. The study included:

1. Books about the psychology of child development
2. Books on nutrition and health
3. Books about targets and developmental achievements
4. Books about early childhood problems
5. Laws and ministerial Regulations about Standards of Child Development

Gathering resources, grouping and classifying them into a material framework that is neatly arranged

b) Classifying Tasks

In this section, the developer makes a framework for using the product. This framework contains several explanations relating to the learning objectives to be achieved from the material that has been compiled. As for this stage, it is divided into several parts, namely:

1) Describe the general objectives and the main focus of the material developed
2) The superiority and strength of the material that is developed compared to the study of material or applications developed previously
3) Explain the advantages in terms of the delivery strategy and technology of the material products developed
4) Develop a basic guiding framework for the use of the material developed

c) **BreakingupTasks** (Describe the tasks that must be done by users/users on e-learning based applications)

d) **Identifying Required Knowledge**(Identifying Knowledge Needs and Skills that Must Be Mastered)

In this section, the developer identifies several users needs related to the knowledge that must be possessed so that a complete material component can be developed which includes:

1) Classify users based on ability. Based on the needs analysis, it can be seen that there are three types of users, namely the stage that is very capable, capable, and unable. So that the developer makes two application usage training classes, namely for the able group and the poor.

2) The right method in the delivery of material and use of the application. The method of delivering material and the use of applications is done directly by practice. Users are taught how to use the application from beginning to end. Based on observations, it is known that the user has advanced using the DGD NB-2 application
3) Duration of study time spent. Duration takes into account user needs.
4) Develop other reference sources that can be used as an alternative material. If in the delivery there are questions from the users, then the question can be closed and included as additional material for the contents of the application.
5) Develop parts in the material such as introduction, main sections, conclusions, and literature studies
6) Re-checking the preparation of the material
7) Editing the theme structure

B. Design

1) Learning Objectives (Designing Special Learning Objectives)

In the analysis section, general objectives have been determined, and the main focus of the NB-2 DGD material is developed. Furthermore, the general objectives are elaborated on the specific objectives of the material so that they can be further developed into a more complete DGD NB-2 application material. Specific learning objectives are operationalized in the form of verbs starting from knowing, understanding, applying, analyzing, evaluating, to creating an idea or idea

2) Defining The Course Sequence (Sort Themes and Sub Themes from General to Special in Form Charts)

In this section, the developer will rank general learning goals and specific learning goals based on hierarchies or material prerequisites that must be mastered first. Certain material will be placed in the first position and must be mastered first because it is a prerequisite for mastering the next material. The sorting criteria are based on:

In this section, the developer will rank general learning goals and specific learning goals based on hierarchies or material prerequisites that must be mastered first. Certain material will be placed in the first position and must be mastered first because it is

a) a prerequisite for mastering the next material. The sorting criteria are based on:

The material is sorted from concrete or simple information and then continues with more abstract or complex concepts. The material is sorted by the stage of development of the child from 0-2 years, which is divided into six stages of development, namely:

1. Age 0-3 months
2. Age 3-6 months
3. Age 6-9 months
4. Age 9-12 months
5. Age 12-18 months
6. Age 18-24 months

The sequence structure of the material can be developed from a general topic and then divided into subtopics in the form of a pyramid. The material prepared is based on six aspects of development, starting from the aspect:

1. Motoric Physics
2. Cognitive
3. Language
4. Emotional social
5. Art

3) Instructional Strategy (Designing Learning Strategies)

The design of learning strategies in development research is focused on how to apply the right learning strategies so that the effectiveness of learning activities can be achieved. In this development research, learning design is implemented in the form of training designs, which include material, methods, media, time allocation, assessment strategies. The learning method used in utilizing and mastering the material from the DGD NB-2 application uses a combination of several learning methods that include:

1. Expositive methods: this method emphasizes the "absorption" of new information. Expensive methods include presentations, case studies, and demonstrations.
2. Application methods: this method emphasizes the active learning process in performing procedural and basic tasks and building new knowledge. The application method includes training methods, simulations and games, research and project-based methods.
3. Collaborative methods: this method emphasizes the social dimension of learning and knowledge sharing and collaborative tasks. Some methods included in this activity include online discussions, group work and peer teaching.

