PEMBANGUNAN APLIKASI PEMBELAJARAN MULTIMEDIA INTERAKTIF UNTUK ANAK TUNAGRAHITA SEDANG DENGAN METODE VAKT BERBASIS *MOBILE* ANDROID (STUDI KASUS SLB ADITYA GRAHITA)

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ABSTRAK

Aditya Grahita SLB Foundation is an educational foundation that is engaged in the service of the education of children with intellectual challenges. Tunagrahita is one type of special needs children who have intelligence below normal intelligence with IQ (Intelligence Quotient) equal to or lower than 70. In school, students tunagrahita also studied mathematics, Indonesian, and ipa like elementary school students in general. Learning is done is still conventional. It impacts when teachers provide practice questions, as many as 11 students out of 33 students had math scores below KKM school graduation percentages as much as 66.7%. Similarly ipa lessons and Indonesian, as many as eight students and 7 students also experience difficulties when practicing the lessons because of limited props.

Based on the problems that have been described, one way to help students to understand subjects is to build a learning media as a tool to support conventional learning. The learning media also help teachers to deliver lessons. Instructional media formed into android based applications by applying VAKT (Visual Auditory Kinesthetic Tactile). Luther used in his research methods Sutopo.

Results of research conducted in the form of application BETA (Learning Together Tunagrahita) in SLB Aditya Grahita. Based on the results of tests performed by means of pre-test and post-test, the value of students has increased from an average value of mathematical 60.94 to 71.67. This indicates that more students understand the subject matter. Based on research and testing done, it can be concluded that the media pembelajran built dapt helping students in grade 1 SDLB Aditya Grahita in the study material.

Kata kunci : *interaktif, pembelajaran, smartphone, tunagrahita, vakt.*

1. INTRODUCTION

Tunagrahita is one type of special needs children who have intelligence below normal intelligence with IQ (Intelligence Quotient) equal to or lower than 70. [1] This would hamper the activities of daily life in social, communication and are more prominent the inability to accept the nature of academic subjects as children of his age. [1]

Based on the interview in SLB Aditya Grahita found problems in math that is difficult to understand the numbers of students in the graduation percentage is only 66.67%. It also occurs in natural science subjects and Indonesian whose graduation rate of 75.75% and 72.72%. From the observation, learning to do still confined to conventional learning. For their special needs children receive learning different methods of delivery. VAKT method is a method of teaching children with special needs who use visual modalities (sight), auditory (hearing), tactile-kinesthetic (touch gestures). The use of visual modality makes learning tends to be easily understood by the Augmented Reality feature which displays 3D objects by scanning the frame marker of learning cards.

1.1 Learning

Secara In general, learning is a process of change, ie a change in behavior as a result of interaction between itself and its surroundings in meeting their needs. In addition, learning is a process carried out by an individual to obtain a new behavior change overall, as a result of individual experience itself in interaction with the environment. [2]

Learning is a change in a relatively permanent behavioral tendencies as a result of practices that reinforced that there are causes of learning. Learning itself occurs between the cause and result of learning (Kimble & Garmezy. 1963: 133). In the process of learning, a relatively permanent change refers to a change in appearance (performance). However, appearances can be observed, but learning (learning) itself can not be observed. It can be concluded that a person has done to learn if he had been able to do something that previously could not do. but not all learned to produce changes in behavior or appearance.

1.2 Interactive Multimedia

According to Vaughan multimedia is a combination of text, art, sound, images, animation and video delivered to your computer or manipulated digitally and can be delivered and / or controlled interactively. [3] Interactive is related to two-way communication / something that is mutually take action, active and interconnected with each other and have a reciprocal between one another. Something interactive involves two or more parties are active in it. Interactive multimedia is a multimedia equipped with a controller that can be operated by the user, so the user can choose what you want for the next process

There are at least six criteria, namely multimedia interactive saying: [4]ease of navigation, content of cognition, presentation of information, integration of media, artistic and aesthetic, and overall functionality.

