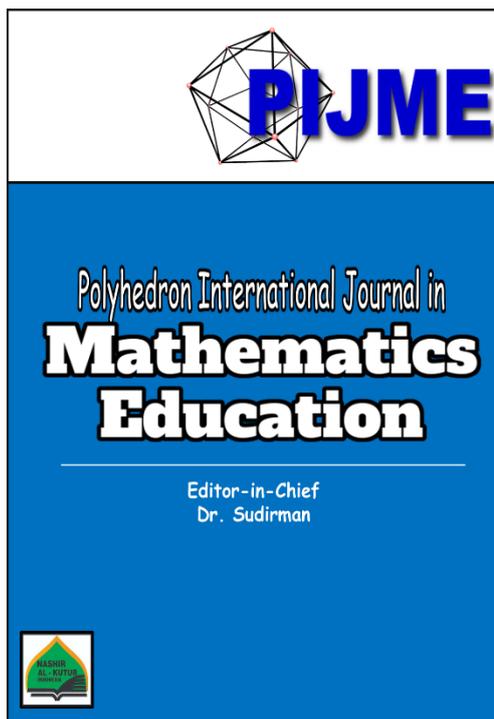


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### Android-based Didactical Design for Learning Lines and Angles: An Interpretive Didactical Design Research

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## **Android-based Didactical Design for Learning Lines and Angles: An Interpretive Didactical Design Research**

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### **Abstract**

Lines and angles are quite important mathematical concepts. This is proven because lines and angles cannot be separated in life. However, lines and angles actually become a problem/obstacle in the classroom. The purpose of this research is to determine the description of students' learning obstacles in the material on lines and angles for class VIII MTs NW Pringgajurang, then a didactic design for learning lines and angles will be prepared. The research design used is didactical design research-interpretive. The participants in this research were Class VIII students at MTs NW Pringgajurang with an age range of 12 to 14 years. The researcher is the main instrument in this research, with several additional instruments such as tests for understanding lines and angles, student biodata, interview guides and didactic designs for lines and angles. The data analysis technique used in this research is thematic data analysis. This thematic analysis is used as a basic foundation for the analytical process in qualitative research, by paying attention to the results of the data collection carried out. The results of the research show that students experience learning obstacles with ontogenic psychological and ontogenic conceptual types. With this Android-based didactic design, it is hoped that it will be able to minimize barriers to students' learning on line and angle material at MTs NW Pringgajurang.

**Keywords:** *Didactic Design, Android Learning Barriers, Lines and Angles.*

### **1. Introduction**

Lines and angles are quite important mathematical concepts (Firmasari & Santi, 2019). This is proven because lines and angles cannot be separated from life (Hartono et al., 2021). However, lines and angles actually become an obstacle in the classroom (Ozen Unal & Urun, 2021). This problem does not only occur in Indonesia, but has become a global problem, both inside and outside the country. According to research results (Ozerem, 2012), there were many obstacles to learning about lines and angles. It turns out that this problem also occurs at MTs NW Pringgajurang. The author found the same thing as previous researchers, namely that there were learning obstacles experienced by class VIII A students in understanding the material about lines and angles. Barriers to student learning occur due to students' lack of basic understanding of line and angle material which is the initial foundation for further geometry learning (Novita et al., 2018), so it is necessary to prepare a didactic design that will help students understand line and angle material (Desmayanasari & Hardianti, 2021). This didactic design uses the help of an Android application, as a researcher's effort to improve learning, especially regarding lines and angles based on learning barriers by considering students' learning trajectories and other factors that become obstacles to students' learning in studying lines and angles.

According to research conducted (Annisa, 2016), class VII students at one of the Makassar City Middle Schools used a qualitative approach with the DDR type, to prepare a didactical design for the Middle School Geometry concept. According to the research results, the didactic design developed can be used as an alternative teaching material for lines and angles to minimize barriers to student learning. The research that has been carried out turns out to be relevant to this research in the context of research design, which uses a qualitative approach with the DDR type. However, in this research there is a difference, namely the Android-based didactic design at MTs NW Pringgajurang.

The aim of this research is to obtain a description of the learning barriers experienced by students, and to use a didactic design in the form of an Android application as a form of effort to minimize barriers to learning about lines and angles at MTs NW Pringgajurang. To achieve the research objectives, research questions were prepared as follows:

- a. What is the description of the learning obstacles experienced by students regarding lines and angles?
- b. What is the description of Android-based didactic design to minimize students' learning obstacles in line and angle material?

