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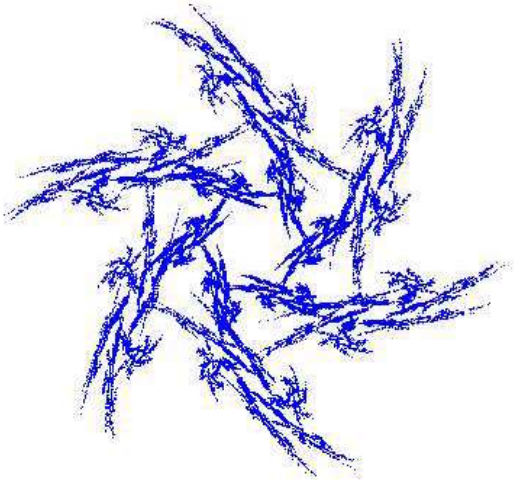
FACULTY OF MECHANICAL ENGINEERING

15th CONFERENCE ON APPLIED MATHEMATICS 2016

PROCEEDINGS



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MOBILE APPLICATION – A TOOL FOR TEACHERS, PUPILS AND THEIR FAMILIES

VOŠTINÁR Patrik (SK), HANZEL Pavol (SK)

Abstract. In the current school environment, tablets and mobile telephones are gradually becoming standard integral teaching aids. Although terms such as the "informatisation of education" may be increasingly encountered, we should not forget, though, about the use of information-communication technologies in mathematics. The aim of education informatisation is to increase the effectiveness of the teaching process, whereby a pupil is not only passively receiving information, but he-she is also taking an active part in the teaching process. Even though our school is currently undergoing a process of modernisation, the use of modern technologies may still not be considered as standard practice in the field of mathematics. In this article an application of geometric shapes is described which may be used as a tool in the teaching process.

Keywords: ICT, teaching geometry at primary level, 2D shapes, 3D shapes, spatial bodies, mobile phones, tablet, perimeter, area, surface, volume

Mathematics subject classification: 97U20, 97G50, 97U50.

1 M-learning

M-learning is a form of electronic education based on the use of mobile technologies such as laptops, pocket computers, smart phones, tablets, etc. [1]

As e-learning is slowly ceasing to meet current needs, M-learning is gradually occupying this niche. The amount of information which we have access to is rapidly growing. In our current hectic period, people require information quickly and whenever they desire. The use of mobile technologies therefore, simplifies access to information, encourages at any time or place the spread of information literacy, increases opportunities for student co-operation and that for independent distance learning. [2]

Thanks to the 'School at a touch' and the Electronification of the Education System of Regional Schooling projects, Slovak schools have obtained tablets.

The use of communication and information technologies supplements and increases effectiveness of mathematics teaching as well as it is extending opportunities for study in this field. Furthermore, it

concurrently serves as a motivational tool for students. If we build on the ideas of Ján Amos Komenský that school games are an effective form of education, it would seem appropriate that the use of tablets and mobile telephones serve as a connection between games and maths teaching. Primary school pupils will subtly extend their mathematical knowledge when using the *Geometric shapes* application, and at the same time they are picking up new computing skills. Those benefits, however, connected to the utilisation of modern technology in maths teaching, depend to a great extent upon the attitude of the teacher towards information and communication technologies.

Therefore, we have intentionally developed an application for mobile telephones and tablets using the *Android* application system. These applications are designed for primary school pupils and teachers, or even parents. They are accessible in three languages – Slovak, Czech or English (according to the language setting on the mobile). In the case when the language setting is not in Slovak (or Czech), the application is displayed in English. The advantages of this application are its simple appearance and easy installation and use.

2 Installation of application

The *Geometric shapes* application is directly downloadable onto a mobile phone by means of the *Playstore* which may be found on every mobile phone or tablet using the Android system. *Playstore* can befound in the telephone's menu - in the section listing all installed applications (Fig. 1). After opening the store, enter *Geometric shapes* in the search field. Select *Geometric shapes – Patrik Voštinár* in the list of displayed applications (Fig. 2). The final thing required before running the application is to click on *Install* thus installing the application on to the mobile (Fig. 3).