1.3 Tunagrahita Medium

Tuna means losing money and mentally means mind. Tunagrahita are abnormalities in growth and mental development of the intellectual (mental retardation) as a baby / in the womb or infancy and children caused by organic factors, biological and functional factors. [1]

Retarded child for the purposes of learning are classified into four, namely the level of the border, tunagrahita able learners (mild), tunagrahita able to practice (moderate), and mental retardation takes care of (by weight). Children with intellectual challenges being is an individual who has the intelligence significantly below normal intelligence with an IQ equal to or lower than 70, deficiencies in adaptive behavior, and occurs during development, namely the period of conception up to the age of 18 years. [1]

Characteristics of children with intellectual challenges being generally have difficulty in learning the lessons that are academic. Language development is very limited because the vocabulary is very less. They need the protection of others, although it is still able to distinguish the dangers and not the danger. Mental abilities at age maximum adult equivalent to 7-8 years of age.

Model education services for children with intellectual challenges among which the transition classes, special schools (special schools), integrated education, home school program, inclusive education, and nursing (TVC) rehabilitation. [1

1.4 VAKT Methods

Metode Visual auditory tactile kinesthetic method (VAKT) is a method of optimizing the entire potential of the senses are there to facilitate a child in the learning process. Visual auditory tactile kinesthetic method (VAKT) penguasaaan vocabulary used for children with special needs, which when viewed from characteristics children with special needs are children who learn the methods that can give a concrete picture. Something concrete that can be absorbed through the senses such as vision (visual), hearing (auditory), and movement (kinesthetic) and palpation (tactile) in order to easily understand what they are learning. In the learning process of children with special needs require objects or media that can represent the use of his senses, so that the learning process of children the picture or object is directly and mention the name of the object as well as comment objects that interest him to master the concept of nouns, adjectives, and verbs. [5]

1.5 Android

Android Android is an operating system for mobile phones based on Linux, which is designed for touch screen mobile devices such as smart phones and tablet computers. Android user interface is generally in the form of direct manipulation, using motion yanag touch similar to the real action, for example shifting, tapped to manipulate objects on the screen, as well as a virtual keyboard to enter text [6]. Android provides an open platform for developers to create their own applications and for use by a variety of mobile devices (mobile device). It allows developers to write managed code (managed code) in the Java programming language, controlling the device via Google-developed Java libraries.

Table 1 Android Operating System Components

Funtionality	***Java Base Class***	**Examples**
Focused thing a user can do	*Activity*	*Edit a note, play a game*
Background process	*Service*	*Play music, update weather icon*
Funtionality	***Java Base Class***	**Examples**
Receive messages	*BroadcastReceiver*	*Trigger alarm upon event*
Store and retrieve data	*ContentProvider*	*Open a phone contact*

Each application must have used at least one of these components, but there are some components that require lists specified permission before use as components Service, Broadcast Receiver, Content Provider [7].

2. CONTENT OF RESEARCH

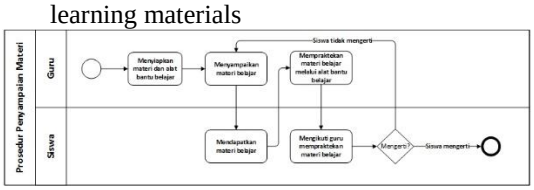
2.1 Analysis Procedure Of The Going

Current procedures are divided into three parts, namely procedures for the delivery of content, learning procedures, learning evaluation procedures.

