Wingeom program in geometry

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Abstract. Wingeom program is a mindtool to solve geometry problems. It is used to develop dimensional geometry frameworks. The program can help visualize geometric concepts so clearly that respondents will understand geometry concepts effortlessly. Driven by this expediency, this design base research was carried out in three stages; what to learn, how to learn, when to learn, monitor the ongoing process and evaluate what has been planned, done, and the results of the process. This research is expected to be an alternative and solution in overcoming difficulties in understanding the Geometry concepts. Five respondents were selected to participate in this study. The results of the study showed that the respondents were able to explore, observe, and perform animated images and dimensional geometry material.

1. Introduction

Wingeom program is a mindtool to solve geometry problems. It is used to develop dimensional geometry frameworks. The program can help visualize geometric concepts so clearly that respondents will understand geometry concepts effortlessly [1]. Current learning trends, involving computer media as a tool for mastering mathematical concepts. The fields of instructional design and technology include the analysis of learning and performance problems, and the design, development, implementation, evaluation and management of instructional and non-instructional processes and resources intended to improve learning and performance in a variety of settings, especially institutional and workplace education [2] While instructional strategies are tools or techniques available to educators and instructional designers to design and facilitate learning [3].

Preliminary analysis was carried out to find problems in mastering geometric concepts. The results of the observation show that most of the respondents had difficulty in visualizing the geometry concepts of two dimensions and three dimensions [4,5].

Previous research studies emphasized the practical use of tools in understanding geometric concepts [5-7,12], while in this study emphasizes what to learn, how to learn, when to learn, monitor the ongoing process and evaluate what have been planned, done, and the results of the process.

In the early 1990s, the first dynamic Geometry System was developed with the aim of guiding users to explore system geometry rules. Mistakes are often found, after construction is completed, the first object is drawn (points) can drag with the mouse, thereby changing the overall construction [6]. The geometry system was developed, such as the Geometer Sketchpad [7,8], Cabri Geometry II [9,10], Cinderella [11,12], Euklid, Dr. Geo [13], WinGeom [3,14], Signature [15], The Geometric Supposer [16], Algebra [17] etc.

Wingeom program is a mindtool to solve geometry problems. It is used to develop dimensional geometry frameworks. The program can help visualize geometric concepts so clearly that respondents will understand geometry concepts effortlessly.
The initial appearance of the wingeom program, it will appear in the dialog box. Select close if you want to close the tips, next if you want to see the next tips and previous if you want to see the previous tips. If you don't want to read these tips every time you run the Wingeom program, then click the check mark that is located in front of the word show a tip at startup.

Click the Window menu to select the menu provided. There are two options to choose from, namely 2-dim (for making 2-dimensional images), 3-dim (for making 3-dimensional images), hyperbolic, spherical, voronoi, guess, tesselations, RGB demo, open last (for open the last file that was run), use defaults (to run settings stKitar) and exit (to exit the program). As in figure 1.

![Options menu](image1.png)

**Figure 1.** Options menu.

This study discusses the use wingeom 2-dim. To run the 2-dim sub menu can be done by clicking: Window> 2-dim (sign "->" means "continue"), it will display the 2-dim window like Figure 2.

![2-dim Window Display](image2.png)

**Figure 2.** Wingeom 2-dim Window Display.

In the 2-dim wingeom there are several menus that can be used:

- **File menu**: contains several sub-menus related to processing files.
- **Point menu**: contains sub menus related to the preparation and processing of points.
- **Line menu**: contains several sub menus about the preparation and processing of lines, for example drawing line segments, putting line segments in the position we want and others.
- **The Circle menu**: contains several sub menus about circles. The Circle menu can be run if a circle has been created. The Circle menu can be used to add curved fields to a building space.
• **Unit menu**: contains several sub menus to display a certain flat plane build. For example drawing triangles, many with a certain size and others.

• **Transf menu**: contains several sub-menu command transformations that we can do on a flat wake.

• **Edit menu**: contains several sub menus about editing, adding certain attributes and settings.

• **Measurement menu**: is used to list certain sizes that can be displayed in the wg2 window.

• **Btns menu**: contains a number of sub menus about buttons, namely the menu to set the "click" function right and left on the mouse.

• **View menu**: contains several sub menus about the display of images that we make.

• **Anim menu**: is used to run the animation that has been created. The form of animation depends on other commands entered as in the Transf menu.

• **Other menus**: contain additional sub-menus containing display accessories.

