

STUDENT VIDEOS FOR STUDENTS

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Abstract: Ten years ago we've been making video tutorials at the Department of Mathematics and Descriptive Geometry. These videos are very popular. Based on the surveys we conducted, students would welcome even more examples of practice. Because the students better understand the expressions of other students than the professional interpretation of the teachers, we have addressed our students and offered them the opportunity to shoot more videos of the exercises to practice.

Keywords: Video, students work, tutorial, youtube.

1 Introduction

Students of master's programs come to the VSB - Technical University from various specializations and the level of their knowledge of mathematics is therefore diametrically different. In this article, we will focus on a variety of students from present and combined following bachelors studies of Faculty of Mining and Geology. We run the Engineering Mathematics and Selected chapters in mathematics for this faculty. The lessons take place in Ostrava and on the detached workplace in Most. Both courses require a good knowledge of a Bachelor's Mathematics I. and II. Not every student has the required knowledge to follow these courses.

The combined form of study is divided into 18 hours of classes, which are running in two or three blocks. We have students with different levels of mathematic attending these classes, as they absolved the Bachelor's maths in different schools, where the level was lower than on VSB-TU Ostrava. Students can use the scripts or the web address called "studijni opory" – learning support (www.studopory.vsb.cz). These pages are not only for teaching maths. They were created in 2006 – 2008 in the Learning Support project with preponderant distant elements for subjects of the theoretical basis of the study, also video materials on the web of the department and the collection of unsolved exercises for training. (Picture 1) If the student approaches a difficulty, he has the possibility of personal consultation with his tutor. If the personal meeting cannot be arranged, we can consult the student over the phone or Skype. The students can also

visit MSC. The main characteristic of MSC is that we lead consultations in an informal study atmosphere, out of the class. Students come to support centre with problems from the lectures, regular lessons or their individual projects. Our tutors don't solve the problem instead of the student. On the contrary, they guide him or her and help with an advice. If needed, they lead students by questions, in such a way that the student gets to the root of his/her problem and finds a solution. Our goal is that students solve their problems by themselves. We believe that with active independent approach, students will learn much more, than if we just say them how their problem should be solved. We advice them how to study and learn effectively and how to independently approach new topics. Without such approach the overcoming of gaps in knowledge from four years of study at secondary school while also studying the first year at technical university is almost impossible. Our approach can be easily described by famous quotation of Benjamin Franklin: "Tell me and I forget. Teach me and I may remember. Involve me and I learn." (Hamřiková, R., Kotůlek, J., Žídek, A., 2017)

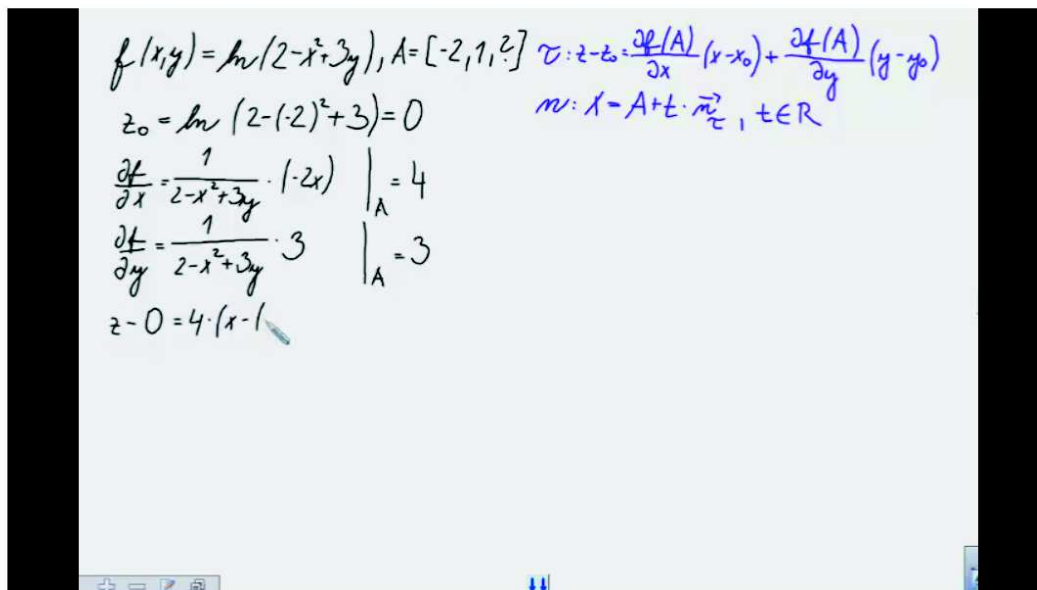
But because most of our students come from distant places and they have to commute to school or study on our detached workplace in Most, personal consultations are almost impossible for them. In these cases, we can help by leading the consultation via Skype or Phone. And because students understand the explanation from another student better than professional definition from teachers, we approached our excellent students and offered them the possibility to take a part in this activity.

2 Commented videos

As a base for video-consultations we used the collection of unsolved exercises for training. From every thematic field, we've chosen one exercise and recorded a video tutorial of solving the problem with the spoken comment. Our students are already used to this form of self-study support, as there is already a bank of exercises from the Bachelors Mathematic I, II and descriptive geometry.

