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THE USE OF QR CODES IN EDUCATION

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Review Scientific Paper

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Abstract – Quick Response Codes (QR codes) are one of the features of smart phones that allow to connect the physical and virtual content for the user to get additional information. QR codes are already in use for various purposes in different areas, but there are not yet sufficiently applied in education.

The aim of this research is through the development of educational games that use QR codes, to popularize and expand the idea for their use in education as a support tool. For this research, various educational activities, for children of different ages were designed and tested. The results of the evaluation have shown that this type of learning is interesting and at the same time motivating and encourage collaborative learning.

Keywords: QR codes, education, collaborative learning.

I. INTRODUCTION

The possibilities of the computer technology and mobile devices with wide spectrum of additional functionalities became an everyday need in different areas of the modern living. Education is an area in which rapid development of information technology has a great impact and therefore the challenges for its use are vast. In order to use modern technologies in education some changes in the way of realization of education process are needed. Teachers should organized their lessons in a way that the students take active role during the classes.

The use of mobile phones in education, is often disputed. However number of studies indicate that the proper use of smart phones could increase student collaboration and engagement. Learning through playing games caused the large interest among students.

In this context we decided to use the QR (Quick Response) codes, for various educational activities, in order to explore the benefits and challenges of their use in education as a support tool. Evaluation was done with children of different ages. The results of evaluation are shown in this paper.

II. QR CODES

QR codes are 2D barcodes (matrix made of square black dots laid in a square scheme on white background). Designed for the first time in 1994 for the necessities in the automotive industry in Japan, in short time they have spread all over the world due to their quick readability, small printout size and immense capacity of storing information unlike the standard barcodes [1]. A useful way of thinking of QR codes is that they link the physical world with the virtual (electronic). This adds value through improving the potential of making access to information more efficient and effective.

QR codes can be generated with different 2D barcode generators, but previously we need to know what we want to be coded and choose the appropriate QR generator. The information that the QR codes carry could be read with the software-QR Reader that should be installed on computers or smart phones. Also the devices need to have a camera installed in order to read the QR codes [1], [2]. Various QR codes generator and reader exist in the market today, but their specifics are out of scope of this paper.

Speaking of where we can put the QR codes, we can freely say: everywhere. Printed QR codes can be placed in newspapers, magazines, brochures, books, flyers, different printed materials or business cards. They can be also put on products as labels, on billboards, in television commercial, or on web site [3]. By scanning the QR code user can get immediate access to the information that the code is carrying.



Figure 1. Using QR code for accessing information on Internet.

III. QR CODES IN EDUCATION

The study of QR codes in education can be placed in the context of mobile learning [4], [5], [6], [7].

The trend of the educational development is to focus more on student-centered education. Considering the characteristics and the opportunities that QR code offered, they really accords with this trend. QR code has a great potential for being integrated into the curriculum because they are incredibly simple and quick to use - a feature that makes them ideal for teaching and learning [8].

There are many reported examples of use of QR codes, in recent years. Rizzo [9] reported the use of QR codes during the chemistry class, where a periodic table with each chemical element represented by a QR code was designed. Chen & Choi [10] reported history learning with QR codes. Liu, Tan & Chu [11] designed QR codes to support language learning. Chaisatien & Akahori [12] used QR codes for classroom management. QR codes was also used in the library, associated each record on a library catalogue with a unique QR code [13].

IV. CASE STUDIES

For this research we introduce several specific examples of using QR codes in education. The survey was conducted among 62 eighth grade students and 64 sixth grade students, who expressed their attitude towards the implementation of the QR codes in regular classes. Before the survey, students were asked if they have seen or heard about QR code. Only minority of them (18.20%) revealed that they have heard about QR code, but only several of them have ever scanned a QR code. This fact encourage us even more to conduct this research.

The major disadvantage for using the QR codes was the fact that not all the students possess smart phones. This deficiency was overcome by creating groups where at least one of the students owned a smart phone. Each member of the group took an active participation in solving the final task.

A. Treasure Hunt game

This game is one of the most interesting and creative games which can be used in the process of learning. It encourage the students to participate actively during the class, increasing the mutual collaboration at the same time.

One of the version of the game is to create a map on which different positions are marked. On each position one QR code which represent one task is placed. To find all the QR codes, you only need to follow the map. Every task need to be solved, in order to reveal the final goal, the "hidden treasure".

QR codes for this game could be created in a few steps with the program QR Treasure Hunt generator. In the first step questions and answers for the game are entered, and in the second step the codes are created for every question. Next, the QR codes need to be printed and putted on the previously chosen positions.

The game Treasure Hunt was implemented during the Programming class. Every QR code carried a task which represent one command line of an actual program. The students need to reveal all the tasks in order to reassemble a program. The students work in groups and only one smart phone for a group was used.

B. Web Quest method

Web Quest is a research activity in which the students use Internet network as source for finding different types of information.

With this method instead of using URL addresses for searching specific information, students used QR codes that lead them to different information on Internet (videos, images or photographs). This method was especially useful for the younger students who have difficulties in writing the URL addresses in a given browser.