## **2. Method**

This research method is a qualitative approach with types didactical design research-interpretif. Interpretive DDR chosen because it is suitable or suitable to be used to analyze factors that cause students to experience learning obstacles (Suryadi, 2013). This research does not reach the design implementation stage, this research is only limited to preparing learning designs based on the results of learning obstacles called didactic design. The qualitative approach consists of three different stages. The first stage involves analyzing the didactic situation before the learning process or carrying out didactic design hypothetical, which cover. Anticipation of Pedagogical Didactics (ADP) (Sidik, 2021; Suryadi, 2013). The second stage is known as analysis metapedidactic, which is essentially a situation analysis didactic- pedagogical. Finally, the third stage is analysis retrospective, where the findings from the analysis of a hypothetical didactic situation are linked to the results of the analysis metapedidaktik (Prabowo & Juandi, 2020).

This research was carried out at MTs NW Pringgajurang. Researchers chose this location because this madrasah is classified as a favorite among religious schools which have many achievements, but have problems in learning mathematics, especially regarding lines and angles. Participants in this research were class VIII A students. Class VIII students were chosen because they had learned about lines and angles in class VII in a time span that was not too long compared to the time of the research.

The data source in this research is data from the analysis of students' learning barriers in the form of answer sheets, the next data is documentation studies in the form of photos and videos (UIN & Banjarmasin, 2018). Data collection in this research was carried out using test techniques, interviews and documentation studies (Murdiyanto, 2020). Researchers are the main instrument in this research, with several additional instruments such as tests for understanding lines and angles, student biodata, interview guides and didactic designs for lines and angles.

The data analysis technique used in this research is thematic data analysis. This thematic analysis is used as a basic foundation for the analytical process in qualitative research, by paying attention to the results of the data collection carried out. Data collection starts from analyzing the answers given to students, then combining the results of interviews with students. Researchers also note down keywords, phrases and mathematical concepts that emerge. The researchers obtained qualitative data through identification, interviews, documentation, and audio recordings which were previously managed first. The validity of the data in this research was carried out by triangulating the data. The data triangulation carried out is triangulation of sources and methods, carried out by checking data that has been obtained through several sources. Data triangulation is used to strengthen the validity of the data found (Sugiyono, 2014).

## **3. Results and Discussion**

Based on the research results, information was obtained that there is a tendency for students to experience learning obstacles due to being careless in learning or other things *psikological ontogenic*. The results of this research are in line with (Atiqoh, 2019) which revealed that students were less careful when carrying out calculations and did not double-check their answers. In

learning, students tend to be careless and not careful, which causes students' low ability to solve mathematical problems (Jannah, 2023). The results of this research are also supported by those who reveal that (Suryadi, 2013) students experience various types of learning obstacles *psikological ontogenic* (Lestari & Suryadi, 2020).

In addition, there is *Epistemological Obstacle* namely learning obstacles that occur due to limited context and students' low understanding of mastery of the material. The third obstacle, namely *didactical obstacle* namely learning obstacles that occur due to the process or method of teaching carried out by the teacher in the classroom (Soendari, 2012). One way that can be done to minimize student carelessness is by adding hints or reminding students to double-check their answers. This is also in line with theories regarding learning *problem-solving* one of the steps is to check the answers again after solving the problem (Maisyaroh Agsya et al., 2019). The didactic design in learning curves and corners consists of three main activities, namely initial, core and closing activities. This series of activities is structured based on theory which reveals that learning consists of at least three learning steps, namely beginning/introduction, core (exploration, elaboration, confirmation), and closing/final (Julaiha, 2014).

Initial activities consist of learning objectives, learning motivation, and prerequisite materials. It is hoped that having learning objectives will help educators and students to focus more on the material being studied. The activities contained in these initial activities are structured based on the theory that learning motivation must be at the beginning of learning (Adinoto, 2019). With the motivation provided, it is hoped that it will be able to arouse students' enthusiasm for learning. One way to generate motivation is with learning videos (Wuryanti, 2016). Through learning videos, students feel happy because the learning carried out in the classroom is not monotonous, especially in this modern era, we are able to utilize super sophisticated technological tools to develop the world of education at all levels of education. Therefore, not utilizing these sophisticated technological tools is a huge loss in the world of education. This is in line with the results of research conducted by (Maulani et al., 2022) who said that learning videos can increase learning motivation and create a pleasant atmosphere that does not easily make students bored while studying. With this technological tool we can create teaching materials via an Android application (Rezasatria et al., 2019). We can create a didactic design, to make it easier for students to solve problems, overcome students' learning difficulties and access learning only with a cellphone or something similar.

