

RESEARCH EXCELLENCE AS ENHANCEMENT OF A HIGH ACADEMIC STANDARD IN THE MASTER DEGREE PROGRAMS

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Abstract

At first sight the statement: "Research excellence provides enhancement of a high academic standard in the master degree programs" appear highly compelling. It seems self-evident that a high academic standard is important to guarantee the quality of master degree programs in engineering. However, this is not necessary true for the professional master programs run by the Universities of Applied Science. Excellence in research is almost synonymous with a high academic standard, and sets an example that can be attained only by very few institutes. A more practical solution would involve a re-defining of the concept excellence in research in practical terms.

Introduction

At first sight most people would agree whole heartedly with the thesis implicated in the title of this paper. A high academic standard is important to guarantee the quality of master degree programs in engineering. So we can all go home, satisfied that we agree on the importance of research for engineering education curricula.

Yet, agreement on the face value of a statement constitutes no proof of the validity. A different example may serve to clarify the point. Everyone would also agree that we want the best possible education for our promising young engineers. Yet, we can observe that the resulting actions are often quite contradictory. In one place the best education means that the most top-rated professors are required to lecture to massive groups of first year students, whereas in another place lectures are abolished completely and the students are being made responsible for their own study program (A successful method known all over the world under the label of Problem Based Learning – PBL [1]).

Evidently, agreement on a statement does not mean agreement on the implications and the consequent actions. In this paper I will challenge the thesis: "Research excellence provides enhancement of a high academic standard in the master degree programs". I will break it down into the elements of which it is build and I will analyze the implications of different visions of the respective elements. For the sake of clarity I will limit myself to the domain of higher engineering education.

Analyses

Beginning at the end of the thesis, I first want to look at the bachelor degree programs in engineering. The Bologna declaration identifies three main stages in University education: the Bachelor, the Master and the PhD. The bachelor phase covers the first two or sometimes three years of the University curriculum. However, the issue is complicated because in Europe there are two different types of schools in higher education in the domain of technology. First there are the research universities who aim to train for an academic career, although of course a fast number of graduates end up with a job in industry. Besides that there are the Universities of applied sciences (polytechnics, école polytechnique, Fach Hochschule, etc) aiming to train engineers for a career in industry.

Hence, besides the bachelor programs at the research Universities, there are also practice oriented bachelor programs, offered by Universities of applied sciences. In theory the two types of bachelor degrees are equal, both allowing access to the master degree programs of the Research Universities. However, in practice graduates with a practice oriented bachelor will have to go through supplementary programs in order to enhance their academic profile. Apparently, the research universities impose requirements that are hard to meet for the candidates from the universities of applied sciences.

A similar differentiation exists among the Master degree programs. Research Universities offer a multitude of two years master degree programs (120 EC), covering the different areas of specialization in their research programs. The research featuring in these programs is mostly applied research or research in relation to design and innovation.

The universities of applied sciences offer practice oriented master programs, often set at 60 EC, or one year of fulltime study. The impact of excellence in research will clearly be different depending on the type of master program. I think it is fair to say that the effect will be minimal in the case of practice oriented programs. Evidently in this respect the thesis is not valid. In the next section we will look more closely at the potential impact on the Research university master programs.

Finally, the PhD stage consists of the training as a researcher in a specific field of science. This stage undisputedly belongs to the research universities. Traditionally, it is not a curriculum with courses and classes, and SEFI feels it should maintain this character [2]. A master apprentice relationship is a better characterization of this learning process, even if it is nowadays often organized in PhD schools. Research skills are learned by doing supervised by an experienced researcher who will give feedback on the young researcher's performance.

Research excellence

The claim in the statement at the beginning of this paper is rather carefully phrased. Instead of suggesting that excellence in research results in better learning it is postulated that

research excellence provides enhancement of a high academic standard. First we have to agree on what constitutes research excellence.

One way of looking at this is that true excellence has to be exceptional. It is lonely at the top. So the label 'excellent' should only apply to research leading to totally new ways of understanding, clearing the way for ground breaking innovations. The kind of research that is published in Nature or Science, and that earns one a Nobel price.

The next question is: how will excellence work out in enhancing a high academic standard? Before answering that question we first will have to agree on what is a high academic standard. Merriam-Webster's online dictionary gives nine different meanings for the word standard, ranging from the banner carried as a rallying point on a battlefield to musical composition that has become a part of the standard repertoire [3]. Somewhere in the middle we find a meaning that seems to make sense in our context: something established by authority, custom, or general consent as a model or an example: a criterion.

The standard for academic performance could be identical to the Nobel laureate's definition of excellence in research. If we accept the judgment of the committee that bestows honor on our greatest scientists, then making their choices this committee sets the standard for the highest academic performance. This would surely set an example worthy of being followed by ambitious young researchers.

The redundancy in meaning between these two elements in fact lowers the threshold to agree with the statements as a whole: excellent research enhances a high academic standard for the master programs at our research universities. Yet there is still room for discussion. The chosen definitions of excellence and a high standard incorporate some disadvantages to be discussed in the next section.

Discussion

There are several drawbacks to setting the standard for master programs at the level of top performance. First of all, because it is so lonely at the top, there are not many persons who fulfill the criterion of being excellent. Especially in Europe there are many highly reputed research universities who do not count even one Nobel laureate among their professors. That means that the standard is not available as an example in most of our institutes. Another aspect of this particular criterion is that most laureates are being awarded in the fall of their career, when their time to serve as an example is limited.

Obviously, this type standard falls short of the mark if we want to use it as an example, or a criterion for the academic performance within our master degree programs. The distance between the level of excellence and the master program is simply too big to allow for any significant influence. You cannot expect to upgrade your master program in order to attain a higher proportion of alumni reaching for the Nobel Prize.

Of course we could adapt the standard of excellence to local criteria, like counting honorary doctorates, keynote invitations, or identifying the ten most cited engineers in Italy, Germany or Holland. The more fundamental issue is, however, what do we want to achieve by using a standard of research excellence? Do we want to impress people, with something that is out of their reach, or do we want to provide them with something they can use to calibrate their own performance?

The last option implies we will have to look closely at the role of research in the master curriculum of the research universities. In most universities there are many different master programs, divided along the lines of the most prominent research topics. This would seem to facilitate a close connection between research and teaching. However, looking more closely into the curricula, it can be seen that there is seldom any specific training in research methodology. Consequently, the master programs do not seem to prepare students for a career as a researcher. This is confirmed by a recent study that inventoried of the careers of alumni of the faculty of Aerospace engineering at TU Delft [4]. The results show that very few of alumni made a career out of research. Even the ones, who did go back to the university to do research, did so most of the time after working in industry for a period.

Again the standard of excellence will be out of reach all too often. An effective standard is one that has impact on the intended target. When we limit ourselves to the Master degree programs at the research universities I personally agree that research performance could enhance such a standard. And I truly feel that acquiring a critical scientific attitude should be part of the education of engineers. However, the consequence of such an approach is that we need to agree on a much more practical definition of research excellence than the one featuring above. For instance, we will have to agree on scientific paradigms and on methodological criteria that define scientific sound research. Excellence should come within reach so to say. Implementing such an adaptation looks less glamorous than the thesis we started out with and it could be quite a challenge, but the results could be worth the effort.

References

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