MALT2: A DIGITAL EXPRESSIVE MEDIUM FOR STUDENTS' AND TEACHERS' MATHEMATICAL ACTIVITY

Gavrinas, Konstantinos

NKUA, kgavrinas@math.uoa.gr

The use of dynamic geometry software (DGS) is important in educational environment, and it is more advantageous for learning mathematics comprehensively. DGS provides a valuable instrument for revising and expanding students' knowledge, as well as adapting learning tasks in geometry to a dynamic geometry environment for expanding and deepening geometrical and pedagogical knowledge and reasoning skills, allowing students to have an accurate reflection process.

In this poster, there is a students' engagement with MaLT2 (Machine Lab Turtle-sphere) – an online environment that integrates Logo textual programming with the affordances of dynamic manipulation. This can foster the students' retention level, who are encouraged to go beyond memorizing formulae and instead grasp the concepts.

Keywords: Logo, Turtle Geometry, 3D Geometry

WHY DGS?

The use of Dynamic Geometry Software seems to be more advantageous for learning mathematics comprehensively, as it provides a valuable instrument for revising and expanding the math knowledge of students of any age/class. There is a significant difference between learners' mathematics performance after the intervention of dynamic geometry computer software (Adelabu et al., 2019; Segal et al., 2021).

WHY MALT2?

MaLT2 is an online Logo-based application that allows the creation, exploration, and dynamic manipulation of 3D geometrical models with textual programming. MaLT2 encourages students to develop intuitively new ideas, to express them by using symbolic language, to run them on MaLT2 environment and to directly observe their outcomes. Thus, pupils can compare their estimates with the results, control their pre-existing knowledge, experiment with new ideas and construct meanings about the concepts (http://en.etl.eds.uoa.gr/digital-resources/authoring-tools/malt2-an-online-tool-of-symbolic-expression-in-mathematical-activity.html).

HOW?

By using "half-baked micro-experiment" (fallible artifact) having one or more "buggy" behaviours built into them. The aim of these "bugs" is to provoke students to fix them – to improve the original artifact (Kynigos & Grizioti, 2018).

EXPECTED RESULTS

Students are expected to amplify their computational thinking skills in the mathematical context, improve their abilities to produce correct conjectures, identify reciprocal relationships between geometrical/mathematical concepts and create meta-representational competence.

PROBLEMS

Problem #1 – Fix a "half-baked" isosceles trapezium.

Fix one (instance of a) correct isosceles trapezium so, if change one of four variables (two parallel sides, leg and base angle) the shape remains (as the class of) an isosceles trapezium.

Problem #2 – Fix a "half-baked" trapezium with a right angle.

Same as above, but with a (fixed) right angle and three variables.

REFERENCES

Adelabu, F. M., Makgato, M., & Ramaligela, M. S. (2019). The Importance of Dynamic Geometry Computer Software on Learners' Performance in Geometry. Electronic Journal of E-Learning, 17(1), 52–63. https://eric.ed.gov/?id=EJ1216699

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MaLT2: A digital expressive medium for students' and teachers' mathematical activity

Konstantinos Gavrinas

Machine Lab Turtlesphere 2 – http://etl.ppp.uoa.gr/malt2

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Why DGS?

- more advantageous use for learning mathematics comprehensively
- valuable instrument for revising and expanding students' math knowledge and reasoning skills
- significant difference between learners' mathematics performance after the intervention with dynamic geometry computer software

(Adelabu et al., 2019; Segal et al., 2021)

Why MaLT2?

- encourages students to develop intuitively new ideas
- express these by using symbolic language
- observe directly their outcomes
- control their pre-existing knowledge
- experiment with new ideas and construct meanings about the concepts

How?

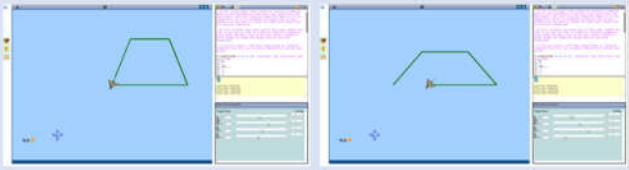
- by using "half-baked micro-experiment" having "buggy" behavior(s) built in
- the aim the "bugs" is to provoke students to fix them – to improve the original artifact

(Kynigos & Grizioti, 2018)

Expected results

- amplify computational thinking skills in mathematical context
- improve correct conjectures
- identify reciprocal relationships
- create meta-representational competence

Problem #1: Fix a broken isosceles trapezium



This is a "defective" isosceles trapezium (you shake it, and it breaks) with four variables (two parallel sides, leg and base angle), having specific values to format an isosceles trapezium.

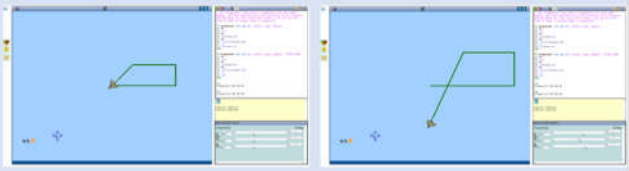
Task for the students

Fix the code so that it always creates an isosceles trapezium based on three variables (out of the four above).

Extra question

Can you create an isosceles trapezium with just two variables? Yes / no / why?

Problem #2: Fix a broken "rectangle" trapezium



This special trapezium (with one leg/parallel angle as a right one) that "breaks" when the other angle is modified.

Task for the students

Fix the code so that is always displays a trapezium.

- Adelabu, F. M., Makgato, M., & Ramaligela, M. S. (2019). The Importance of Dynamic Geometry Computer Software on Learners' Performance in Geometry. Electronic Journal of E-Learning, 17(1), 52-63.
- Kynigos, C., & Grizioti, M. (2018). Programming Approaches to Computational Thinking: Integrating Turtle Geometry, Dynamic Manipulation and 3D Space. Informatics Educ., 17, 321-340.
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Created by Konstantinos Gavrinas, NKUA, Mathematics Education graduate studies
kgavrinas@math.uoa.gr