1. Procedure delivery of material

Here are the steps implementing the material being run:

1. Teachers prepare material according to the students' learning materials, including preparing study aids related study materials
2. Teachers deliver learning materials
3. Students get the material delivered by the teacher
4. Teacher practice learning materials through a learning tool
5. Students follow what is practiced by the teacher
6. If students can not follow that practiced by the teacher, then the teacher to repeat the communication of study materials
7. If students can attend practiced by teachers, it is considered that the student has understood and completed the delivery of learning materials



Gambar 1 Content Submission Procedures

2. Learning procedure

Here are the steps of learning that are running:

1. Teachers teach children in accordance with the timetable
2. Teachers simulate teaching materials using tools or props.
3. Students pay attention to that exhibited by the teacher
4. The teacher asks questions to test whether students have understood the material presented
5. Students answered by demonstrating as teachers demonstrate previous

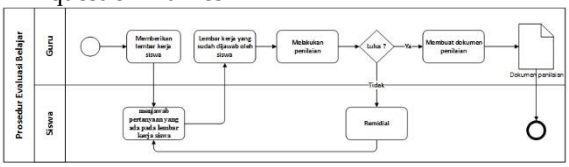


Gambar 2 Learning procedures

3. Lerning evaluation procedures

Here are the steps of the evaluation study:

1. Teachers give students a collection worksheet exercises to students
2. Students answer the question on student worksheet instructed by the teacher
3. If students are finished, students submit worksheets for teachers
4. Teacher assessment
5. Teachers check the value of the final result of students, if passed then the teacher will make assessment documents
6. If it does not pass then carried out remedial actions to do the exercise with the same question 2 times



Gambar 3 Learning evaluation procedures

2.2 Analysis of Interactive Learning Built

The system will be built is a learning application for children with intellectual challenges were based mobile which can be operated using the android platform. The system will have two interfaces, namely the frontend and backend. Here is a workflow system in general:

1. IT staff (administrators) can login, data processing teacher, student data processing, and evaluation with the help of a computer or the like.
2. Teacher login and then guide students to use a smartphone to learn a lesson.

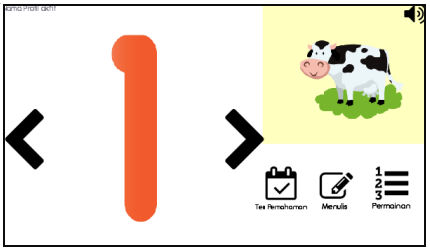
There are several features in this learning medium, ie learn, play AR (Augmented Reality), instructions, evaluation. Learning is used to assist students in learning subject matter, AR is used for media play in helping understand the subject matter, the instructions are used as instructions for using the application, evaluation is used to view reports of student learning.

2.3 Analysis of Interactive Multimedia

Applications to be built consisting of several components of the learning material presented is to use visual modalities (sight), auditory (hearing), kinesthetic (movement), and tactile (feeling). All four known methods VAKT. Here is the application of methods VAKT against children tunagrahita middle category on an application to be built:

1. *Visual* (Vision)

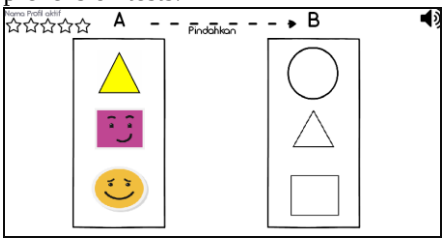
Learning to use visual elements in the application to be built with an important role, as the one of the senses are active and dominant in children tunagrahita category of being is the eyes or eyesight. One use of the visual modality in the application to be built are as follows:



Gambar 4 Visual modality

The introduction of number with one object associated with numbers. The relationship of elements in common pronunciation, for example the number 'one' object 'cow'.

2. *Auditory* (Hearing)
   Learning that utilize ear as the sense of hearing is also important for children with intellectual challenges medium category. The use of auditory modalities on the applications that will be built are as follows:
   1. Sound of each lesson, depending on what lessons can be learned.
   2. A sound understanding of test-related questions.
   3. A sound sign of appreciation for successful and failed.
   4. A sound background musical instruments for application at run time.
   5. Mengeluarkan suara instrumen musik untuk background aplikasi pada saat dijalankan.
3. *Kinesthetic* (Gerakan)
   Pembelajaran dengan cara menanggapi setiap pelajaran yang diterima dengan gerak fisik. Anak tunagrahita kategori sedang mempunyai keterbatasan dalam gerak fisiknya, tetapi hal ini dapat menjadi solusi untuk melatih motorik anak agar keterbatasan geraknya bisa diminimalkan. Pada aplikasi yang akan dibangun modalitas kinestetik diterapkan pada aspek penulisan angka dan huruf
4. *Tactile* (Feeling)
   Learning application through which tentacle hands or skin. Learning process on applications to be built all served by touching the screen smartphone. The use of tactile modalities on the applications that will be built is the flat wake comprehension tests.