4) Defining The Delivery Strategy (Determining the Submission Strategy)

The delivery strategy is the methods used to convey learning to users, and at the same time to receive and respond to user input. Thus, this strategy can also be called a strategy for carrying out the learning process. In the delivery strategy for learning activities based on the DGD NB-2 application, there are several factors considered, namely:

a) User-Related Factors

1. Availability of Resources, Tools and Factors of Comfort in receiving learner material.
2. Heavy material in the form of high-quality video format sometimes requires high internet access in the network so developers must pay attention to several formats such as audio, animation, text and images that are easily and lightly accessed. Delivery of these materials can be accessed directly through the DGD NB-2 application.
3. User Expertise Level

4. If a user has difficulty in learning streaming videos, then other alternatives can be found, such as the availability of material download menus.
5. Available time.
6. The difference in time availability and timeliness for educators and users is an obstacle in learning activities so that it can be replaced with activities that are asynchronous.

b) Technology Aspects

Capabilities, infrastructure and connectivity that are owned by each user need to be considered before making the technology system used. Developers need to understand whether users have easy access to network systems, but some users who do not have a good internet connection must have material available that can be stored in an offline form such as an ebook so that it can be opened anywhere.

c) Organizational Aspects

Various factors originating from the organization can also hinder the developer in developing and implementing products such as policy issues, licensing, availability of time and budget, personnel and the availability of available facilities and infrastructure.

5) Defining The Evaluation Strategy (Determining Evaluation Strategies)

One important aspect that must be considered in developing the DGD NB-2 application is determining the strategy and type of evaluation. In contrast to conventional classes, the characteristics of learning activities are asynchronous, which can be done anywhere and anytime allowing users to give assignments or evaluations at any time. So the type of evaluation can be adjusted. The evaluation strategy can take the form of direct observation and questionnaire about the level of user knowledge.

C. Development

a) Content Development

Learning activities based on the DGD NB-2 application are very different from conventional face-to-face retaliation activities. Interaction limitations require that the material developed must have specific criteria

b) Storyboard Development

Storyboard in DGD NB-2 application is divided into two parts, namely material storyboard (Structure of an Interactive E-Lesson) and system storyboard or application. Material storyboards are in the form of story lines that are arranged using flow diagrams so that the sequence of material flow developed from cover, table of contents, introduction, main material, summary, and finally bibliography can be known. The storyboard system contains a system flow in the form of a design created in a table in which there are page names/scenes, images, elements and descriptions

c) Courseware Development

Developing the DGD NB-2 application that involves various types of software both for creating a remote system. The several types of data and applications used to develop the courseware in this study include:

1. Text data: Microsoft office
2. Images/graphics: Adobe Photoshop and Corel draw
3. Animation: AAdobe Flash
4. DGD NB-2 application: **JDK (Java Dev. Kit)**, Eclipse

d) Results of Development of NB-2 DGD Product

Opening Intro Scene:

On this page, the user runs the DGD NB-2 application, the first display that appears is the intro. The intro contains information about the name of the program, containing information about the material. The intro is presented in the form of images and text. The information aims to provide information or instructions and a description of the program to the user.

Fig2. Application

Main Menu:

On the home scene, there are nine menu buttons, where the buttons will deliver the user to explore the contents of the NB-2 DGD application. The buttons include the following:

1. Latest news button: will contain all the contents of the news about children's development and articles related to children's health. News will be updated at any time.
2. Children's products, containing products of children's needs, especially related to stimulation of child development
3. Consultation, for bus users to conduct various consultations and share information on the group via Whats app
4. Nutrition of children, containing information on the child's nutritional needs and proper diet so that children develop according to the stage of development.
5. Story of children contains a collection of fairy tales to instill the cultural character of children.
6. Activities are containing information on seminars, training and socialization activities that can be followed by users.
7. The expert team is the development team of this application
8. Care contains about the handling and care of children if there are cases of illness and problems
9. Assessment contains an evaluation of the assessment of the development of children from 0-2 years of age

