

Importance of fundamental and applied science in higher education

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Abstract

In science and every field where one wants to reach for excellence it is very important to get fundamental basic knowledge first; there are very different approaches how this goal can be achieved. The most common way in science is to study, but there is more to it: Research! This offers a better approach to look to science itself. Research work can be done in libraries, in the open field or in the laboratory. Nevertheless it should be the goal of every student to find a way to abstract the insights gathered and implement the knowledge in various projects. But let us start from the beginning and have a look at the different ways of education in Austria. One of us (O.F.) started his academic career after completion apprenticeship in gastronomy, which was very practice oriented. See Table 1 with a listing of the theory and practice lessons in this tourism school:

Year 1 Theory/Practice	Year 2 Theory/Practice	Year 3 Theory/Practice	Summary Theory/Practice
26 Hours / 16 Hours	15 Hours / 33 Hours	16 Hours / 33 Hours	57 Hours / 82 Hours

Table 1: Table of the hours per week at the Tourism School of Vienna "Am Judenplatz", see: <http://www.gafa.at/de/index-gafa-studentafel.html>, last visited 20th May 2012

So O.F. built up his first experiences with a more practice oriented education. Please note that this abstract focuses on comparing the amount and form of knowledge provided and not on the level of education. After seven years of practice O.F. decided to start studying physics at the Vienna University of Technology. There the main form of providing knowledge is by teaching basic science approaches (see Table 2).

Year 1 Theory/Practice	Year 2 Theory/Practice	Year 3 Theory/Practice	Summary Theory/Practice
38 Hours / 3 Hours	28 Hours / 8 Hours	18 Hours / 10 Hours	84 Hours / 21 Hours

Table 2: Table of the hours per week suggested for the BSc. at the Vienna University of Technology, see: <https://tiss.tuwien.ac.at/curriculum/public/curriculumSemester.xhtml?le=falsewindowId=5ackey=37273semester=YEAR>, last visited 20th May 2012

As opposed to most of his fellow students, O.F. was exposed to a very practical way of learning from the beginning. It remains to be evaluated if the tendency of universities to more and more school-like curricula really yields the success increasingly demanded by

the governments; study times get shorter but the employability and inventional capability of the alumni are not increased as much as intended.

The authors stress the importance of both approaches! A sound fundamental science base helps to analyse and abstract the results coming from the field. Experimental results can be used to amend or completely change the theory (see the endless quest to prove the existence of the Higgs Boson as foretold by the Standard Model in physics).

Nowadays it is common, at least in Austrian universities, to keep the students on an very short leash, when it comes to the curriculum. With the main goal to keep the time spent at university very short, the students rush through basic education with a very strict plan. Mainly producing academic worker bees with a basic knowledge and the final goal to become an expert at special fields or getting the basic requirements to apply for a special job. Considering the fast pace of our current times, this is a method to keep the academic circle populated and keep up with the fast progress. On the other hand every student lost individuality within the process of learning. If one student decides to leave the path given by the curriculum and takes classes not necessary to achieve an academic degree, but interesting and important for the personal education process,(s)he opens up a variety of options and benefits for continued personal and professional growth.

To conclude this abstract: Often it is not easy to decide if an information provided by a book can be taken for granted or is to be questioned. In our opinion, it is best to take the theoretical information from the book and set it into a spotlight, view it from every angle and decide about its quality. If we take it from the other side, collecting data from nature (practice) itself and try to fit different aspects into other applications (for example take the special form of underwater communication from whales and use it in submarines) seems in the first view very naive, but is often a very straightforward way to find solutions for actual problems.

Finally it is often a very good idea, just to sit down and simply think about problems and their solutions or get together and discuss them with others. For example with students and research staff from different faculties to get more diverse points of view, then walk into the nearest library and identify the most obvious way to approach a given problem. It might be not invented yet.