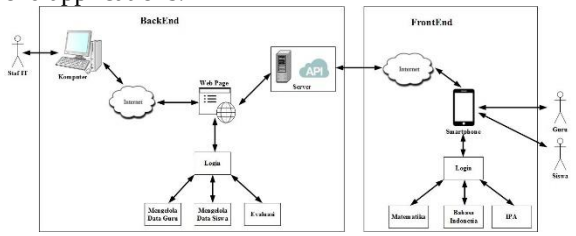


Gambar 5 tactile modalities

Tactile element in this case the child rubbing and moving flat wake. Movement is done by moving one at a flat wake.

2.4 System Architecture Analysis

The system architecture is a picture of the entire system to be built, both in terms of front end or back end applications.

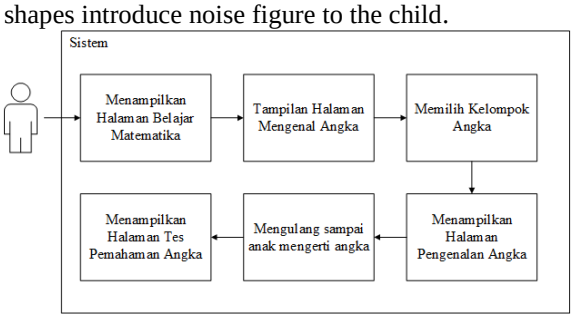


Gambar 6 System Architecture

2.5 Concept Description Application

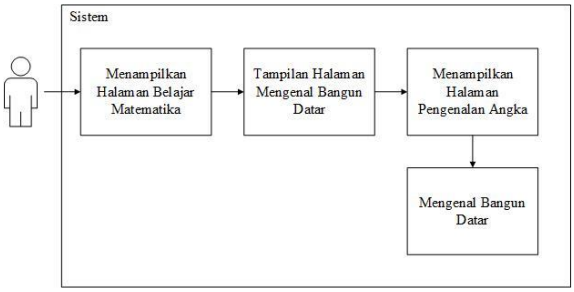
Description of applications to be built clarify the concept application on learning. Here is an explanation of the concept of learning applications that will be built.

1. Learn to recognize numbers
   Learning is learning to recognize numbers and shapes introduce noise figure to the child.



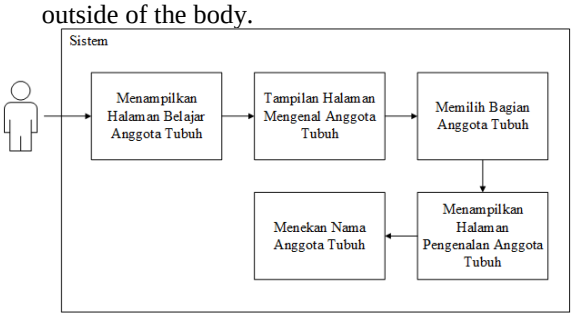
Gambar 7 Flow learn to recognize numbers