The menu on Child Development Assessment:

In the child development scene, users can choose a range of ages between 0-3 to 18-24 months, where there is one menu. In this menu, users can check six aspects of a child's development, whether in the category of maximum development or mistakes. Then after the user selects one of the menus, questions will emerge from six aspects of development. These questions or questionnaires must be answered until completed to analyze the achievements of the child's development. After all the questions are answered, there will be a display that shows a graph of child development for six aspects of development. Six aspects of this development will provide information on any aspect of development that must be improved or simulated.

D. Implementation

1) Installation And distribution

After all the programs designed on the storyboard are made, then the next action is to install the DGD NB-2 application for each member. On the server installation, the developer will create an account on Google Playstore. Then after the application is successfully installed, then install it into each HP. If both of these steps have been carried out, then they will be socialized to the user to conduct an access test.

2) Managing Learner's Activities

This activity consists of several stages ranging from socialization to work evaluation procedures. As for the steps outlined as follows:

a) Components of an instructor-led or facilitated course:

1. Kickoff event (Inauguration and Dissemination) in this activity, the developer explains or disseminates the program to users regarding the DGD NB-2 application along with its purpose and instructions for use.
2. Pre-course learning activity (introduction of learning activities), At this stage, the developer explains the learning objectives and the material to be delivered, especially related to the mastery of the NB-2 DGD application.
3. The cycle of learning events (scheduling further activities) the developer starts learning activities related to the operation and operation of the DGD NB-2 application.
4. Feedback and conclusion (receiving feedback and input), users or users provide input and feedback related to the learning program.

b) Planning and documenting activities is an activity to document all learning activities carried out by the user starting from the first activity until the activity ends. Documentation can be in the form of photos or jobs for users.

c) Facilitating learners' activities, are activities carried out by developers to keep monitoring learning activities and provide some supporting facilities such as usage instructions, tutorials, and other general guidelines.

V. EVALUATION

A. Reaction and Validation

1) Reaction (User Feedback)

Reaction is a response or assessment given by the user after using and studying the DGD NB-2 application. User feedback is very useful for developers to make adjustments so that the DGD NB-2 application can be used and used properly by users.

User test results on the initial product DGD NB-2 application were obtained from the user questionnaire. Questionnaires were distributed to users. The results of this trial aim to see the feasibility of the DGD NB-2 application based on user ratings based on the attractiveness and practicality of the NB-2 DGD application. The small group validation instrument is divided into 15 aspects of assessment. The translation of the results of the small group assessment conducted by 19 users is as follows:

Table 7. Assessment Result

No	Indicator/Item	Percentage	Category
1.	Very interesting application from the display side	82%	Good
2.	Application is suitable to user needs	85%	Good

No	Indicator/Item	Percentage	Category
3.	Easy to use application	88%	Excellent
4.	The application has complete contents	80%	Good
5.	The application is easy to access/download	88%	Sangat Baik
6.	Easy application to install on mobile	84%	Good
7.	Information contained in the application is easy to understand	85%	Good
8.	There is no misinformation and writing in the application	81%	Good
9.	The material contained in the application is relevant to the user's learning needs	88%	Sangat Baik
10.	Presentation of interesting and structured material	85%	Good
11.	Contents or material are presented simply	82%	Good
12.	Material is easily understood by the user	81%	Good
13.	Material contains important information	86%	Sangat Baik
14.	Navigation or buttons are easily clear	87%	Sangat Baik
15.	The navigation path is clear and structured	91%	Sangat Baik
16.	Navigation works well	88%	Sangat Baik
17.	Light application to access	80%	Good
18.	The level of proposition size of the application with the screen of the cellphone	83%	Good
19.	The colour elements of the layout are harmonious and clarify the function.	83%	Good
Total		84%	Good

Data on the practicality of DGD B2 applications were obtained from field trials using questionnaires. Application data is in the form of a user response questionnaire. The application data for application material will be analyzed by descriptive percentage, using the formula:

$$A = \frac{TSEV}{S-max} x100\%$$

$$A = \frac{1926}{2280} x100\%$$

$$A = 84\%$$

Based on the results of the assessment, the application is included in the Good enough category (can be used with revisions) 70% - 85%.