Didactical design contains problems because DDR is based on social constructivist theory (Solehah & Haqq, 2018). Didactical design is a solution for students who still have many obstacles in their learning, especially students who do not understand the pre-requisite material (*ontogenic conceptual*) and who still experience many procedural errors in solving questions or learning. This problem is proven by research conducted by (Ulfa et al., 2021) that students often experience learning obstacles because they do not understand the prerequisite material, which causes students to answer questions incorrectly. It is hoped that this initial activity will help understand the learning objectives, raise students' enthusiasm, and recall the material that has been taught (Suraningsih et al., 2020).

Furthermore, good learning consists of core learning activities. The core activities consist of *exploration, elaboration, and confirmation* (Ubaidillah, 2023). This activity is simplified in terms of "let's look for/find or let's solve the problem", by providing previous instructions to remain careful and thorough in solving a problem as per the results of research from (Ubaidillah, 2023). The didactic design is created in the core learning activities, in which several problems are presented to be discussed and resolved by students. After discussion, students are expected to be able to solve the problem and in the end they create a concept for the material. Understanding the concept will help students understand the material for a long period of time compared to students who only memorize the formula without understanding the concept of the

material (Rahmi et al., 2021). The process of concluding at the end of learning will help students to better understand the basic concepts of prerequisite material.

The final activity as a form of evaluation in learning, the teacher provides a reflection, in which there are main points, namely (1) remembering briefly return to the material they have studied to find out their understanding of the material and (2) ask students how they felt when they finished studying, whether they were happy or not (Nasir & STKIP Bima Biology Education Study, 2021).

The didactic design that has been created is then made into an Android-based application. Android is a Linux-based operating system designed for touch screen mobile devices such as smartphones and tablet computers (Aprilyana Puspa et al., 2019; Julaiha, 2014). Making this Android application of course goes through several processes and uses three additional applications (Kadek et al., 2018). This application is *Ms. Power Point*, *Aplikasi iSpring Suite 11* and *ApplicationsWebsite 2 APK Builder Pro v5.2*. which will later produce a new application that contains a simple Android-based didactic design that discusses lines and angles, named "UNW Math Lines & Angles". This application is expected to be able to reduce learning obstacles that occur in students due to conceptual errors in understanding pre-requisite material, as well as students often being careless in answering questions and being reluctant to check the answers again before submitting them.

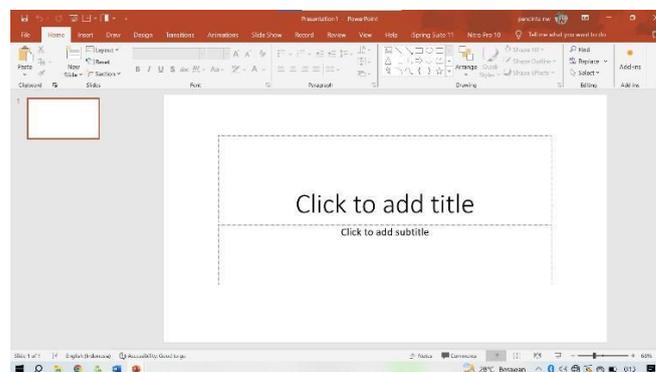
The following is the process of creating a didactic design based on an Android application with the help of three additional applications.

#### **a. Application *Ms. Power Point***

Researchers use *Microsoft power point 2019* to create an operating flow for didactical design for mathematics learning on Android-based line and angle material using features *template* and *hyperlink* (Suratman, 2020).

Figure 1

*The initial view of Ms. PowerPoint 2019*



Use of Ms. Power Point makes it easy for us to create the designs we want. Because many interesting features have been provided according to our respective desires (Suratman, 2020).

**Figure 2**  
*Material manufacturing process lines and angles*



Basically, in making this application there are 167 pages consisting of four main points, namely the main page for lines and angles, material for lines and angles, a collection of questions about lines and angles, and finally the student worksheet (LKPD).