2. Learn to recognize Flat
   Flat recognize learning is learning to introduce forms of flat wake.



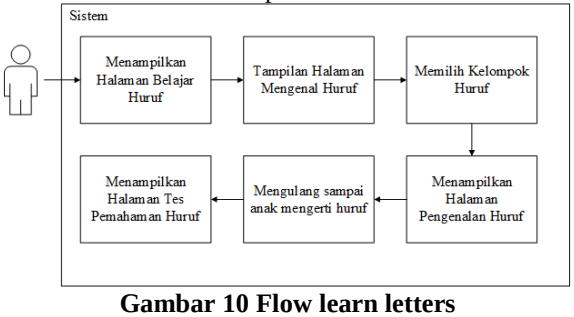
Gambar 8 Flow learn about Flat

3. Learning limb
   Learning limb is learning to introduce members outside of the body.



Gambar 9 Flow learn limb

4. Learning the alphabet
   Learning the alphabet is learning to introduce the small letters of the alphabet.



Gambar 10 Flow learn letters

2.6 User Analysis

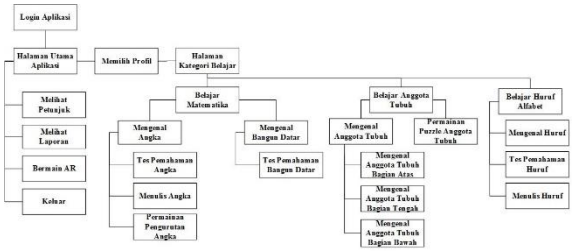
Analysis of the users who will use the application to be built are as follows:

Tabel 2 Analisis Pengguna

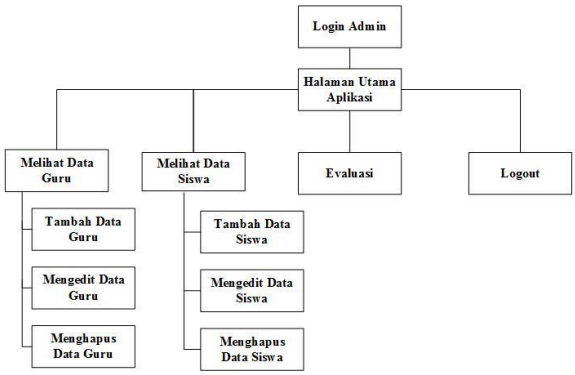
Name Classification	Results Analysis
Educational Level	For teachers ie at least graduate high school / vocational or S1, for children at least have learned about the first theme is family
Typing Skills	Applications built not require typing skills
Aplication Experience	Teachers have experience using applications on smartphones, and the child does not have to have experience
Native Language	Applications to be built using Indonesian
Color Blind	Not color blind, but if the color blind will only be less than optimal in interacting with the application

2.7 Menu structure

The design of the menu structure presents an overview of the software menu structure to be created. Here is an overview of architectural design in the application menu that will be built.



Gambar 11 Frontend Menu Structure



Gambar 12 Backend Menu Structure

Tabel 3 Software Implementation

No	Software Builders	Information
1	Windows 10 Profesional 64bit	Running the application development support program
2	Unity 5.3.6	Writing program code c # and models
3	Adobe Illustrator dan Corel Draw	Making the application assets
4	Vuforia	Plugin augmented reality

2.8.2 Hardware Implementation

Perangkat Computer hardware used to build the application are as follows:

Tabel 4 Implementasi Perangkat Keras

No.	Builders Hardware	Specification
1	Processor	AMD Quad-Core A8-4500M
2	Memory	RAM 4 GB
3	HardDisk	Free Space 10 GB
4	Monitor	Monitor Dengan Resolusi 1366 x 768 pixel
5	Mouse	Standar
6	Keyboard	Standar
7	Graphic Card	AMD Radeon ™ HD 8750M

2.8 Software Implementation

Implementation of the system is a translation stage design based on the results of the analysis into a programming language that is used and the application software is built on a real environment. The purpose of implementation is to implement a design that has been made to the application, so that users can provide feedback for the development of applications that have been built.

2.8.1 Implementasi Perangkat Lunak

Computer software is used to build communications applications, learning and therapy for people with autism are as follows:

2.9 Testing Systems

2.9.1 Blackbox testing

Black Black box testing is testing conducted only observing the execution results through the test data and the functional check of the software. Black box testing evaluate only from the outside look and functionality. Stage in black box testing performed on the application scenario study with mental retardation are black box testing and black box testing conclusions.