2) Validation

At this stage it is used to test the feasibility of the NB-2 DGD application before being used in user trials, the results of the expert assessment will be analyzed by percentage techniques, and the results will be converted using assessment criteria to determine whether or not the design of the product produced is revised. If it needs revision, then the results of the validation are made into revised material to the final conclusion that the product is feasible to be tested on the user. The following is a list of validators or experts in this study:

Table 8. Validator List

No	Name	Qualification
1.	Dr. Umi Dayati, M.Pd	Material Expert for Early Childhood Education
2.	Prof. Dr. Punadji S., M.Ed	Media Expert
3.	Dr. Sri Wahyuni, M.Pd	Child Psychologist
4.	User	Practical Test

Based on the collection of data from the pilot study on the development of the DGD NB-2 application, below is presented data from the results of expert reviews to assess the level of validity that has been developed. From the experts' review, the results of evaluations from material experts, media experts and psychologists were explained. Expert opinions are collected using questionnaires or questionnaires containing questions. The question is in writing and filled with a range of 1-4 scales.

a) Review of Media Experts

To determine the application feasibility, an assessment is carried out by media experts who are qualified as Educational Technology users who teach DGD B2 applications at Malang State University and held on March 28-30 2018. Validation of media experts serves to assess the level of validity as a media contained in the DGD NB-2 application. Instruments developed in the category of media experts are divided into 54 assessment indicator items. The results of the assessment can be seen in table 9.

Table 9. The Result of the Assessment

Validasi	Dimensions	Indicators	Percentage
Application Quality	1. Learner	1) The application has good attractiveness increasing the user's interest to use it	100 %
		2) The level of suitability of the application with the needs and problems in the field	75 %
		3) The level of ease of application to be mastered to increase user confidence	100 %
		4) The application has a complex and complete material so that it can provide maximum benefits for the user	75 %
		5) Applications can be accessed for free by the user	75 %

Validasi	Dimensions	Indicators	Percentage
		6) The application system has help facilities making it easier for users to master the application	75 %
		7) The menu structure is structured so that it allows users to access	75 %
		8) Applications are flexible so that they can be accessed on types of HP with low specifications	75 %
		9) The light application so that it is easy to download	75 %
		10) Applications provide new knowledge for users	75 %
		11) Applications can provide new learning experiences for users	100 %
		12) The application system is fully accessible 24 hours a day	75 %
		13) Users can access applications anywhere via mobile phones connected to the internet	100 %
		14) The application presents various types of supporting material	100 %
		15) Application systems provide forums that allow users to communicate with each other	100 %
	2. Content	16) The material delivered has high accuracy	100 %
		17) There is no misinformation and writing in the application	75 %
		18) References contained in the application are up to date or up to date	50 %
		19) Materials contained in the application are relevant to the user's learning needs	75 %
		20) Presentation of structured menus	50 %
		21) Contents or material are presented simply	100 %
		22) There is no ambiguous information presented in the material	100 %
		23) Material contains important information	100 %
	3. Delivery Mode	24) Navigation or buttons are easily clear	50 %
		25) The flow of navigation is clear and structured	100 %
		26) Navigation works properly	50 %
	4. Technology	27) Application technology used by the level of understanding of the user regarding the computer	100 %
		28) Light application to access	100 %
		29) The application does not require special software to open it using only a browser	100 %
		30) Lecturers can set when time and learning activities	50 %
		31) The system allows each user to have his own account	100 %
	5. Design	32) The user account is protected by a password	50 %
		33) The level of the proposition size of the application with the HP screen	100 %
		34) Match the layout size with the composition of the application contents	100 %
		35) Showing a good center point.	100 %
		36) The colour elements of the layout are harmonious and clarify the function.	100 %

