

What will the Learning Experience of Physical Science Students be in 2020?

50 years ago, speculations about what the learning experience of Physical Science students would be in 2020 would conceivably have ranged from absorbing knowledge by swallowing pills to simply memorising a recently completed Theory of Everything. Being a third year student of physics, I can attest that these scenarios are still as removed from our world nowadays as they were during the last century. Nevertheless, the learning experience of Physical Science students is likely to change in three interconnected areas over the next ten years: Technology's role will continue to expand, courses will become more intense and diversified, and degrees will become globalised (students will be more connected with other students and degree requirements will become increasingly standardised).

Before describing the three areas in detail, it will be helpful to outline on what basis future changes in (Physical Science) education may be predicted. Clearly, one possibility is to look at past and current trends and to extrapolate those forward in time. Although this approach does not yield definitive answers and cannot take into account innovative, unforeseen developments, it does have the advantage of giving a good indication of what is likely to happen and what is not; hence, I will base my analysis on this reasoning.¹

When projecting how (Physical Science) education will change in the next decade, the increasing importance of technology is one of the first thoughts that comes to mind. Already during my first three years of studying physics, I have witnessed several such changes: I no longer get exam results on a sheet of paper but only online; one of my lecturers recently told me that he was reluctant to give out hardcopies of his handout since many people exclusively learn from online notes; an increasing number of lecturers are trying smart boards and tablet PCs, in particular to illustrate mathematical steps (even though the blackboard stubbornly refuses to go away). At the same time, the number of students completing (science) degrees online continues to rise (a website by Nobel laureate Gerardus 't Hooft even promises students that they can teach themselves to be good theoretical physicists, perhaps on their path to Nobel glory²). Physical Science students in 2020 are likely to spend even more of their study time in front of a computer. As laptops continue to become lighter and more user-friendly, students may even begin to type mathematical answers to practice problems (so far, writing these by hand has been the convention). In fact, not only will students spend more time using their computer's programs, but they are also likely to spend more time writing their own programs in order to solve scientific problems (my department is currently considering how computing can become a more central part of the physics course for all students).

¹ Federal Ministry for Education, Science and Culture, Austria. "Current and Future Trends in Higher Education." *Federal Ministry for Education, Science and Culture, Austria*. 19 Jul. 2007. Web. 22 Mar. 2010.

² 't Hooft, Gerardus. "How to Become a Good Theoretical Physicist." *Universiteit Utrecht*. 2009. Web. 22 Mar. 2010.

All technological developments at universities should have one common goal though (which is not achieved by, for example, too many overlapping online systems for a single course) – to make it easier for students to acquire information.

Next to becoming more technology-focused, degrees in the Physical Sciences will probably also tend to become more intense during the next 10 years. Because of the difficulty of finding a job in the current economic climate and because of the increasing value that is placed on expertise and knowledge in our 'information society', obtaining further degrees has become an increasingly attractive option for many students. In fact, alternating periods of education and working (carried out by MBA students, for example, nowadays) may become commonplace. Furthermore, due to the scientific challenges that face humanity in the 21st century (in particular, with regard to energy usage and climate change), universities are likely to restructure their Physical Science courses and expand their units on these topics (to produce the generation of scientists which will finally save the world). At the beginning of my course, I got the impression that most of my fellow students wish to stop studying after three or four years and are not interested in interdisciplinary research areas such as climate change. Still, even during the last three years I have noticed changes – compared with one year ago, many more of my fellow students can now imagine doing a further degree or pursuing a career in the energy sector.

Finally, degrees in the Physical Sciences are likely to become more globalised. This means that, firstly, students will exchange more information with students at other universities (which is also a direct consequence of the increasing roles technology and the internet play in education). Online study groups and Q&A forums will be an important part of most students' learning routines. This new approach to learning with others, even with people who are thousands of miles away, could be quite different to what most students are used to nowadays. Although we do work on problems together and consult with supervisors, the majority of time, for many people, is still spent on independent studying and research –for instance, trying to follow a detailed derivation in a library book. Despite this general change, all students should continue to have the freedom to choose their favorite routines. Secondly, universities will try to align their courses and promote exchange programs. The Bologna Process is the best example of such an attempt to make education uniform in a large region. It may become possible to not only routinely switch universities after completing a degree, but also while in the middle of studying for one.

Ultimately, Physical Science students in 2020 are likely to use technology extensively, be enrolled in demanding and diverse programs, and follow more globalised degrees. These changes will probably occur at universities in all parts of the world, particularly though at universities in developed countries. Whether or not these adjustments will improve the student learning experience remains to be seen (although I hope I will not witness them firsthand in 2020 as that would imply repeatedly failing my exams during the current decade). What should be clear, though, is that the value placed by our society on the expertise and analytical thinking skills of Physical Science students will very likely continue to rise, which would certainly be a positive development.