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The potential of YouTube as a learning tool in physics education: a survey among secondary students

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Online education is based on modern ICTs, the potential of which is being revealed more and more recently. During the long-distance learning in the pandemic conditions of COVID-19 in Bulgaria, we decided to explore the potential for creating video lessons on YouTube and to explore some attitudes among students. A YouTube physics training channel was set up, and students had to answer a few questions. The report presents an algorithm for creating an educational YouTube channel and video lessons in physics, as well as summarized results of the survey among students. The questions in the survey are designed to assess the effectiveness, visibility, and accessibility of video lessons, as well as the motivation of students to learn from YouTube.

Keywords: Online education, physics, YouTube, video lessons

INTRODUCTION

There is an active introduction of modern information and communication technologies (ICTs) in modern distance learning. ICTs benefit the presentation of teaching materials, the interaction of teachers with their students, and the intermediate and final control of students' advancement [1].

One of the most suitable learning tools is video tutorials. They allow to make the lesson more interesting, dynamic, and convincing, and a huge flow of information is easily accessible. Such a methodological technique as video learning allows to better visualize the learning material and can be an important tool for students' self-learning. This approach can also be used as a form of distance learning.

The relevance of the introduction of video lessons in education is determined for several reasons:

- When studying the teaching material in video format, the student can regulate the learning process, namely to review the video from the required place, to pause for viewing, thus studying in detail incomprehensible (complex) or especially important moments for him.
- The effectiveness of video lessons is increased by the fact that the student perceives the material given to him by two senses - sight and hearing, therefore such material contains more information than a single text presentation or audio reproduction and comments.
- The training can be held at any convenient time and place while creating in the student a sense of personal presence in class.

As a result, it can be concluded that maintaining an educational information channel for video lessons is extremely important.

The creation of educational video films today is impossible without the use of modern methods and technologies for video data processing and initial video recording skills. Unfortunately, not all teachers know where to start the process of creating a video lesson, how to write a script (or to make a scenario of the lesson), and how to make the video lesson more attractive according to the requirements of the students. Based on this, one of the ways to improve the educational process is to create guidelines for teachers to develop video lessons.

RESEARCH METHODS

The research questions we asked ourselves at the beginning of this study were related to the opportunities that YouTube provides for the development of educational channels and what are the attitudes of students to learning from YouTube. We also initially looked at articles on these issues. Some of them address issues related to the potential benefits, advantages, and disadvantages of YouTube in the classroom [2-5], while others are more specific concerning certain disciplines [6-9]. As a result of our theoretical research, we concluded that there is a need for more research, especially in connection with the attitude of students to the educational opportunities of YouTube.

Thus, our research work went through the following stages:

(1) Creating a YouTube channel for the needs of physics education in seventh grade;

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(2) Developing a questionnaire to study attitudes and motivation among students;

(3) Processing and analysis of the survey results.

Creating a YouTube channel

When creating your own YouTube video channel, you have several tutorials available, such as [10], or you can simply use YouTube itself to do so (creatoracademy.youtube.com/page/home). The YouTube video-sharing platform has its pedagogical benefits in several ways:

• creating specific playlists with materials on a given subject. This supports the learning of the students and is a convenience for the teacher;

• creating video lessons that are recorded outside the classroom;

• students are taught to follow the rules for sharing content on relevant platforms, not to violate copyright laws, to be ethical and fair to others;

• "learning by doing" method can be implemented to encourage students' creativity by creating their videos with an educational goal.

The structure of a lesson and a video lesson may vary in some stages. According to the structure of the modern lesson and the requirements for each stage in the creation of educational videos, the following points must be taken into account:

1) Stage of motivation for learning activities - a necessary component of learning that must be maintained throughout the lesson. Of great importance is the clearly defined goal that is set for students.

2) Setting a training goal - the student from the very beginning of working with a multimedia didactic tool must know what is required of him. Learning objectives should be clearly stated during the lesson.

3) Stage of updating - creating prerequisites that support the perception of the learning material.

4) Stage of choosing a strategy to achieve the goal.

5) Stage of initial consolidation - students solve typical problems using the new method of action shown in the video lesson.

6) Summary of the lesson - there must be a connection between the set goal and the obtained results. Additional goals of the activity may be outlined.

It is necessary to create video lessons which should be expressed in simple language, without using complex definitions and formulas. This is because when a person watches video fragments, he first perceives the visual information and only then the auditory information. It is also not advisable to create long video tutorials. It is recommended that the duration be up to 10-15 minutes.

It should be noted that the effectiveness of video courses on a YouTube channel is directly dependent on the quality of the video lessons and the technical means used. The video method places great demands on the organization of the learning process, which must be characterized by clarity, thoughtfulness, and expediency. A teacher using the video method is required to develop the ability to introduce students to the range of studied problems, direct their activities, and draw general conclusions.

After getting acquainted in detail with the possibilities of YouTube for creating and maintaining the channel, we created a short guide to help teachers who would benefit from this. In conclusion of our work on creating the channel (we have chosen the video logo to be PHYSICS TV), we can say that it is within everyone's ability to maintain their channel.