Validasi	Dimensions	Indicators	Percentage
		37) The font size of the title in the application header is more dominant and proportional than the size of the contents	100 %
		38) The title colour in the application header contrasts with the background colour.	50 %
		39) Do not use too many font combinations.	100 %
		40) Illustration describes the contents	100 %
		41) Shape,colour, size, the proportion of objects according to reality.	100 %
		42) Illustration Able to reveal the meaning/meaning of an object.	100 %
		43) Creative and dynamic illustrations.	100 %
		44) The placement of elements of the layout in the application is consistently based on the pattern.	75 %
		45) , The separation between menus, is clear	100 %
		46) Proportional margin field.	75 %
		47) The composition between content heder and footer side by side proportionally.	75 %
		48) Spaces between text and illustrations are appropriate.	100 %
		49) Placement of decoration/illustration as a background does not interfere with the contents	75 %
		50) Don't use too many fonts.	100 %
		51) The use of letter variations (bold, italic, all capital, small capital) is not excessive	100 %
		52) Normal text width.	100 %
		53) Space between lines of normal text arrangement.	75 %
Average			87 %

The results of media expert validation on the DGD B2 application were obtained through a questionnaire. The overall score results are then calculated and included in the percentage formula to see the overall level of validity. The formulas used are as follows:

$$Vd = \frac{TSEV}{S-max} x100\%$$

$$Vd = \frac{186}{216} x100\%$$

$$Vd = 86\%$$

Based on the results of the assessment, the application is in the category of Very Good 86% (can be used without revision) 86% - 100%.

b) Review of Material Experts

Material experts from the NB-2 DGD application for Class X are users who have qualifications in the field of developmental psychology and teaching at Malang State University. Instruments developed in the material expert category are divided into 29 assessment indicators. The results of the assessment can be seen in table 10.

Table 10. The Result of the Assessment

Validation	Dimension	Indicators	Percentage
Content Quality	1. Feasibility of Content	1) Completeness of application contents	75%
		2) The content is easy to be understood by users.	100%
		3) Compatibility of the material depth	75%
		4) Accuracy of concepts and definitions	100%
		5) Accuracy of data and facts	75%
		6) Accuracy of examples and cases	100%
		7) Accuracy of Pictures, diagrams and illustrations	100%
		8) Accuracy of terms	75%
		9) Accuracy of notation, symbols and icons	100%
		10) Accuracy of references.	75%
		11) Compatibility of material with the development of science studies	75%

Validation	Dimension	Indicators	Percentage
		12) Examples and cases are by reality in everyday life.	100%
		13) Pictures, diagrams and illustrations by the contents	100%
		14) Use the right case example and implement it	75%
		15) Credible sources	75%
		16) Complete contents so as to encourage curiosity	100%
		17) Encourage users to continue in learning the material	75%
	2. Feasibility of presentation	18) Systematical consistency from simple facts to complex (general-specific)	75%
		19) Concept chaos	75%
		20) DDisplay quality	100%
		21) Appropriate appearance with contents	100%
		22) Users can use it independently	75%
	3. Language quality	23) Accuracy of sentence structure	100%
		24) Effectiveness of sentences	75%
		25) Stiffness of terms	100%
		26) Accuracy of grammar	100%
		27) Accuracy of spelling	75%
		28) Consistency in the use of terms	100%
		29) Consistency in using symbols or icons	75%
Rata-rata			87%

The results of the material expert validation on the DGD B2 application were obtained through a questionnaire. The overall score results are then calculated and included in the percentage formula to see the overall level of validity. The formulas used are as follows:

$$Vm = \frac{TSEV}{S-max} x100\%$$

$$Vm = \frac{101}{116} x100\%$$

$$Vm = 87\%$$

Based on the results of the assessment, the application includes in the Very good category, 87% (can be used without revision) 86% - 100%.

c) Review of Child Psychologists

Psychologists from the DGD NB-2 application for Class X are users who have qualifications in the field of developmental psychology and teaching at Malang State University. The review of child psychologists is an evaluation which was conducted on 4 to 6 of March 2018. Validation of psychologists serves to assess how much the validity level of material compatibility with the psychological aspects contained in the DGD NB-2 application. Instruments developed in the category of psychology experts are divided into 29 assessment indicators. The results of these assessments can be seen in table 11.