**Table 1** *Main menu didactic design*

<p align="center"><b>Figure 3.3</b> Pg. Main</p>	<p align="center"><b>Figure 3.4</b> Material</p>
<p align="center"><b>Figure 3.5</b> Group of questions</p>	<p align="center"><b>Figure 3.6</b> LKPD</p>

**b. Application *iSpring Suite 11***

Figure 3

*Application iSpring Suite 11*



Application *iSpring Suite 11* used to create quizzes/evaluation questions, where the I-spring is directly connected to *Microsoft power point*. In *appiSpring Suite 11* we will change the PPT to publish before going to the final stage.

Table 2 Application main page *iSpring Suite 11*

A screenshot of the iSpring Suite 11 main interface. The window title is "iSpring Suite". On the left, there is a sidebar with various icons for "Courses", "Quizzes", "New", "Help", "Settings", "About", "Feedback", "Helpdesk", "Support", "Feedback", "Helpdesk", "Support". The main area shows a "Courses" section with a "New" button and a "Open" button. Below that, there are three options: "New from Scratch", "New from Existing", and "New from Existing with iSpring Suite".	A screenshot of a Microsoft PowerPoint slide. The slide is white with a red border. The text on the slide reads "Click to add title" and "Click to add subtitle". The PowerPoint ribbon is visible at the top, showing the "Home" tab.
<p>Figure 3.8 Main page <i>iSpring suite 11</i></p>	<p>Figure 3.9 Connected power point <i>iSpring Suite 11</i></p>

**c. Application *Website 2 APK Builder Pro v5.2*.**

The Windows operating system has an application called *Website 2 Apk Builder* which can be used to make it easier to convert web-based programs into application-based programs. So learning becomes interactive, the web is expected to be the medium. The use of interactive learning tools has the potential to significantly increase students' ability to respond well to taught lessons (Marliani et al., 2022). The final process in creating a new Android application is the application creation process using *iSpring Suite 11*.

Figure 4  
*Application website 2 APK Builder Pro v5.2.*



Figure 5  
*Final process of creating the "UNW Math Lines & Angles" application*



Figure 6  
*The "UNW Math" application has a PC computer version but the file format does not support PC computers because it is specifically for Android*

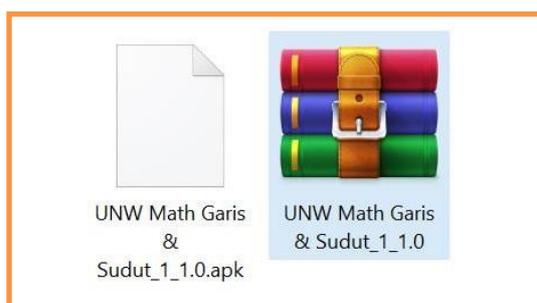
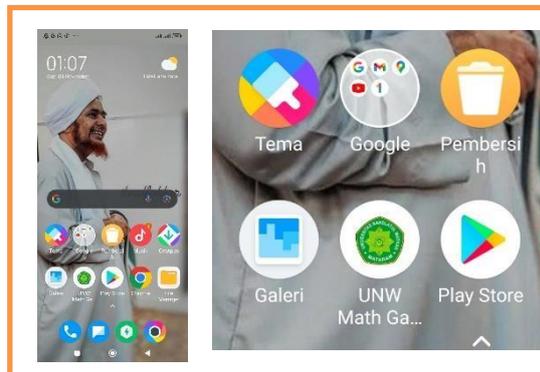


Figure 7

*The "UNW Math" application is ready, Android version*



#### 4. Conclusion

Based on the description of the results of this research, students do not understand the prerequisite material so they cannot answer the questions given and tend to be careless in answering questions, so students are indicated to experience several types of learning obstacles, including: psikological ontogenic because students experience learning obstacles caused by carelessness or students tend to rush in doing their work; ontogenic conceptual because students cannot understand the prerequisite material, so learning obstacles occur; and didactical obstacle namely learning obstacles that occur due to the process or method of teaching carried out by the teacher in the classroom.

With these learning obstacles, it is very necessary to create a didactic design, especially in teaching mathematics about lines and angles, which can increase understanding of the concepts of lines and angles, especially in pre-requisite material. Next, you need to remind students in writing in the questions, to check their answers again and not to rush and remain careful and thorough in answering the questions. Hopefully this didactic design of line and angle material will be continued until the final stage by the next researcher. Due to time constraints, we only reached the stage of creating an Android-based didactic design.

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