When recording the lessons, we used BANDICAM - a multimedia program that records actions on a computer screen, audio, and more (www.bandicam.com) and is easy to use. A specific feature of the program is that it can record for up to 12 minutes for free.

Survey and target groups

For our study, we chose to make a lesson on "Sound and Hearing" from the physics program for 7th grade. The duration of the video lesson is about 10 minutes and it includes explanations from the physics textbook that students study and also contains embedded videos. The link to this video lesson is given in [11]. You can subscribe to the channel and see the other lessons as well. The target audience is seventh-graders from 119. Secondary school "Acad. Mihail Arnaudov", Sofia and the video tutorial is available on the Internet for everyone. Creating a similar video lesson is within a day.

After the students watched the video lesson, they were asked to fill out an online questionnaire consisting of a total of 7 questions, of which 4 with optional answers and 3 open. The survey is anonymous and involved 40 students.

RESULTS AND DISCUSSION

Here are the questions and the summarized results. We provide only descriptive statistics due to the small sample size.

Question 1: How often do you visit YouTube?

- ✓ Very rarely -1 student;
- ✓ Rather a several times a week - 10 students;

✓ Every day - 29 students.

The answer “Every day” was most often chosen (≈73%), followed by the answer “Rather a several times a week” (≈25%), and finally, the answer “Very rarely” was chosen by only one person (≈2 %) (Figure 1).

Figure 1. Answers to Question 1

These results confirm the global statistics, according to which YouTube is the second most visited site on the Internet after Google. It is therefore interesting to find out for what purpose students visit YouTube most often.

Question 2: For what purpose do you visit YouTube?

This question is open, but the answers allowed them to be grouped into three main groups:

✓ Music and movies - 28 students;
✓ I'm looking for information about something - 9 students;
✓ Education - 3 students.

This means that for the largest percentage of students (approximately 70%), YouTube is a source of entertainment. For approximately 22% YouTube is a source of information and for only 8% it is a learning tool (Figure 2).

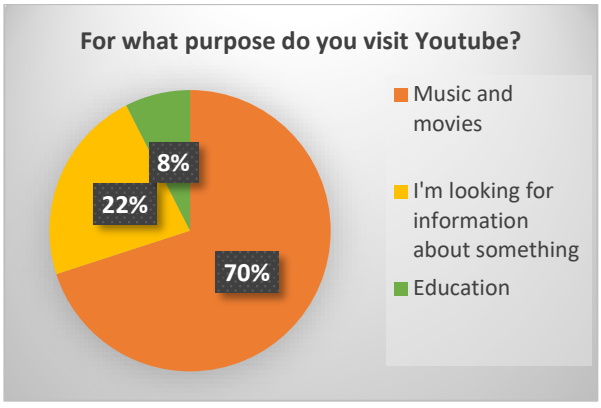

Figure 2. Answers to Question 2

The purpose of Question 3 of the survey is to assess the educational opportunities of YouTube according to the opinion of the students, after watching the video lesson "Sound and Hearing". The question has 5 optional answers, which are designed to evaluate 4 main characteristics of video lessons: a) effectiveness; b) clarity; c) repeatability (information is not lost); d) accessibility. It is possible also to choose a neutral position (only 1 student found it difficult to choose from the other options). The summarized results are the following:

Question 3: Which of the following statements most accurately reflects your view of YouTube's educational opportunities after watching the Sound and Hearing video tutorial?

✓ Video lessons save time for self-preparation - 4 students;
✓ The information is clearer and more understandable - 18 students;
✓ If something is not clear, I can watch the lesson again - 5 students;
✓ The lesson is available anytime and anywhere - 11 students;
✓ I do not have a clearly defined opinion - 1 student.

From these results, we see that the most students rate the clarity and comprehensibility of video lessons (almost 46%). Almost the same percentage (if we combine answers 2 and 3, as they are close in meaning) receive the other characteristics - repeatability and accessibility (41%). Only 10% believe that video tutorials would save time for self-preparation. Finally, the conclusion is that video lessons are more a means of better visibility and comprehensibility of information, but can also be part of students' self-preparation (Figure 3).

Question № 4 assesses students' attitudes towards video lessons, and the answers (see below) can guide students' attitudes if teachers use such lessons.

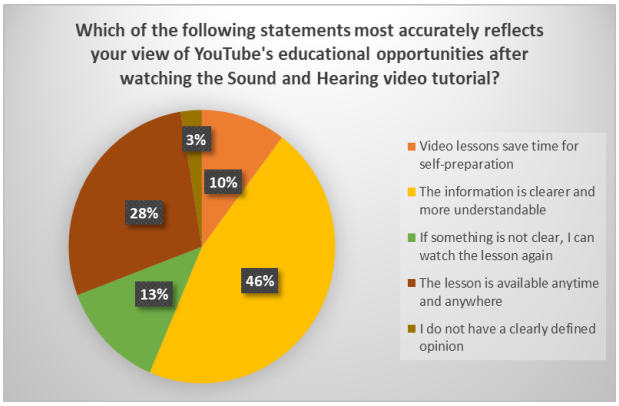

Figure 3. Answers to Question 3

Question 4: Which of the following statements most accurately reflects your attitude towards video tutorials?