Fig. 1. Android phone menu

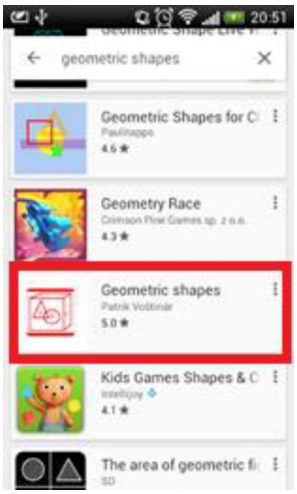

Fig. 2. Search in Playstore

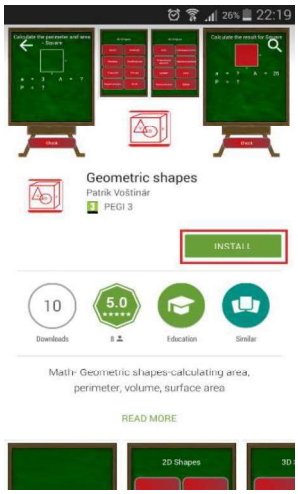

Fig. 1. Installation of application

A further alternative is to download the application by means of a computer's search browser. The application is accessible at the following address: https://play.google.com/store/apps/details?id=com.pavo.geometricketvary. In order to download, it is necessary to log in to *GooglePlay* and subsequently click on the *Install* button. In the displayed window the device on to which the application is to be installed needs to be selected

(Fig. 4). This second option is preferential in the case where the application is to be installed on several devices using the Android operating system.