Test scenario describes the sequence and it is tested in the tests performed on the application. Scenario testing is done on aspects of data input.

Based on the results of black box testing has been done with the case that has been tested, it can be concluded that in this learning applications can run well and there are no errors in the process

2.9.2 Acceptance testing

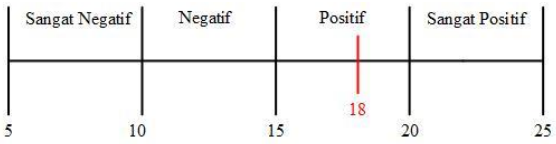
Pengujian Acceptance testing is a test that is objective which this test is carried out directly in SLB Aditya Grahita, which aims to determine the extent to which the quality system built on learning applications

Tests conducted on the application acceptance study with mental retardation using the media to megetahui questionnaire responses and the assessment of the application, and then performed calculations using a Likert scale where data were analyzed by calculating the average response by scoring each answer from the respondent and then summed. Data was collected through questionnaires to:

1. Teachers who understand the methods VAKT tunagrahita in SLB Aditya Grahita consisting of 6 teachers
2. Experts retarded by 1 person
3. Experts who understand about human interaction with computers (IMK) of 1

The result of the calculation of questionnaires to teachers according to the first objective of the research is as follows

The result of the calculation of questionnaires to teachers according to the first objective of the research is as follows:



Gambar 16 Result Likert Expert IMK

2.9.3 Conclusion Acceptance Testing

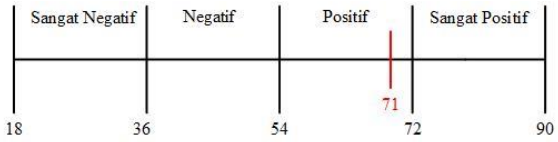
Based on the results of acceptance tests conducted by questionnaire observation it can be concluded that the application of learning together to assist and facilitate retarded retarded students in understanding the lesson. The application also makes it the teacher in delivering the subject matter.

2.10 Testing Pre Test and Post Test

Tests comparing pre-test and post-test was used to compare the value of the student prior to using the application and value of students after using the application.

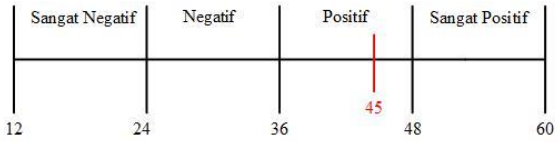
Testing post test obtained from the testing of applications that are built, while the pre-test results have been obtained from the value rapot students in certain subjects.

Tabel 5 Pre Test Results



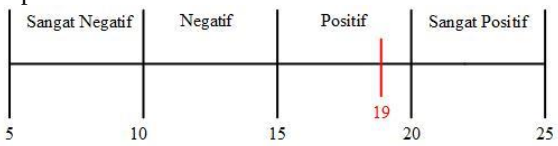
Gambar 13 The calculation result Likert Objective 1

The results of questionnaires to teachers calculation in accordance with the purpose to two of the study are as follows:



Gambar 14 The calculation result Likert Objective 2

The results of questionnaires to the calculation of an expert on mental retardation are as follows:



Gambar 15 The calculation Results Likert Expert Tunagrahita

The results of questionnaires to the calculation of an expert on human interaction with computers (IMK) is as follows:

No	Student's name	Pre Test		
		Mtk	B.Indonesia	IPA
1	Tia Tiara	68	68	70
2	Faza Oktaviera Nur	60	60	60
3	Ahmad Rizki Januar	65	70	58
4	Nurul Fitriani	60	65	60
5	M. Herdi Gunawan	65	60	60
6	Muhammad Salman Nurfaiz	58	70	58
7	Indra Lesmana	68	68	65
8	Muhammad Alham Nur Arief	58	68	65
9	Rizky Rivaldi Muchtar	68	70	58
10	Heri Sam	65	70	68
11	Radika Krisna Anugrah	58	65	55
12	Marlina Triawan	65	65	60
13	Widiya Pratiwi Siswandini	68	72	62
14	Udan Gustiawan	58	68	68

