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POSSIBILITIES OF USING INTERNET EDUCATIONAL VIDEOS FOR MOTIVATION IN COMPUTER SCIENCE EDUCATION

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Abstract

The paper deals with the motivation of Internet educational videos in computer science. Due to the increasing popularity of Internet videos and the increasing number of users of various social networks, Internet videos seem to be an appropriate element to be included in education in terms of approaching youth of the 21st century. The majority of the videos fulfill only fun features and serve more to fill students' leisure time. However, we can find also ones that can be considered as educational and at the same time we can use them as motivation in education. In connection with the upcoming changes in the curriculum in the Czech Republic, where the emphasis will be put on student creativity and especially on the development of *critical* and *computational thinking*, programming and algorithm teaching is a suitable tool to support these goals. The aim of the paper was to analyze the content of video file sharing sites such as *YouTube* or *SchoolTube*, select suitable educational videos focused on programming and algorithmization, evaluate them in terms of strength of motivation and include them in the suitable phase of the learning process. The paper introduces freely available internet educational videos, which could be used in computer science teaching, especially in programming/coding lessons. The integration of the Internet educational videos mentioned in our article can contribute to the improvement of the quality of computer science education, not only in the form of motivation but also as a component supporting the understanding of the subject matter itself.

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1. Introduction

Watching videos on the Internet is a phenomenon of present time. This activity has become one of the main daily activities of young teenagers over time. According to Alexa server (2018), *YouTube* is the second most popular web site in the world, and it is even the first in the Czech Republic in terms of popularity.

Except *YouTube*, there are plenty of other servers for sharing video files, such as for example *Vimeo*, *Dailymotion* or *SchoolTube*. Lots of videos fulfill the fun features and are the biggest attraction for visiting these servers. However, there are also ones having educational character and students can use them as a source of useful information. Using appropriate videos as a motivational element in computer science education could positively contribute to improving the learning process (Klobas, McGill, Moghavvemi, & Paramanathan, 2018; Pratama, Hartanto, & Kusumawardani, 2018).

In our article, we present four educational videos that, in our opinion, can suitably help teachers in computer science education. Our goal is to evaluate their motivation strength and include them in the phase of the learning process. As a source of educational videos, we have chosen two servers. The first is *YouTube*, whose focus is general. As the secon one, we have chosen *SchoolTube*, which focuses directly on education.

1.1. Motivation

Motivation can be understood as a process of internal justification of the individual's need to learn (Cook & Artino Jr., 2016; Metodický portal RVP, 2011).

However, if we look at the issue of motivation further, we can find two basic concepts in many literary sources. The first is motivation – explaining why one behaves in a certain way; and the other is learning – explaining how behavioral changes take place (Nakonečný, 2013).

These two concepts or also psyche components were separated in the past. Motivation had only the function of energizing and learning the function of behavior focusing. In fact, however, it is empirically proven that motivation is a condition for learning. Emotions are also an important part of this complex process. Reward and punishment are an irreplaceable condition of learning. They are emotional aspects of ongoing activities.

Learning leaves more complete and deeper effect on motivation than on any other mental function of a human. Motivation can also be further divided into *short-term*, *long-term*, *internal* and *external*.

Short-term motivation is a type of stronger and more intense motivation. It will, however, last for a shorter time. It is typical for younger people, such as pupils of elementary schools.

Long-term motivation occurs in older and more mature individuals, such as students at higher education levels. This motivation requires a great deal of self-determination and self-denial.

Internal motivation – students are internally motivated to engage in learning activity if they are aware that they are able to meet one of their needs by participating in it. Internally motivated students perceive active participation as something they can benefit from. The learning activity itself is also considered as valuable.

External Motivation – students have external motivation for learning when they want to get some reward that is artificially linked to performing an activity, or when they want to avoid unfavorable consequences, that have been deliberately set for non-cooperative behavior.

It is always better to build students' internal motivation. Nevertheless, the teacher must select and prepare learning activities, so as to help students with achieving the goals, that will meet their needs. Only then can the student have inner motivation. To support internal motivation, it is advisable to use, for example, problem learning.

In our article, we will introduce such videos that, in our opinion, can help to build students' inner motivation. All the videos will be included in the appropriate phase of the learning process. We have chosen the three-phase learning model *E-U-R* (Meredith, Steele, Temple, & Walter, 1997), which is associated with *critical thinking*, since we believe that the development of *critical thinking* and related *computational thinking* needs to be developed by students.

1.2. Critical Thinking

Critical thinking can be understood differently (Cholisoh, Fatimah, & Yuniasih, 2015). The definitions in literature differ in many things. However, it is common for all of them, that the method of critical thinking is understood as a tool, thanks to which the student understands the curriculum, discovers the relationship between facts and acquired phenomena, creates his/her own opinion on the problem, and also leads to in-depth curriculum (Zormanová, 2012).