- ✓ They are more interesting - 20 students;
- ✓ They motivate me to study - 6 students;
- ✓ I like them the most - 4 students;
- ✓ There should be more such lessons - 10 students;
- ✓ I have no definite attitude - 0 students.

There is not a single student who has found it difficult to choose a position. Half of the students find this type of lesson more interesting. Twice fewer students (25%) are adamant that there should be more such lessons. 15% will be motivated to learn if there are such lessons, and 10% are adamant that they like this type of lesson the most (Figure 4).

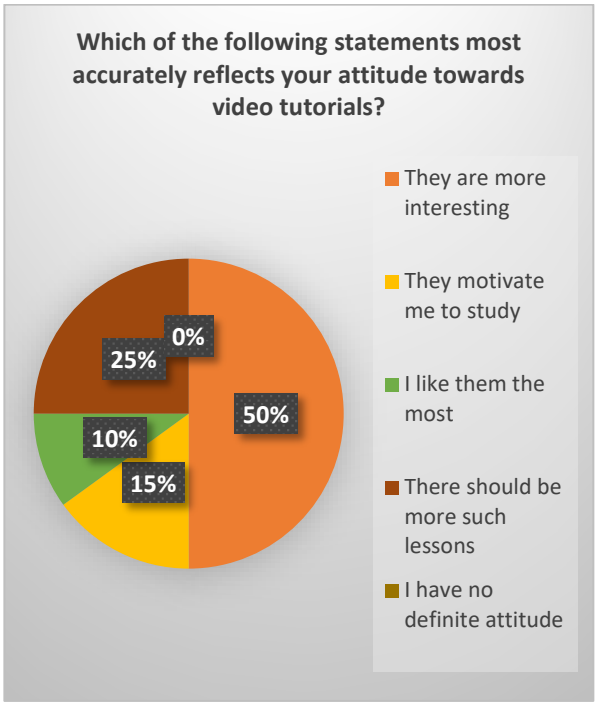

Figure 4. Answers to Question 4

Question 5 was open-ended, but the answers allowed them to be grouped into 4 main categories:

Question 5: Indicate what you liked the most in the lesson you watched.

- ✓ Everything - 7 students;
- ✓ There is 3D - 5 students;
- ✓ The presentation of the lesson as a whole - 20 students;
- ✓ Its duration – 8 students.

Half of the students liked the idea that the lesson could be presented in the form of a video and the video itself. 20% believe that the duration (about 10 minutes) is optimal for this type of lesson; 17% liked everything and 13% liked the 3D (Figure 5).

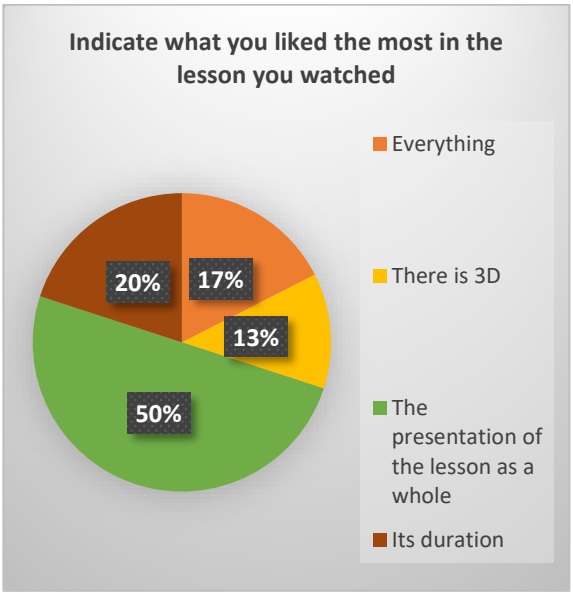

Figure 5. Answers to Question 5

And on **Question 6:** What did you not like in the lesson?" 36 students (90%) have no remarks, two - speaking more slowly and two more - write down the unit of decibel.

To the last **Question 7**, would they give any recommendations to the teachers who want to create similar video lessons (or what they expect the most from such video lessons), almost half of the students (17 in number) do not have recommendations, 12 in number express a wish to have more such lessons and 11 in number, the video lessons to be of similar duration.

CONCLUSION

At present, the problems and issues related to distance learning are extremely relevant, and the final product of this thesis - the created information and education channel, is an appropriate solution. Adding to the technological and informational capabilities of YouTube, more work should be done in the future to develop video tutorials, especially since this opinion was also expressed by the majority of surveyed students.

We hope that the modest research we have done will motivate many teachers who are willing to improve the quality of education and increase students' interest in the subjects they teach to benefit from the potential of YouTube as a learning tool.

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