For video recording we use interactive board, program for operating the board, which is called the Device manager, then the Camasia studio for cut and sounding and a graphic calculator GeoGebra for functions and 3D mathematic, which is free to download. This form of study is very popular among our students. We've created a questionnaire and it was answered by half of our students approx. From their answers, it was clear, that our videos are very important part of their preparation for an exam. They appreciate their accessibility on the internet and our willingness to record another videos.

From our experiences, we already know, that when solving a certain exercise, students play the commented video of a similar problem in the first place and they try to understand each step of the solution. We record our videos such as the exercise is not only solved correctly but also economically. Too long explaining of each step could discourage the more talented students and would cut down the independent activity of another ones. If any student shall need further and closer explaining of any steps, he can send us a question. For communication with students, we use the school e-mail or comment underneath the videos on YouTube.



Video 5 - tečná rovina a normála

Picture 1 - commented video

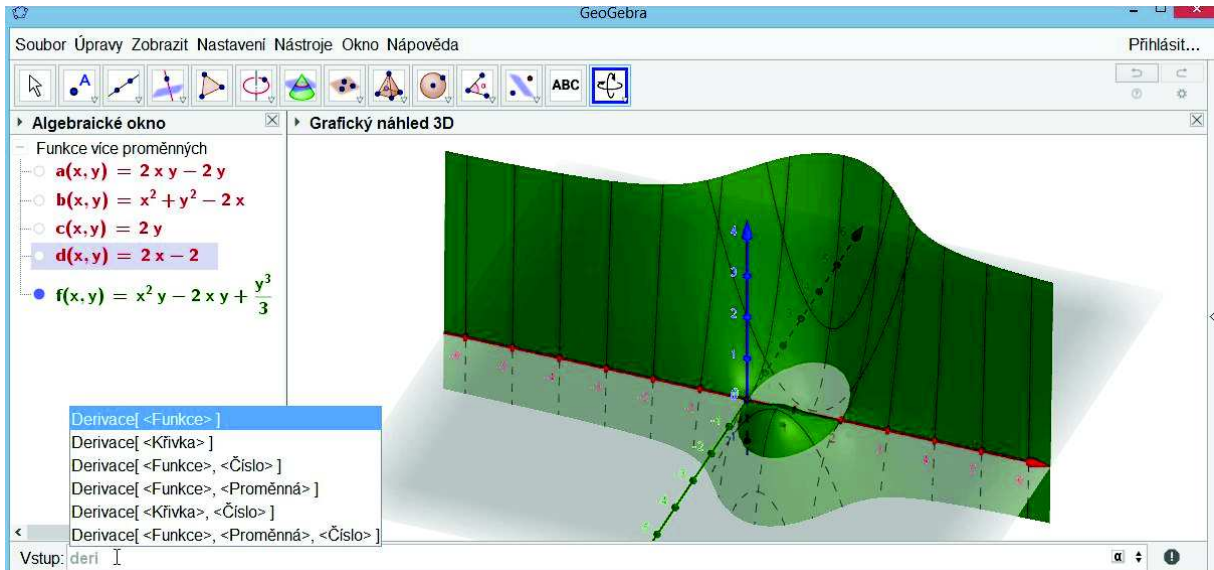
3 How does it work?

Now we will be showing how the usual communication between students and tutors looks like. One of the situation is extremes of a function of two variables (local, dependent and global). In the time allocation of 1 hour are students introduced to the theory, they will have the example of exercise calculated and will receive the link to the web address with materials to self-study. Unfortunately, the majority of students is only re-writing the information from the board and are thinking about the meaning back at home, where there is no one to explain what they didn't understand. Many students also can't attend all classes due to high workloads.

Therefore they often find difficulties when solving the exercises from the collection of unsolved exercises as a preparation for the exam, and they are unable to solve them on their own. The collection has 17 themes. We recorded a video of one example of the theme and the students are to solve another exercises by themselves.

3.1 Student questions

- Q: Can you explain me, how does the function look like?
A: We will record instructory video of how to work with GeoGebra and make a model of the function.



Picture 2 - Graph in GeoGebra

- Q: How did you find four stationary points?
A: The video will show you how to solve a combination of two functions of two variables.

$$f(x, y) = x^2 y - 2 x y + \frac{y^3}{3}$$

$$\begin{aligned} f'_x &= 2 x y - 2 y & 2 x y - 2 y &= 0 \\ f'_y &= x^2 + y^2 - 2 x & x^2 + y^2 - 2 x &= 0 \\ & & 2y(x - 1) &= 0 \\ & & y = 0 & \quad x = 1 \end{aligned}$$

$$\begin{aligned} y = 0 & \text{ dosadíme do druhé rovnice} \\ x^2 - 2x &= 0 \\ x(x - 2) &= 0 \\ x = 0 & \quad x = 2 \end{aligned}$$

$$\begin{aligned} A_1 &= [0, 0] \\ A_2 &= [2, 0] \end{aligned}$$

$$\begin{aligned} x = 1 & \text{ dosadíme do druhé rovnice} \\ 1 + y^2 - 2 &= 0 \\ y^2 - 1 &= 0 \\ (y - 1)(y + 1) &= 0 \\ y &= \pm 1 \end{aligned}$$

$$\begin{aligned} A_3 &= [1, 1] \\ A_4 &= [1, -1] \end{aligned}$$

Picture 3 - Video with equation system

- Q: How is determinant being calculated?
A: Supplementary video with picture of the video.
http://www.studopory.vsb.cz/studijnimaterialy/Sbirka_uloh/video/deter1/index.html