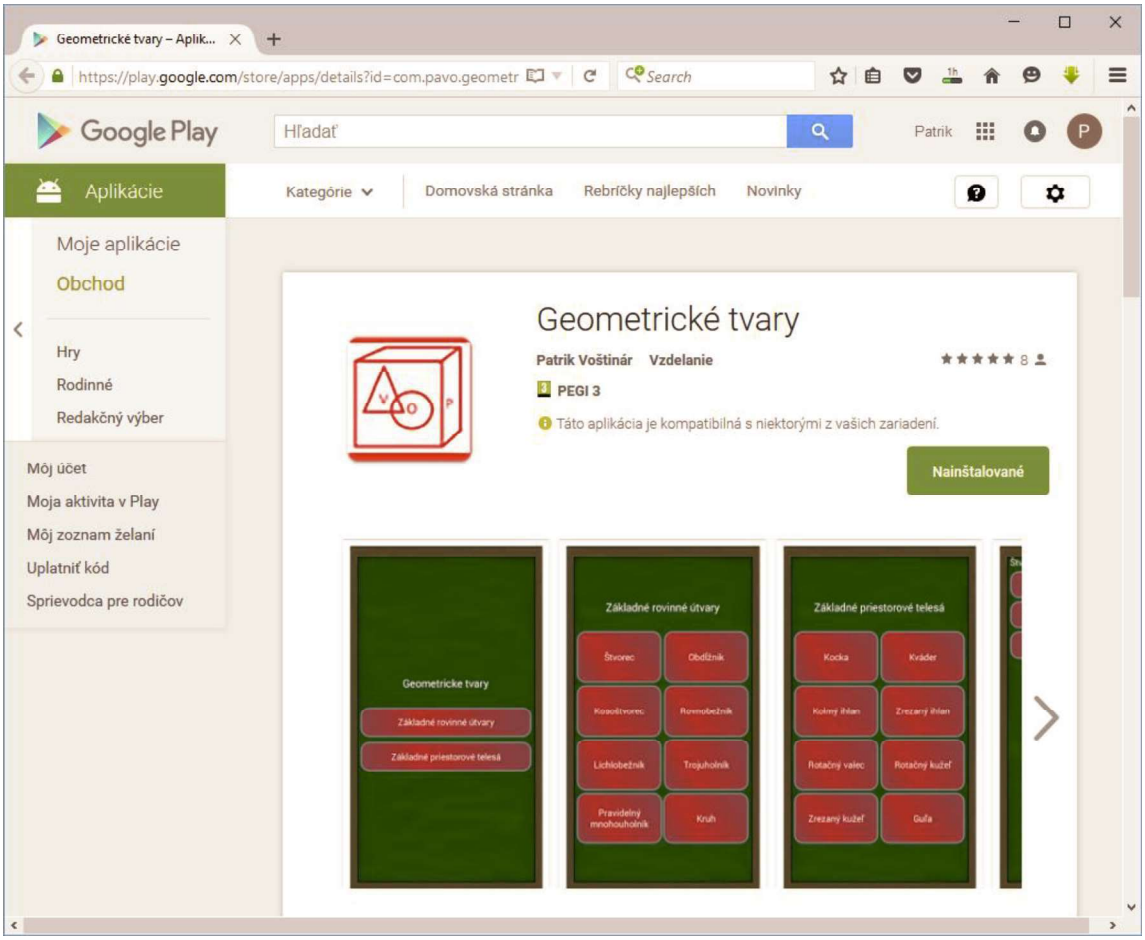

Fig. 4. *Google PlayStore* on internet search engine

After installation is complete, the following icon is displayed on the tablet or mobile (Fig. 5).

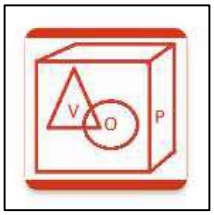

Fig. 5. Geometric shapes icon

3 Structure of the application

A few seconds after running the application a main introduction menu is displayed wherein the use may select whether to work on 2D Shapes (basic planar shapes) or 3D Shapes (basic spatial bodies) (Fig. 6).

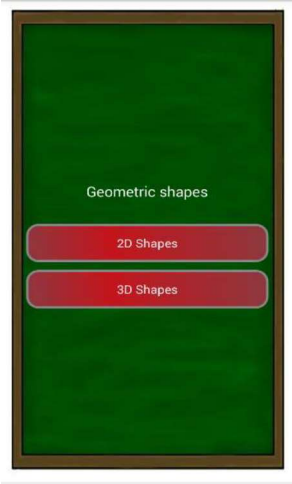

Fig. 2. Main menu of *Geometric shapes* application

If the user decides to work on the Basic Planar Shapes, the following shapes/formations are available: *Square, Rectangle, Rhombus, Parallelogram, Trapezoid, Triangle, Regular Polygon and Circle* (Fig. 7). In the Basic Spatial Bodies section, it is possible to work on: *Cube, Rectangular prism, Perpendicular Pyramid, Truncated Pyramid, Cylinder, Cone, Truncated Cone and Sphere* (Fig. 8).

Fig. 3. 2D shapes

Fig. 4. 3D Shapes

After clicking on one of the offered selections, further alternatives are displayed to the user: “Help”, “Examples”, “Verification of Result” (Fig. 9, 10).

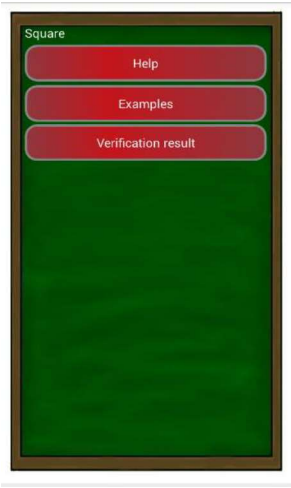

Fig. 5. Help, Examples, Verification of result for square

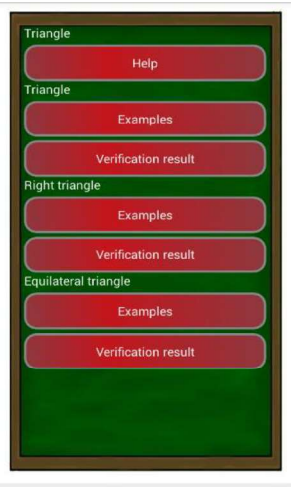

Fig. 6. Help, Examples, Verification of result for triangle

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Every option has its own function. “Help” offers some brief theory combined with a model example of solution (Fig. 11-13).