Table 11. The Result of the Assessment

Dimensions	Elements	Indicators	Percentage
1. Aspects of visual psychology	a. Display	1) Colour suitability with the characteristics of the user's age	75%
		2) Proportional colour alignment	
2. Communication Design	a. Communicative	3) Compatibility of material with user characteristics	100%
	a. Dialogical and Interactive	4) Ability to motivate users	100%
	b. Conformity with User Development	5) The ability to encourage critical thinking.	75%
	b.	6) Conformity with the user's intellectual development	
3. Context assessment	a. Contextual nature	7) Conformity with the level of the user's emotional development	100%
		8) Linkages between material and problems	100%
	a. Contextual Component	9) Contents The ability to encourage users to make connections between the knowledge that the user has and its application in the user's daily life	75%
	a.	10) Encourage Constructivism.	75%
		11) Encouraging questioning skills	100%
		12) The material can be used to create a Learning Community	75%
		13) The material can be used to create modelling (modelling)	100%
Total			89%

The results of the psychology expert validation on the DGD B2 application were obtained through a questionnaire. The overall

score results are then calculated and included in the percentage formula to see the overall level of validity. The formulas used are as follows:

$$Vp = \frac{TSEV}{S - max} x100\%$$

$$Vp = \frac{101}{116} x100\%$$

$$Vp = 89\%$$

Based on the results of the assessment, the application is included in the Very good category of 89% (can be used without revision) 86% - 100%.

d) Overall Validation

The overall validation is used to determine the level of application validity if an assessment is made to three aspects. roduct development is said to be valid and feasible to use if it has a validity level above 70%, so it is feasible to be used in learning (Akbar & Sriwiyana, 2011: 147).

$$Vt = \frac{Vm + Vp + Vd}{3} = \cdots \%$$

$$Vt = \frac{86 + 87 + 89}{3} = 87{,}3\%$$

Based on the results of the overall assessment of the application, the application is in the category of Very Good 87.3% (can be used without revision) 86% - 100%. Interpretation is an interpretation of the analysis of respondents' data.

3) Learning's

A learning activity carried out by users using the DGD NB-2 application. In this section, a study will be made regarding the implementation and results of practice by the user. The assessment will measure the user's skills or mastery of the NB-2 DGD application.

4) Behaviour and Revision

Analyzing the difficulties of users when conducting learning activities using the DGD NB-2 application. In addition, researchers also received input and revisions from experts to make improvements. Based on evaluations from material experts, psychologists, and media experts, the application of DGD NB-2 that had been made by researchers could be used as an initial product in evaluating child development. The results of revisions from media experts only on the layout of the title and writing are too narrow and less balanced and less proportional; the video is given the title. From the results of expert evaluation, the media can be said that the media is feasible and valid for testing because it is only a matter of aesthetics.

VI. CONCLUSION AND SUGGESTION

A. Conclusion

Developing the application of Detection of Growth and Development for New Born until Two Years (DGD NB-2) based on Android can help parents who have children starting from the new born up to 2 years old to understand the development and growth of their children. So that this application can help the Government to reduce child mortality and reduce the burden of producing a quality generation.

B. Suggestions

In this section, some suggestions were suggested by researchers regarding the products developed. The suggestions put forward include suggestions for use, suggestions for dissemination, and suggestions for further development

1) Suggestion for Use

a) For Users

1. It is expected to read the instructions/information and commands on the application before using it because there are certain terms and orders.
2. It is better to use this application to see in detail the aspects of child development so that the assessment can be done correctly.

b) For Managers

1. This application is expected to be a reference for use by the health center. Health office in the process of providing knowledge about child development.
2. Dissemination advice
   In the use of development products to a broader target, the researcher gives advice, namely, before using this product, you should first study the material contained in this application.
3. Further Development Advice
   For further development, several suggestions that can be given is including:

C. For Further Research

It is suggested the further research can be done at the next age of children, such as 2-4.

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