Maňák and Švec add that critical thinking is based on the teachings of constructivist psychology and pedagogy. Thus, the main feature of critical thinking is respecting children's thinking that evolves and changes over time (Maňák & Švec, 2003).

Model *E-U-R* (*Evocation-Awareness of the Meaning-Reflection*) – *Critical thinking* or learning in context. The three-phase model of *critical thinking*, the so-called *E-U-R* model, focuses on long-term learning results. This model was introduced thanks to the *Reading and Writing for Critical Thinking* program (Meredith, Steele, Temple, & Walter, 1997).

1. Phase: evocation – in the first phase, the student tries to recall what he/she knows about the curriculum and creates his/her own structure of knowledge. He/she re-evaluates the facts that he/she already knows, and puts them into context with new facts (Meredith, Steele, Temple, & Walter, 1997).

2. Phase: Awareness of importance – at this stage, the student learns about self-learning, mastering and subsequent fixation of the subject (Meredith, Steele, Temple, & Walter, 1997).

3. Phase: reflection – in the final phase, the student will consolidate the curriculum and create a new mental scheme. The student can explain his/ her newly acquired knowledge in his/her own words (Meredith, Steele, Temple, & Walter, 1997).

1.3. Computational thinking

There are plenty of definitions and approaches to understanding *computational thinking*. To introduce this concept, we chose Google's definition (2016): *"Computational thinking (CT) is a problem-solving process that includes a number of characteristics, such as logically ordering*

and analyzing data and creating solutions using a series of ordered steps (or algorithms), and dispositions, such as the ability to confidently deal with complexity and open-ended problems. CT is essential to the development of computer applications, but it can also be used to support problem solving across all disciplines, including math, science, and the humanities. Students who learn CT across the curriculum can begin to see a relationship between subjects as well as between school and life outside of the classroom."

1.4. Educational videos on YouTube as a means of motivation

The beginnings of this social network date back to 2005, when its founders Chad Harley, Steve Chen and Jawed Karim registered this domain. A year later, youtube.com was bought by *Google* for a total of $ 1.65 billion in own shares. At that time, *YouTube* had about 72 million viewers. To date, this number has increased to one billion viewers (Čížek, 2015).

Videos shared on *YouTube* are of a different nature. From amusement videos, various documents, tutorials, video tutorials to vlogs of the so called "*YouTubers*" who are capable of recording and talking about anything. Videos can be viewed, uploaded, shared with others, and commented, for example their content. Many videos uploaded here can also be suitably used in education as a means of motivation and for better understanding of the subject.

"*YouTube service is localized in 88 countries around the world and it can be used in 76 different languages.*" (YouTube, 2018).

The biggest problem may be the availability of suitable educational videos in the mother tongue, i.e. Czech. While it is possible to turn on the subtitles, the machine translation will never be that accurate. Therefore, it is necessary that the teacher choosing the foreign language videos was able to mediate these videos to students and to understand their content, otherwise the choice of such a video will not make sense.

1.5. Educational videos on SchoolTube as a means of motivation

This video sharing portal was established in 2007 and is specially created and designed for educators and students. It is written directly on the official site, "*Imagine YouTube.*" (SchoolTube, 2018). At the beginning of 2017, *SchoolTube* launched a plan to incorporate a number of improved and new features into the system to make videos even more integrated into the learning process and to improve learning results (SchoolTube, 2018).

SchoolTube currently has more than 70,000 registered schools.

SchoolTube appears to be a suitable alternative to the much more known *YouTube* video sharing server. Taking into consideration that some schools even have a *YouTube* social network blocked, so as the students could not watch a variety of non-educational videos, the *SchoolTube's* philosophy is very interesting, and perhaps even well usable in practice.

The biggest problem is the availability of videos only in a foreign language (English) and the inability to turn on the machine-translated subtitles, as it is possible with *YouTube*

2. Problem Statement

One of the important aspects of learning efficiency is motivation. To a great extent, it influences students' attitude towards education, learning about the subject itself and, in general, to gaining new knowledge. With this in mind, the issue of availability and relevance of internet sources becomes a primary consideration as using appropriate videos as a motivational element in computer science education could positively contribute to improving the learning process. The issue is which internet sources are appropriate to fulfil this agenda.

3. Research Questions

On the basis of studying the literature (Maňák & Švec, 2003; Zormanová, 2012; Nakonečný, 2013; Nakonečný, 2011; NÚV, 2017) and the author's own considerations, two research questions were formulated. The first is: "*Which internet videos have the motivational potential in computer science education?*" The second research question is: "*In which part of computer science can the particular videos be used?*"

4. Purpose of the Study

The aim of the article is to examine and analyze web servers for sharing video files and to select the most suitable ones for computer science education, to evaluate their motivational strength and to include them in the learning process. As already mentioned above, we have chosen two servers – *YouTube* and *SchoolTube*.

