

What Covid gave and took away from physics teachers

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Abstract. The coronavirus pandemic and the associated school closure have had a very significant impact on education in virtually all types of schools. In my paper, I will try to collect and summarize the views of physics teachers in the Czech Republic involved in the Heureka project on the negative consequences of the transition to online education. However, I would also like to focus on whether they consider some of what they and their students have experienced to be a challenge or a chance for further development. I also wanted to find out from the teachers what they want to keep in full-time teaching from what they have learned in connection with distance learning.

INTRODUCTION

Before addressing the changes in schools brought about by the coronavirus pandemic, I consider it necessary to describe our activities for physics teachers in our country.

In the early 1990s, the Heureka project [1] was created, which focuses on the development of inquiry-based teaching in schools, but mainly on working with teachers to bring this style of teaching to their classrooms. A two-year cycle of weekend seminars for new participants (ten seminars altogether), some further seminars and an annual conference “The Heureka Workshops” are organized. All activities of the project are very informal and free of charge. Their main goal is to help teachers both to improve their understanding of physics, and their physics teaching at their schools. Although teachers do not obtain any formal credits for their career advancement when attending the seminars, they perceive the activities so useful that they come back for further seminars and events. More than 300 teachers belong to the Heureka community.

The experience and “human resources” of Heureka provided the basis on which the project *Elixir to schools* [2] was built in 2013. This project now established more than 35 regional centres in the whole Czech Republic, where more than 1200 teachers take part each month. Leaders of these centres are experienced physics teachers, often teachers who “passed through” Heureka seminars. Once a month, an afternoon seminar is organized in each centre with a program prepared mostly by the leader of the centre but sometimes also by some participants themselves. Also, there is a possibility to borrow some teaching aids; sometimes teachers go on some excursion, invite some expert to give them a lecture, etc. The project also established its own conference to help interconnect teachers from different regions. *Elixir to schools* attracts additional physics teachers who do not participate in the *Heureka* project. Although it has existed just a few years, it is appeared this project has potential to become a long-lasting activity.

The activities described above refer to the normal state, without quarantine. Unfortunately, the situation has not been normal since March 2020, it is not possible to meet in person, at the Heureka seminars or at the Elixir centres. Just as schools switched to distance learning, so we switched to distance learning seminars. This form of in-service teacher education has many disadvantages, but we see also one big advantage. Teachers can attend meetings of any

centre of the Elixir to schools, regardless of geographical distance. This finding will also appear in the following text, describing the experiences and opinions of teachers during the pandemic.

DATA COLLECTION

I used two resources to collect data for this paper. The first resource was an evaluation questionnaire, which the management of the Elixir to school sent to the participants of the meetings and in which it sought the opinions of teachers on the work of the centres. One of the questions in the questionnaire was: *"What positive did distance learning bring to you personally?"* to which 328 teachers answered.

The second resource was my personal request to 20 teachers, participants in the Heureka project, many of whom are also heads of Elixir's regional centres. I sent them an abstract of this article and asked them to think about what the covid had given them and taken from them, as physics teachers. I was very surprised by the result. I expected a few sentences from a few addresses, and I received reflections from 14 teachers, often two-pages long, together 22 pages of deep thoughts. Processing the answers was difficult, especially if I wanted to preserve at least a little personal story of the authors, their personal experiences.

From the above, it is clear that the views expressed in this article are not those of ordinary physics teachers. In all cases, these are teachers who are looking for ways to lead their teaching better, and not just during distance learning.

ANSWERS FROM THE QUESTIONNAIRE

The question *"What positive did distance learning bring to you personally?"* in the questionnaire for participants the Elixir to schools meetings was open, offering no answers. During processing, I found that many answers were repeated, so I divided the answers into several groups (Table 1). Some answers were more extensive; respondents described more phenomena, so the total sum in the table is higher than the number of respondents.