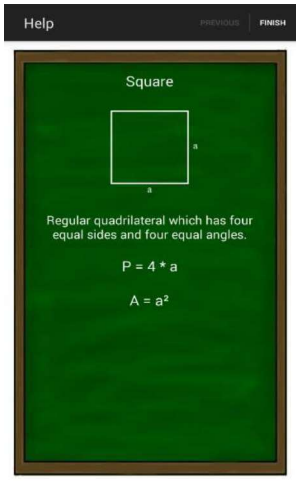

Fig. 7. Example of Help function for square

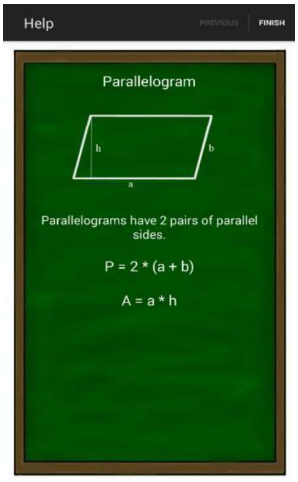

Fig. 8. Example of Help for parrallelogram

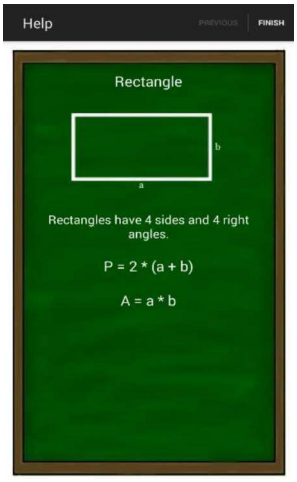

Fig. 9. Example of Help for rectangle

The “Examples” section enables the user to practise calculation of circumference or areas of planar shapes and surfaces, or even the volume of spatial bodies. The user may select the level of difficulty for solution of examples. For the majority of examples, the user may choose from two levels of difficulty – easy and difficult (Fig. 14).

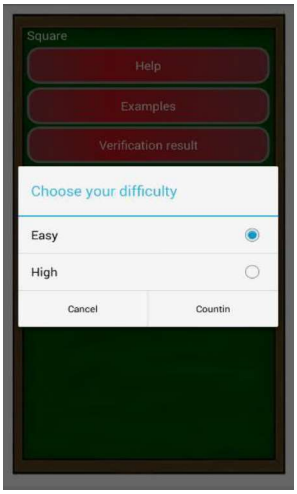

Fig. 10. Difficulty selection for generated examples

After difficulty selection, the application generates tasks which the user subsequently attempts to solve (Fig. 15).

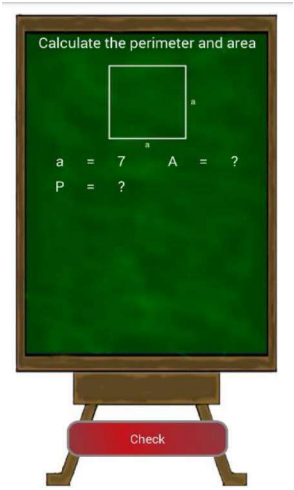

Fig. 11. Random generated task

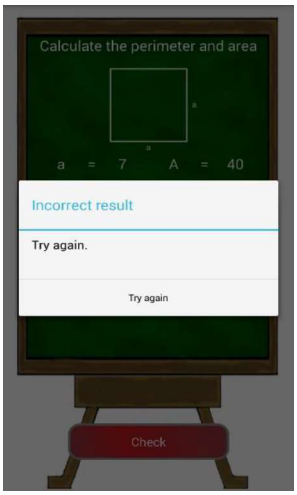

Fig. 12. Incorrect result

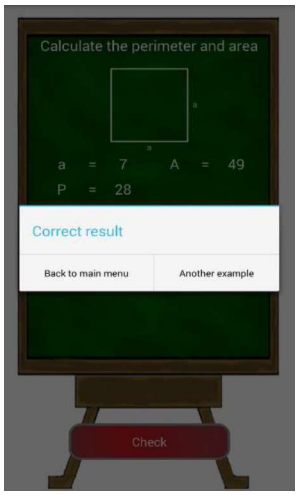

Fig. 13. Correct result

After solving, the user enters his/her result in the place where there is a question mark and selects the "Check" button. The application subsequently checks the given solution. If it is not correct, the user has to repeat task solving (or make use of the telephone's hardware button and return to the previous menu) (Fig. 16). In the case of a correct answer, the user may select another task or return back to the main menu (Fig. 17).