Due to the development of *computational thinking* and the forthcoming reform of the ICT curriculum in the Czech Republic (NÚV, 2017; MŠMT, 2018), where more emphasis will be placed on students' creativity, we searched for video from the fields of programming and algorithmization. We think that the videos can greatly help to understand certain principles and stimulate some inner motivation of the students, so as they wanted to learn programming.

5. Research Methods

The analyses of commonly available video files suitable for computer science, namely programming and algorithmization was used as the research method (Chráska, 2006).

6. Findings

There is a huge sum of internet educational videos available. Many of them are aimed at teenagers and serve only to entertain and fill their free time. However, we also found a large number of useful and quality educational videos suitable for teaching of computer science, that, in our opinion, have sufficient motivational strength to be used by teachers in their lessons. For our article and illustration of the suitable educational videos, we finally selected the four following videos based on the analysis.

6.1. Video no. 1: What Most Schools Don't Teach

This video (Code.org, 2013) was placed on *YouTube* in 2013. We could include it in the first phase of the *E-U-R*, i.e. evocation. In the video, celebrities such as *Microsoft* founder Bill Gates or *Facebook* founder Mark Zuckerberg talk about their beginnings with programming. The video is supposed to show that each student should have the opportunity to learn how to program and, at the same time, that he/she does not have to be a genius in order to get started.

The environment of a large foreign company in which programmers work is also nicely introduced. Various benefits, open space offices, etc. are shown here. At the end, there is a link to *Code.org*, that aims to bring programming closer to students and the general public, and to show that anyone can learn the basics of programming.

By presenting of a promising and well-paid job – the programmer, and especially by emphasizing the fact that really everyone can program, the student's inner motivation can be developed and we can awaken the desire for further education in this area. So, in our opinion, it is a strong motivational video.
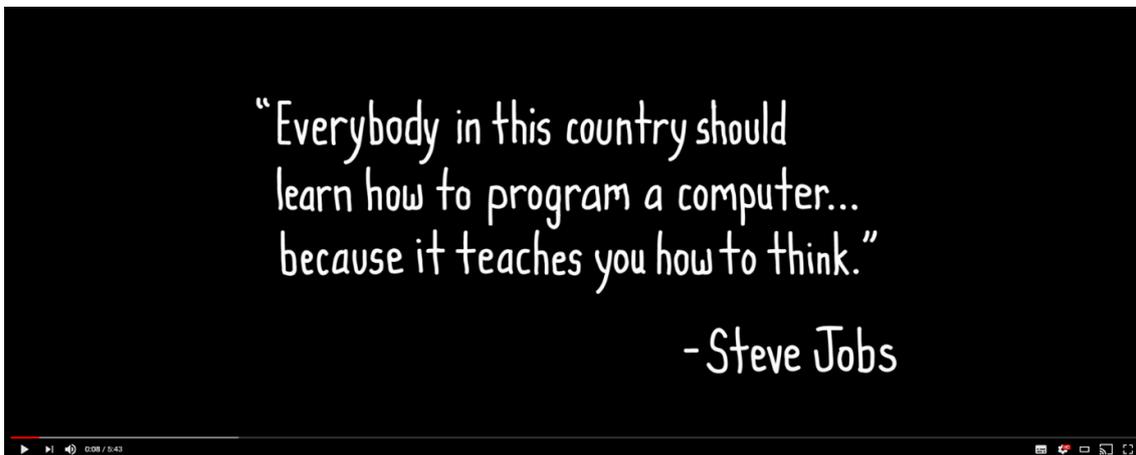

Figure 01. Steve Jobse's quote from the Video no. 1
(Source: https://www.youtube.com/watch?v=nKIu9yen5nc)

6.2. Video no. 2: Python Programming

Python programming language is becoming more and more popular today. We can even say that this is probably the best choice as the first programming language for beginners. Although this video (Banas, 2014) was published four years ago, we can still maximize its benefits. During a 43-minute footage, a user named Derek Banas shows the viewers almost everything *Python* offers, such as loops, arrays, conditioals, etc.

The video can serve well in the phase 2 – awareness of meaning. Students get a well-commented explanation directly accompanied by writing the code on the left side of the screen and directly interpreting the result on the right. The teacher himself can go through all the parts of the video, pause over more complex passages and complement his/her own knowledge and commentary.

We believe that thanks to the fact that it takes only a 43-minute video to acquire the basics of the *Python* programming language, students will be motivated to start learning *Python*.