TABLE 1. Answers from the questionnaire

Topics	Number of answers
Improving IT skills	152
Changes in the content of the curriculum, changes in the view of my own work	39
The possibility of organizing my own time	30
Creating my own digital materials	28
A better relationship with parents and children is being built	23
Easier self-education, online seminars	19
Children are more independent	16
Children work better, I don't have to deal with disciplinary problems	5
Nothing	46

It might be interesting to select a few quotes on each topic:

1. Improving IT skills

- I gained experience with distance learning tools that can be used in normal times.
- I am more competent in digital technology; my own children share more digital technology experience with me and advise me on how to keep students interested.
- Personally, I have advanced a lot in the use of information technology: online conferencing, zoom, Apple Pencil, material sharing, web search, preparation and correction of tests has become much simpler.

2. Changes in the content of the curriculum, changes in the view of my own work

- I reconsidered the importance or irrelevance of some of the topics taught. I figured out in my head how I want and can continue to teach physics and mathematics.
- To choose essential things in the curriculum, not to overwhelm students, to lead them to think, to combine knowledge.

- I learned to improvise in teaching, because not all students have identical tools for experiments.
3. The possibility of organizing my own time
 - I don't have to get up in the morning, scratch the car. I can enjoy the tea. I'll save time necessary to commute. I am with my children, with my family.
 - I had to sit more at home, so I had the opportunity to tidy up my teaching materials.
 - Time for myself, because I didn't spend up to 3 hours a day moving between home and work.
 4. Creating my own digital materials
 - I have created my own presentations, videos and pictures into which I can draw.
 - I learned to work with students differently, to use new applications, to prepare study materials.
 - The situation forced me to process previously accumulated and newly collected material into long-planned presentations and tests and thus compile digital teaching materials that can be used in the future.
 5. A better relationship with parents and children has been built
 - A completely different and sometimes very surprising view of the pupils. I see who is used to working regularly, who has problems submitting anything on time. I see parents and children from a different side.
 - In fact, I am constantly surprised that some children can appreciate the efforts of teachers - for example, from time to time they write an e-mail, a comment, a message thanking me for giving so much attention that I try to help them when they don't know what to do.
 - Trust has grown to the maximum, understanding, tolerance, respect, we are simply partners.
 6. Easier self-education, online seminars
 - Possibility to visit other online centres.
 - I've been saying this for a long time: students can do less, but teachers have learned a lot of new things.
 - I have more confidence, I'm not afraid to stand in front of the camera.
 7. Children are more independent
 - Pupils have learned to work more independently and submit digitized materials, take photos, shoot videos. Some students are really very handy.
 - Pupils describe the process of their reasoning, thinking.
 - Some children surprised me with how independent and responsible they are.
 8. Children work better; I don't have to deal with disciplinary problems
 - The systematic solving of educational problems in the classroom from the position of a class teacher was eliminated. I don't have to discipline students during lessons.
 - Some more introverted children prevailed.
 - Disruption in teaching and guiding unruly students is over, I have more time for those who want to learn something new.

It is necessary to emphasize that the question was "*What positive did distance learning bring to you personally?*", so teachers do not mention many of the negative aspects associated with a pandemic.

PERSONAL THOUGHTS OF TEACHERS

In this part of the article, I have selected some of the many ideas that teachers have written to me. I selected, translated and quoted from the long texts of each teacher only short passages, from which I created a kind of mosaic documenting the current situation. I can't assure that I chose the most interesting ones - they were all interesting. However, I tried to cover various aspects of teaching life in a pandemic - from the position of a regular teacher in various types of schools, class teacher, and school management. I am very sorry that the permitted scope of the article does not allow me to present whole essays; I believe that they would be interesting for readers.

Zbyšek, Upper medical school¹

The biggest loss I feel is that the COVID-19 pandemic has taken away my students. Our relationship is very friendly and I'm very sad that we cannot meet face to face. We only have two years together and it's been more than one year (half of our dedicated time) that we haven't seen each other. I'm afraid that most of the students will never have the possibility to study physics in the way I planned.

On the other hand, this difficult period of time has brought me several new and valuable experiences. Firstly, I learned that many teachers are great at learning and coping with problems. I also mentioned that colleagues who were not very good in IT quickly and considerably improved. Some of them really positively surprised me.