C. Self-assessment activities

Self-evaluation is an activity that is identified as an opportunity in including students in the process of evaluation. One of the most commonly used strategies of self-evaluation and mutual evaluation is comparing the tasks. The students get worksheets with the tasks that need to be solved and after solving them, they compare the results with already solved or partially solved model

saved as a QR code. In this way the students locate their mistakes and self-evaluate their work. QR codes can also be saved on mobile phones and can be used for solving tasks at home or as a link that could be forwarded to the students in the class.

D. Student portfolios

A student portfolio is a collection of projects or papers created by the student during the school year which are placed on the web. One of the goals of making a student portfolio is to present the student's projects to their parents and other students.

One part of the projects (an abstract) is displayed on the presentation board in the school, while the web location of the whole project is given as QR code. So, using the QR codes, the costs for the printed materials are reduced, and at the same time the way of presenting the projects is simplified. All the student have equal space for their presentations. Parents can also follow the work of their children from home and get familiarize with their projects and achievements.

E. Multicultural blogs

For solving the problems on various topics student blogs are created. These blogs provide information in different languages, depending on student nationality. For every post on the blog the students set a QR code in a prominent place at school. The rest of the students, as well as parents and teachers, can read these QR codes and actively participate in writing their suggestions and reviews. By using the QR codes students use common information space and have the free space on the blog to express themselves on their native language. In this way, regardless their nationality they are mutually closer and actualize their activities among all the students in school.

F. Homework

Some homework can be realized much easier and more efficient when given in form of QR codes. For example, when students have to answer questions from the content that is realized as videos, or questions whose answers should disclose the relevant web sites. Also, during the preparation of exercises that have different levels of difficulty, it is a good practice to use QR codes and to give them to each of the students, because in this way the individual work of the student is

increased while the opportunity to copy each other's homework is reduced.

G. Student technical support

Student team for technical support helps the teacher to maintain computers in school. Students use videos where all procedure for solving a given task is presented. Teacher can store these videos in a form of QR codes so the student support team can do their job regardless of teacher presence. In this way the student can also learn some advanced computer skills.

V. EVALUATION

During the research we received a positive feedback from the students about using QR codes in education. Students were asked whether they were satisfied with the use of QR codes for learning and their reasons for saying so. The majority were satisfied, explaining that the QR codes were easy to use, learning was fun and motivating, and that they would like to utilized QR codes more in education.

Near 70% of the students agreed that they learned new things about phone use, 85% agreed that QR codes are very useful for research activities, and 18% of the students somewhat agreed that they needed help with QR codes (this is mostly due to technical problems with the used smart phones).

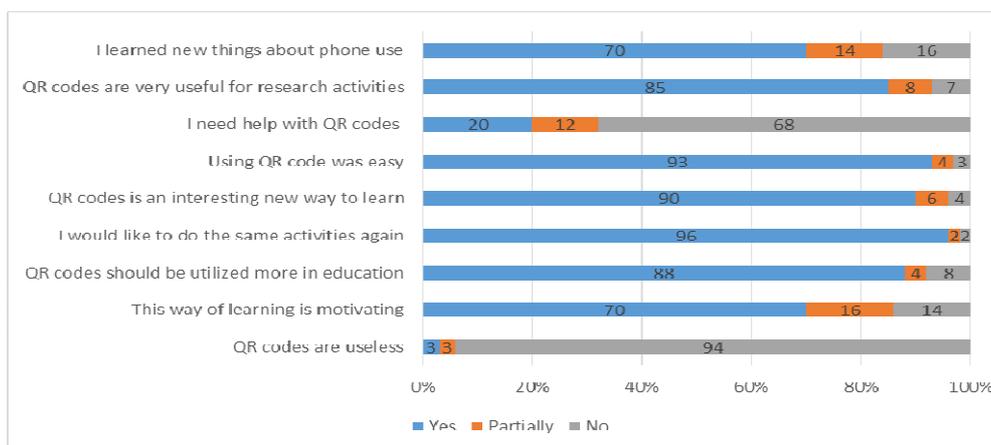
93% of the students agreed that it was easy to use QR codes, 90% of them agreed that using QR codes is an interesting new way to learn and near 96% of the students would like to do the same activities again.

88% of the students strongly agreed that QR codes should be utilized more in education. 70% of the students agreed that this new way of learning is motivating. Only 3% of the students thought that QR codes are useless.

The results of the evaluation are showed in Table I.

Interesting fact is that students have shown most interest in the first activity, The Hunting Game. This shows that the students are most motivated and active when learning through play.

TABLE I. RESULTS FROM EVALUATION



VI. CONCLUSION

The purpose of this paper is to determine students' level of awareness and acceptance of QR codes, at a same time exploring the benefits of its use as a support tool in education.

The activities conducted by using the QR codes have encouraged the collaborative learning and have a positive impact on student motivation and engagement in their learning process.

QR codes demonstrate a good potential for application and promotion in the area of education, especially when they are properly integrated into the education process. We can say that applying the QR codes in education, represents a step forward towards integration of a new technologies in learning process.

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