Pf.1 - determinant 2. řádu
 Pf.2 - determinant 2. řádu
 Pf.3 - determinant 3. řádu
 Pf.4 - determinant 3. řádu
 Pf.5a - determinant 4. řádu,
 Pf.5b - determinant 4. řádu,
 Pf.6 - determinant 4. řádu, z.
 Pf.7 - determinant 5. řádu, ú

Vypočítá determinant

$$A = \begin{vmatrix} 2 & 5 \\ 3 & 8 \end{vmatrix} = 2 \cdot 8 - 3 \cdot 5 = 16 - 15 = \underline{1}$$

$$A = \begin{vmatrix} -4 & 3 \\ 1 & 2 \end{vmatrix} = -4 \cdot 2 - 3 \cdot 1 = -8 - 3 = -11$$

Picture 4 - Studopory

4 Youtube channel

At first, we planned to put those materials on school web, where they also were for two semesters and students were using them actively. After we started to do video-consultations we realized that the space on our web is highly insufficient, so after considering another options we decided to move our materials on YouTube. We don't have many views so far, but we believe that students will watch our materials here too, because the rules of video-consultations are explained in the presentation. All students, which have the certain subject written in their study plan have received an email with a new link to all materials.

Also visit our educational channel on youtube.com.

https://www.youtube.com/channel/UCK_YTyx_ZpwaJXYJ0qniEVg/videos

The screenshot shows a YouTube channel page with a search bar at the top and a navigation menu on the left. The main content area displays a grid of video thumbnails, each with a title, duration, and view count. The videos are related to mathematics, specifically calculus and linear algebra.

Video Title	Duration	Views
Video 17 - divergence a rotace	3:12	4 zhlédnutí • před 3 hodinami
Video 16 - gradient	2:51	3 zhlédnutí • před 3 hodinami
Video 15 - křivkový integrál 2. druhu	3:20	1 zhlédnutí • před 3 hodinami
Video 14 - křivkový integrál 2. druhu	2:54	3 zhlédnutí • před 3 hodinami
Video 13 - křivkový integrál 1. druhu	3:14	3 zhlédnutí • před 3 hodinami
Video 12 - těžiště	3:28	3 zhlédnutí • před 3 hodinami
Video 11 - dvojitý integrál - objem	3:09	2 zhlédnutí • před 3 hodinami
Video 10 - transformace do polárních souřadnic	4:16	1 zhlédnutí • před 3 hodinami
Video 9 - dvojitý integrál	5:15	1 zhlédnutí • před 3 hodinami
Video 8 - extrémní funkce 2 proměnných	5:39	2 zhlédnutí • před 3 hodinami
Video 7 - tečná rovina	1:47	
Video 6 - tečna implicitní	2:58	
Video 5 - tečná rovina a	1:56	
Video 4 - totální diferenciál	1:39	
Video 3 - limita	1:15	

Picture 5 - Youtube channel

5 Students for students

The fact, that one group of students help another is praiseful. We are glad, that we can at least partially reward them from resources, that we have got from the Program. This is mainly for learning support and talent-management in the field of technology and science in the statutory city of Ostrava for the year 2017 and 1st.trimester of 2018. It's a big benefit for the school that excellent students, who are already co-operating with us, want to stay at our school as post-graduate students. We can also expect, that they will stay as scientists, even though they are from various regions all over the Czech and Slovak Republic. We want to be helpful and prepare them for their pedagogical or scientific path by preparing them for publishing activities and for their participation in professional conferences. Although video tutorials can't replace personal consultation, they show as beneficial for both sides. It is also a way, how to keep intensive contact between the lessons and exams. Yet we see the biggest benefit of working with the students, which are co-operating with us.

Conclusion

Videotutorials can't obviously replace personal consultation, but regarding the limited time schedule of our students, it seems to be beneficial for both sides. It is also a way of how to keeps students in intensive contact between learning blocks and exam. This can also help to eliminate the deficiencies of a large number of students at once. Those students which are using video-consultations are usually well prepared for the exam and they do complete it without problems.

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STUDENTSKÁ VIDEA PRO STUDENTY

Abstrakt (Streszczenie): Během letošního roku jsme přizvali ke spolupráci studenty 2. ročníku inženýrského studia. Studenti měli za úkol vypracovat motivační úlohy k tématům inženýrské matematiky, pak jsme společně natočili výuková videa, studenti je doplnili slovním komentářem a zveřejnili jsme je na youtube.com. Naše spolupráce bude pokračovat i nadále.

Klíčová slova (Słowa kluczowe): video, studentská práce, konzultace, tutoriál, youtube