I feel I am much more confident now, I know I am able to improvise and I confirmed that I really love teaching. Not bad with regard to the terrible situation we all are going through.

Katka, Lower and upper secondary school

I soon stopped being nervous about some colleagues' discussions about how many online tests they had already written and how to complicate the assignment so that it could not be copied, etc. As a realist, I know that anything can be copied down in any short time. I didn't want to praise the children for something they might not have written by themselves; I didn't want them to learn that fraud is a viable way. And I went (especially in mathematics) to the path "Write what you mastered easily, where you needed to know the solution; where dad had to advise; where you need advice from me." The marks began to lose meaning. I usually don't intentionally mark tasks, but I just push, advise and call for repairs. I hope that we will maintain mutual trust and partnership even in the era of full-time teaching.

Jitka, Lower and upper secondary school

I have one student who is in the online world, like a fish in water. He moderated the republic championship in computer games, he is a youtuber and he is much further and more experienced in using ICT than I am. I asked him what to do when I found that after three days of operation my laptop was starting to crash and slow down terribly. And he asked me, "And why do you have your computer running for 3 days continuously?" And I said, "Well, because I work all the time." And he said, "But it's not healthy either for the computer or for you, Mrs. teacher." And so I learn from my students. I turn off the computer every night (unfortunately sometimes it's quite late) and I definitely don't plan on trying and doing everything I could. Like students, I'm starting to think more about what I really need.

Jana, Lower secondary school

I assumed that writing a few lines about the pros and cons of distance education would be done soon. When compiling the balance sheet, the positives were almost balanced by the negatives. And how did I come to that conclusion? I take the current situation as a challenge; I believe that the optimistic approach and its transmission through the monitor to children can make wonders. It can at least partially balance the missing team and common experiences in the classroom. I definitely miss spontaneous questions of pupils. On the other hand, the screens bring insights into the teacher's room; sometimes a funny situation occurs when a pet invades. I approached the children like a man on the same boat with them.

Jan, Upper secondary school of informatics and economics

I teach at a secondary vocational school focused on IT and I teach not only physics, but also several different subjects such as programming, which is the most important subject for me. Physics is a marginal subject taught with a minimum hourly allowance in our school. Synchronous teaching of physics online is no miracle, but at the moment it is the maximum possible.

I have a lot of positive feedback from that programming - great data from questionnaires, information from students that my subjects suffer the least from Covid. And students really appreciate that what they went to school for is doing well. The energy I put into it is returning. Even in physics, those who were interested still want to talk, it just doesn't have priority and that's probably right.

Milada, Lower and upper secondary school

¹ The ISCED system for identification of levels of schools is used [3].

The experiments that I give to children "at home" now, I usually use in physics at school. However, when pupils do experiments at home, they always have to write their hypothesis first, describe how the experiment will turn out. Only then they do the experiment, take a picture, write how it turned out and explain why it turned out that way. I was surprised that often children enjoy the home experiment more, express their surprise more, take more of it, remember more, and think more.

I have the impression that children in distance learning are more aware that they themselves are mainly responsible for their learning and not the teacher.

Pavel, Lower secondary school

Closing the school meant for me the end of the flow of energy that I used in teaching. I believe that the teacher works with the energy that is generated during the lesson – positive and negative energy. Teaching through monitors prevented the flow of both negative energy (which is actually an advantage) and positive energy, which is the driver of meaningful work.

So I started looking for other sources of this positive energy from which I could draw. In early spring, I planted the windowsills of the classroom with herbs. I learned to throw bo shurikens (*Bo-shuriken* is a throwing weapon). I regularly use an empty gym and fitness room.

This time took away the basis of my teaching work, took away my students and replaced them with virtual pictures, numbers to which I have no relation.

Covid also took away my personal meetings with colleagues as part of the Elixir or other training and work. On the other hand, it allowed me to reach far more people than I would be able to handle within a traditional organization.

Jiří, Lower and upper secondary school

As deputy headmaster I observe how colleagues have problems with meeting tasks, deadlines. I don't know what the cause is, but personally I would probably end up the same way. So, even though I don't have to, I go to school every day to have some rhythm and regularity.