Apart from the "Help" and "Examples" options, the user may select "Verification of Result". This option enables the user to verify the result of whichever task in the relevant category. The application challenges the user to enter his/her example into the device, which is subsequently solved by the application, and the correct result is displayed (Fig. 18-22).

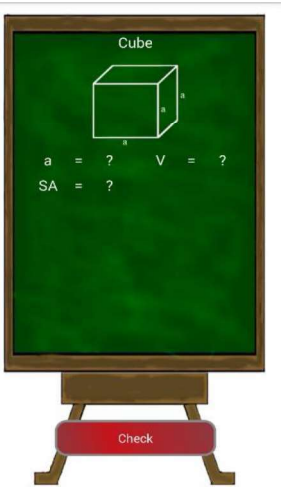

Fig. 14. Working out the result for a cube before pressing button

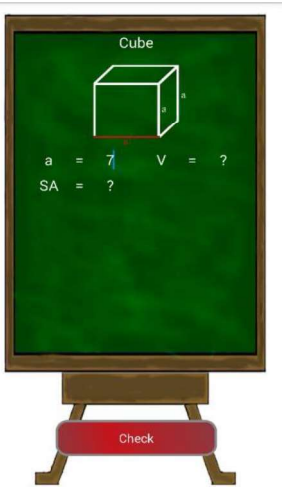

Fig. 15. Working out the result for a cube after entering the side length

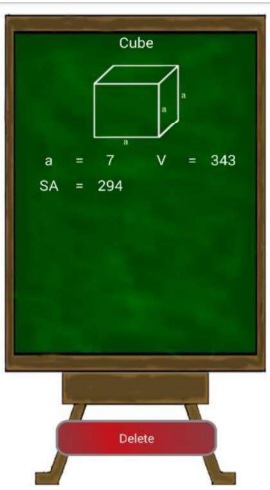

Fig. 16. Working out the result for a cube after pressing button

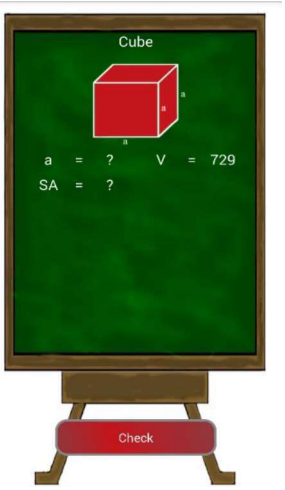

Fig. 17. Working out the result for a cube before pressing button

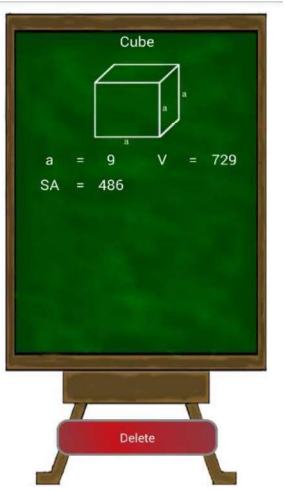

Fig. 18. Working out the result for a cube after pressing button

4 Conclusions

The efforts of our work concern the development of an application for practicing the topic of geometric shapes. It supplements existing teaching material and aids in the teaching environment. Moreover, it serves as an electronic source of examples. It can be used by students as well as teachers. In fact, parents can make use of it too, when checking their children's homeworks. The application was developed with the aim of enhancing and supplementing the teaching process. Teachers, pupils and students have the opportunity to have this application always at hand, since mobile telephones became an ordinary part of our

daily lives. Tasks may be solved during spare time, for example, when travelling in the means of public transport or sitting in the waiting room at the doctor's.

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