No	Student's name	Pre Test		
		Mtk	B.Indonesia	IPA
15	Sifa Latifah	65	70	68
16	Irfan Kurniawan	60	65	55
17	Nurfitri Cahyani Gumelar	55	60	62
19	Hendra Lesmana	55	68	65
20	Agus Supriadi	62	65	62
21	Sopian	55	62	60
22	Septi Wahyuningsih	52	65	57
23	Irfan Apriliansyah	68	65	68
24	Juniawan	65	68	60
25	Luna	60	63	58
26	Ilham Kusuma	62	65	62
27	Lina Marlina	68	70	70
29	Jajang Pamungkas	58	65	62
30	Edi Maryadi	60	63	65
31	Wahid Setiawan	60	62	57
32	Yogi Triansyah	52	65	60
33	Ernawati	55	65	62
Total		2011	2168	2045
Rata-rata Nilai		60,94	61,97	65,70

Information:
Mtk = subjects of mathematics
B.Indonesia = subjects Indonesian
IPA = natural science subjects

Tabel 6 Result *Post Test*

No	Student's name	Post Test		
		Mtk	B.Indonesia	IPA
1	Tia Tiara	70	80	80
2	Faza Oktaviera Nur	70	78	80
3	Ahmad Rizki Januar	75	80	75
4	Nurul Fitriani	67	85	80
5	M. Herdi Gunawan	67	80	75
6	Muhammad Salman Nurfaiz	70	80	75
7	Indra Lesmana	75	75	70
8	Muhammad Alham Nur Arief	73	75	75
9	Rizky Rivaldi Muchtar	70	80	75
10	Heri Sam	70	85	75
11	Radika Krisna Anugrah	68	80	70
12	Marlina Triawan	70	75	75
13	Widiya Pratiwi Siswandini	75	85	70
14	Udan Gustiawan	73	80	80
15	Sifa Latifah	70	80	75
16	Irfan Kurniawan	75	75	73
17	Nurfitri Cahyani Gumelar	70	75	75
18	M. Ilham Faturrahman	75	75	80
19	Hendra Lesmana	68	85	80
20	Agus Supriadi	75	80	75
21	Sopian	68	75	75
22	Septi Wahyuningsih	70	70	70
23	Irfan Apriliansyah	70	80	75
24	Juniawan	75	80	73
25	Luna	75	80	75
26	Ilham Kusuma	73	75	70
27	Lina Marlina	75	73	85
28	Eka Setiawan	75	75	80
29	Jajang Pamungkas	70	80	80
30	Edi Maryadi	70	80	75
32	Yogi Triansyah	73	75	70
33	Ernawati	70	80	70
Total		2365	2586	2416
Rata-rata Nilai		71,67	78,36	73,21

Based on the comparison table of the results of pre-test and post test performed, it can be concluded that with the application of some students learn with retarded mental retardation increases in value on each lesson

3. CLOSING

3.1 Conclusion

The results obtained from studies conducted in the preparation of this paper as well as referring to the purpose of research it could be concluded.

1. Applications built to provide convenience to the student in understanding the moderate category retarded subjects (mathematics, Indonesian, IPA).
2. Applications built to provide convenience to teachers in delivering learning materials.

3.2 Suggestion

The advice in the development of these applications in the future are as follows:

1. Learning materials in applications that are limited to recognize numbers from 0-20 can be developed so that students can learn tunagrahita other figures.
2. In this research focuses only on children's learning is being retarded by the approach through VAKT method, is expected to be combined with other methods so that students are more active in learning, especially for children with intellectual challenges stimulate motor nerve.
3. Problems are still limited understanding on the application statically, can not be changed or added, it can be developed with an understanding about the added features that matter not understanding that's it

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