Figure 02. Introduction of the Video no. 2 (Source: https://www.youtube.com/watch?v=N4mEzFDjqtA)

6.3. Video no. 3: Learn Computer Code – Primary School Education

This video was added in 2016 by the user ICT Tools for Teachers (2016). It is rather for teachers than students, but can be suitably used in the evocation phase of the learning model. Some key skills are presented here, that should be included in the educational content, so as the pupils can learn programing more easily. Great emphasis is put on algorithms that are the basis for programming and at school, they can be taught in connection with common life situations such as cake baking, dog bathing or washing. Also other tools for the development of algorithmic thinking (such as *Scratch*) are presented here.

A big benefit are the references to other materials related to computing at school, such as teacher manuals etc.

Through video, students find that algorithms are found in lives of each of us and that we apply them to everyday activities basically all the time. At this point, it would be possible to use the method of *critical thinking* – brainstorming and let the students think about in what situations they use an algorithm on a daily basis.

Video can be used as an element of motivation in teaching. However, it only depends on the teacher, how the teaching will continue after seing this video.
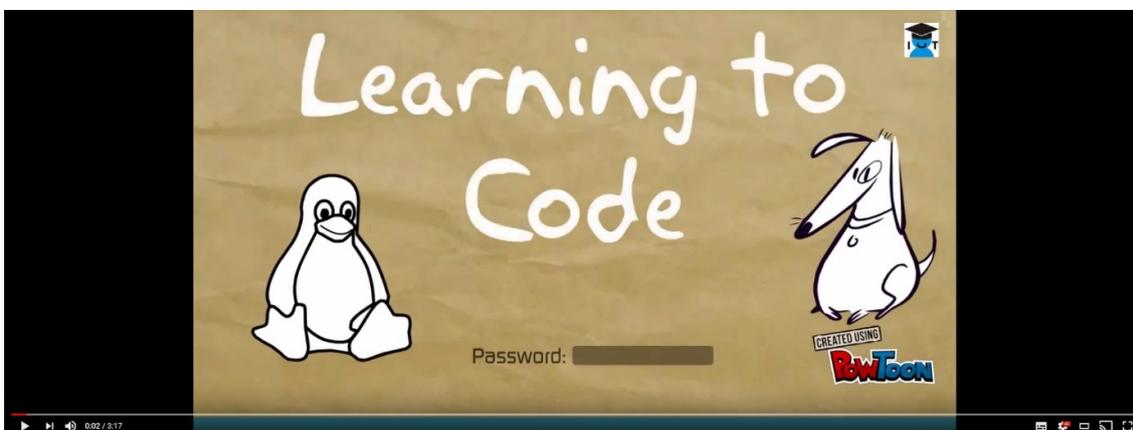

Figure 03. Introduction of the Video no. 3
(Source: https://www.youtube.com/watch?v=MRPpYX8SOA8)

6.4. Video no. 4: What is coding?

The video titled "What is coding" (microsoftlearning, 2014) has a footprint of just one minute and fifteen seconds, but as an initial motivation for the first lesson of programming, it is, in our opinion, very useful.

The video is graphically nicely processed and it shows the viewer in a short interval of time how the code is an integral part of today's world.

Students can then perceive programming as a means to their better future, as programming/coding is the future. We think that students' inner motivation can be developed by demonstrating that we teach them something meaningful at school, something with future, and that can be beneficial for students themselves from multiple points of view.

Figure 04. Introduction of the Video no. 4 (Source: https://www.youtube.com/watch?v=cKhVupvyhKk)

7. Conclusion

When searching and analyzing educational videos, the focus was on *YouTube* and *SchoolTube* servers. However, not a single video from the second mentioned one in this article was included. Not only because it is not possible to turn on subtitles in these videos, but also the quality of videos, both audio and visual, is not very pleasant. Only a few videos about the programming/coding were found to be interesting in, but none that would be worth mentioning or presenting. However, there were a lot of relevant results on *YouTube* and searching by keywords and phrases worked much better.

All of the videos introduced in this article were published in 2016, 2014 and 2013. No current video from this year was available for use as a motivational element in computer science.

Most of the videos on *YouTube* from the field of computer science education are in the form of a tutorial. They are therefore more suitable for learning phase – awareness of meaning. For illustration, one that was considered to be valuable in terms of motivation was introduced, although we were more interested in videos suitable for the first phase – evocation. Videos that can develop students' inner motivation and interest in learning to program, which can also positively contribute to the development of *critical* and *computational thinking*.

Based on the results of the author's surveys and experience, the inclusion of the Internet educational videos mentioned in this article can make a very positive contribution to enhancing the quality of computer science, not only in the form of motivation but also as a component

of understanding the subject itself. An obstacle to more global use may be English language of the video, or the poor machine translation of subtitles into the Czech language and, for example, a poor understanding of the problem presented.

The most important element of motivation are not only the videos themselves, but it is the teacher himself and his concept of teaching. Videos are only a suitable tool.

Acknowledgments

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