• **Help menu**: displays some general notes about the Wingeom program for two-dimensional (2-dim) geometry.

1.1. *The steps run the 2-dim wingeom*

Preparation before starting to choose a menu:

- Each menu has a help file.
- Text input is not case-sensitive.
- Some windows or dialog boxes can still appear on the screen. If you want to close it, then just click the button called 'close' or by pressing Esc.
- When the window or dialog box is active, the title bar will turn on. To select a different dialog box, you can use the Tab or Mouse button.
- To copy text material, press Ctrl + C while to enter text material, press Ctrl + V.
- If you want to go back to the initial settings, click Use defaults.

1.2. *Example of a wingeom program for 2-dim*

For example of a wingeom program for circle tangents. Open the circle menu, this menu is used to draw things related to a circle. The following steps:

- **Circumcircle**, to draw a circle through three points. The center point is expressed as a new point and labeled. Example, make three points A, B and C then click Circle> Circumcircle> ABC> draw.

- **Incircle**, to draw a circle in a triangle. The center point and the three point of contact are then labeled.

- **Radius-center**, to draw circles and arcs circle if the center point is known. Poincare, if given a circle and two inner pointscircle, for example A and B. Poincare will draw an arc which through A and B.

- **Apollonian**, if given two points A and B, will be apollonian will give all points P that have a comparison the same as PA / PB.

- **Excircle**, to draw a circle that alludes to a segment line BC, line AB and line AC over triangle ABC.
Figure 3. Example excircle.

- **Nine-point**, to draw a circle through three triangular height lines.
- **Equation**, to draw a circle by determining the center and fingers or by writing the formula.

Figure 4. Display equation at circle.

- **Tangent circle**, if given three points A, B and C, the tangent circle will give three circles centered on A, B and C that intersect each other.
- **Soddy circle**, if given three circles that intersect each other, the Soddy circle will give two circles that allude to the three circles.

2. Material and methodology
Five respondents were chosen to participate in this study, they were first year students in the 2017-2018 academic year from Mathematics Education at the Indonesian Institute of Education. This basic design research is carried out in three stages; what must be learned, how to learn, when to learn, monitor the ongoing process and evaluate what has been planned, done, and the results of the process. The research instrument has been validated by experts who include learning design experts, curriculum experts and instructional media experts who are then tested to measure the validity and reliability.

To find out the increase in learning achievement, data from respondents were processed using quantitative methods [18]. The T test is applied to test hypotheses in one treatment study. the use of the T test was also conducted to determine whether the average results of the research conducted had met certain criteria or not [19].

3. Result and discussion
The focus of this discussion is on the presentation and analysis of data obtained from the successful use of wingeom programs in improving student learning achievement, this section outline discussion of research data that is connected with previous relevant studies and literature.

Before explaining the efficacy of Learning to use this session's wingeom program will be explained clearly about the quality of the learning process so far. Observations were made on five observer respondents. The results showed that respondents could not explore, observe, and do animated images
and dimensional geometry materials. In the geometry learning process, the respondent shows confusion about what to learn, how to learn, when to study, and they have not been able to monitor the ongoing process and have not been able to evaluate what has been planned, done, and the results of the process.

Based on these findings, researchers designed a geometry learning assisted by the Wingeom program. A set of research instruments was validated by the expert team in order to get a steady and accountable instrument.

The next step, the research instrument was used in the geometry learning process using a wingeom program. The results of processing research data show that:

| Table 1. One-sample test. |
|---------------------------|
|                          | N | Mean  | Std. Deviation | Std. Error Mean |
| Wingeom Program           | 5 | 3.8211| .54555         | .10773          |

| Table 2. One-sample test. |
|---------------------------|
|                          | t | df  | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference |
| Wingeom Program           | 9.236 | 26  | .000            | .97259         | .7632 – 1.2020                           |

The results show that the number of student data is 5 people with an average = 3.8211, and standard deviation = 0.10733. The test criteria are used if the significance value is more than alpha, the null hypothesis is accepted [20].

The data further shows Test Value = 2.76 with the value t_{count} = 9.236; value (2-tailed) = 0.000. while the hypothesis testing criteria is if the value (2-tailed) > α then H₀ is accepted, because the value (2-tailed) = 0.000 < α then H₀ is rejected, meaning that Geometry learning using wingeom programs is effective in improving student learning achievement.

**4. Conclusion**

Conclusion of the results of this study showed that the respondents were able to explore, observe, and perform animated images and dimensional geometry material. Wingeom programs can improve student geometry learning achievements.

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