For the running of the school, I positively evaluate that in the "normal mode" there were various lectures, discussions, competitions during the teaching - all this disrupted the teaching. Now my colleagues organize everything outside of online classes or outside of teaching, so I hope that it will last even after returning to normal.

Hanka, Lower and upper secondary school

What to use in full-time teaching?

I will definitely make more aids with the children. We did scales and force metres and I realized that pupils can also learn with their hands. When a child makes its own force meter, he or she can draw it more easily and understand how it works.

I will keep submitting tasks via mail or chat. I do not lose any more time with it at school and the child gets feedback home, which will be more useful for him.

Dan, Lower secondary school

I give children more demanding experiments at home, such as measuring the effectiveness of an electric kettle (associated with the preparation of tea for parents). I often want children to predict what will happen and why, then do an experiment and evaluate whether it turned out as expected. Most children welcome these tasks and enjoy exploring at home how the world around them works.

Jiří, Lower and upper secondary school

Students' skills in professional online communication have developed very well. Students realize they need to be at school, not only to be with their friends but also because of the school and education itself. They appreciate the previous years spent at school.

Hana, Lower and upper secondary school

In home experiments, it worked for me to offer children more suggestions and let them choose which one they want to do. A certain advantage of home observations was that it did not tempt children to copy the solution from their classmates. Many of them also involved younger siblings as their "assistants".

Overall, I can say: The faster children learn to work on their own after entering the school and accept that the basic approach is to use their own head and hands, the better. When they are not afraid to talk and propose their

solutions, ideas, etc., even if they sometimes say some nonsense, there is much better work even in online classes. When the impression prevailed that the student would be embarrassed by the wrong answer, we had a hard time getting into a debate.

Jiří, Lower and upper secondary school

Even for class teachers, distance learning is a very non-standard period. Communication with parents has gained momentum; I spend much more time communicating with parents.

A great challenge for class teachers in the future will be to work on maintaining the mental health of students and work with the dynamics of the class team. In this respect, however, I feel very unskilled, which is true of class work in general. It seems to me that class teachers are generally expected to have considerable professionalism, but I don't know much about where teachers should recruit it.

Miroslav, Lower and upper secondary school

However, I see the biggest problem of online teaching in general in the fact that through remote means of communication I am only able to pass on information to students. Other possibilities of attracting students, motivating them, passing on to them some of my attitudes, opinions and value criteria, which I consider irreplaceable in teaching, are very limited. I miss "interactive theatre, where I can play with students, communicate verbally and facially, joke and sometimes cry".

As I mentioned above, teachers' thoughts were much longer than I could have included in this article. In view of the fact that they provide a testimony to the current situation, we are planning to publish the complete texts in Czech.

CONCLUSION

I believe that thanks to vaccinations, the situation in the school year 2021/22 will return to normal and children and teachers will meet face to face at schools again. Then memories of the pandemic period and more than a year's quarantine will gradually fade, and this contribution will only be a record of one phase of the life of pupils and teachers in the Czech Republic.

However, teachers will retain the acquired ICT skills, all created materials, the newly established relationships between them, pupils and parents, and all other experiences they have gained during this time, which they describe in their statements.

ACKNOWLEDGMENTS

I would like to thank all my colleagues who were willing to devote time and energy to writing their texts.

REFERENCES

1. I. Dvořáková, "Active Learning in the Heureka Project — Teachers in the Role of Students", *Scientia in Educatione* 8, (2017). Online <https://doi.org/10.14712/18047106.731>
2. I. Dvořáková and L. Dvořák, "Informal Physics Teacher Training In The Czech Republic: A Possible Inspiration" in *Contemporary Science Education and Challenges in the Present Society: Perspectives in Physics Teaching and Learning*, edited by Mauricio Pietrocola, Ivã Gurgel & Cristina Leite (MPTL Multimedia in Physics Teaching and Learning, University of São Paulo, 2017). Online <http://www.livrosabertos.sibi.usp.br/portaldelivrosUSP/catalog/book/177>
3. International Standard Classification of Education ISCED 2011, UNESCO Institute for Statistics. Online <http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf>