The Impact of Student Numbers on the Quality of Teachers – The Situation in Vienna and a Possible Way Out

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Abstract

For years the Vienna University of Technology has had problems attracting a sufficient number of surveying students. This leads to financial problems if the budget is based on student numbers. Another problem is that low student numbers lead to low graduate numbers and this limits the choice when looking for employees at universities. Then even less suited candidates have to be accepted. In the long run this will have an impact on the quality of the teachers. This can only be prevented if more students are attracted. The traditional fields are well covered. Thus we need to address new target groups. However, both, the curriculum and the job description must be attractive.

1. Introduction

Assessing and improving the quality of education is a standard problem (compare, for example, [1]). The curriculum is often used as a measure for the quality of the education. A specific field can only be taught if there are a certain number of classes with a minimum duration. The education is deemed poor if this requirement is not met. There are many examples for such curriculum descriptions [2-5]. However, the discussion of educational quality should not be restricted to the development of curricula and how to assess ECTS points to the various fields. The quality of education is based on several other factors, too. Some of them are

- monetary expenditure (for personnel, equipment, rooms, etc.),
- access to recent research results (projects, contacts, etc.),
- motivation of teachers, and
- quality of teachers.

Deficiencies in any of these areas can eliminate benefits from improved curricula. The discussion in this paper concentrates on the quality of teachers. The quality is influenced by several parameters including the ones listed above. What is usually ignored, however, is the fact that the number of students has an impact on the quality of teachers.

The remainder of the paper is structures as follows: Section 2 shows the impact of lacking monetary expenditure on the quality of the teachers. Section 3 shows the connection between student numbers and the quality of teachers. Some numbers and experiences from Austria show the effects. Raising the university budget is in Austria a political decision and thus we have almost no influence. Thus attracting more students is the only way to improve the quality of teachers. Section 4 thus provides some ideas to raise student numbers in Austria.

2. Impact of Tight Budgets on the Quality of Teachers

Monetary expenditure is a problem in times of tight budgets. High quality teachers demand adequate payment and if universities reduce salaries (as done in Austria) the quality of teachers will drop. Excursions and field training are expensive as is the acquisition of modern equipment. High quality teachers will try to guarantee that they have enough budgets to finance these activities and investments. Attracting internationally renowned experts as professors is thus connected to a guaranteed minimum budget. Lack of money has thus a direct influence on the attractiveness of the university for high quality teachers.

A typical way out of this problem is the acquisition of projects to bolster the budget. However, this has a disadvantage. Project proposals have to be written and, for accepted projects, the according work has to be done. Surveyors, as engineers, are usually successful in acquiring projects. But what is the impact on the teachers? They will have to help drafting the proposal and overlook the implementation of the project. This takes time and is usually missing somewhere else. Since administrative duties cannot be neglected, either teaching or independent scientific work will be affected. Scientific work is a major component for the development of new teaching material and thus excessive workload for project acquisition will have an impact on the quality of education.

The acquisition of projects usually requires ideas. Many ideas develop while reading texts or listening to presentations. The publishing channel must be accessible for reading. These channels are still mainly journals and books. Access to these kinds of publications is influenced by monetary expenditure. The access depends mainly on the budget of the university library. A shrinking library budget results in deteriorating working conditions because it is more difficult to access recent work of colleagues. Departments can try to keep the access by paying for the access themselves. The required money will, however, be missing somewhere else. Using project money may help but again leads to higher workload for the personnel. Thus the budget has not only a direct effect on the quality of teachers by limitation of wages, but also an indirect effect by deterioration of working conditions.

Time pressure and short budgets may also have an impact on the motivation of teachers. It is frustrating if there is not enough money available to implement excursions or student projects. This is not yet a pressing issue in surveying education in Austria (as most of my colleagues are highly motivated and budgets are still high enough to support teaching) but it may become one.

3. Impact of Student Numbers on the Quality of Teachers

We still have enough money and a number of excellent teachers in Vienna, but can we keep this level? The number of students is a crucial factor to keep a certain level: Smaller communities like surveyors have less influence than bigger ones (like, e.g., computer science or architecture) and receive smaller shares of the budget. Additionally, teachers have to be selected from the group of former students. It is therefore necessary to have a decent number of surveying students to guarantee the quality of future education.

Looking at the incoming student numbers for surveying studies in Austria shows a significant increase [6, 7]. Unfortunately, these numbers only tell half the truth since the number of graduates does not correlate with these numbers. One of the main problems is that ERASMUS students are included as starters, although they usually do not plan to finish their studies in Austria. Students who want to finish their studies in Vienna will usually take courses according to the proposed schedule. This can be used to separate ERASMUS students from regular students. In addition, there may be students who only need the inscription for access to social security system or who find out within the first weeks that surveying is not their main interest. These students can be eliminated when looking at the number of students participating in a course from the second or third semester. Figure 1 shows the difference between the incoming student numbers and students participating in the course adjustment computation in the third semester. Some of the missing students stopped studying. However, this cannot explain the different shape of the curves. Even if we eliminate the peak in 1997, the correlation between the lines is small. In 2003, for example, the number of students in the 3rd semester increased whereas the number of new students from the previous year shows a decrease.

The number of graduates is another important factor. Figure 2 shows a comparison of the student numbers in the 3rd semester with the numbers of graduating students four years later. The correlation between the numbers is 82% and thus the number of students in the 3rd semester seems to be a good indication for the available graduates four years later. Even better results can be obtained if removing the peak in 1992. This peak originates from the end of the old curriculum in 1996 (four years later). A large number of students wanted to avoid complications with the change of curriculum and this resulted in the high number of graduations. After removing this peak the correlation is even 94%.

A major problem from low numbers of graduates is employment at universities. Currently 71 researchers are employed at the three surveying departments at the Vienna University of Technology. This number rises to 74 if including currently open positions. Three other Austrian universities have surveying departments: Graz University of Technology (30 researchers), University of Applied Life Sciences (11 researchers), and University Innsbruck (6 researchers). Thus the universities alone must fill 120 research positions. Assuming an average work life of 40 years 3 graduates per year are necessary (the actual rate is even higher due to short-time contracts and migration to industry and administration). This is a quarter of the recent graduates. Vienna University of Technology and Graz University of Technology recently had problems finding suitable candidates for research positions. At least 4 to 5 candidates would be necessary to guarantee high quality of the personnel but at the two universities there were less than two applications per position. Thus even less qualified applicants have to be employed. Since these

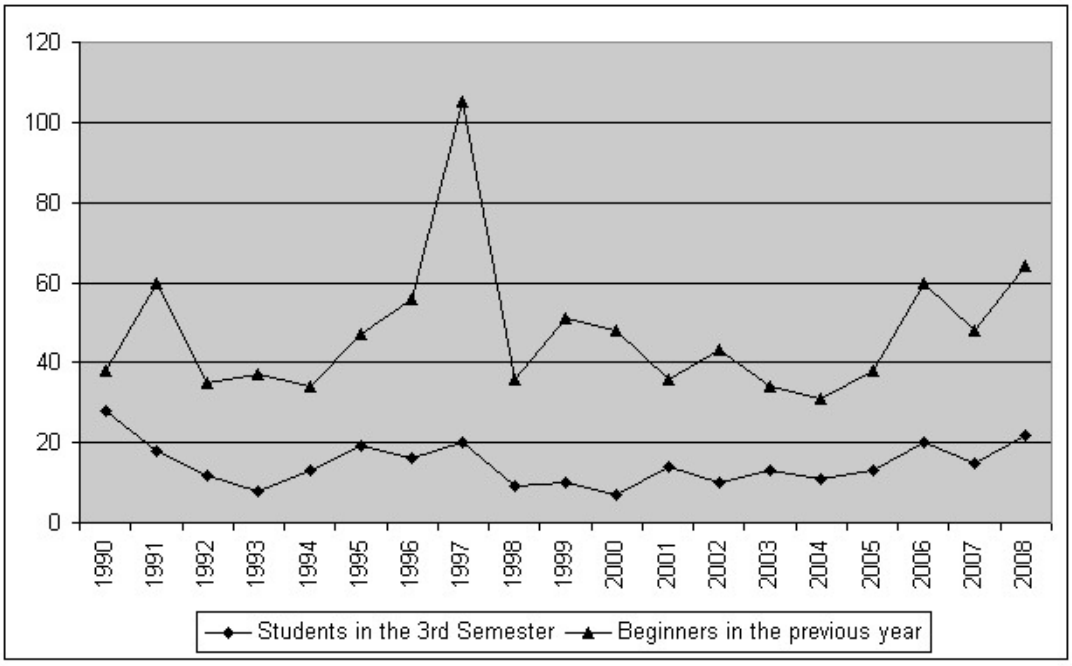

Fig. 1: Comparison of surveying students at the Vienna University of Technology: Newly registered students in the previous year vs. students in the 3rd semester.

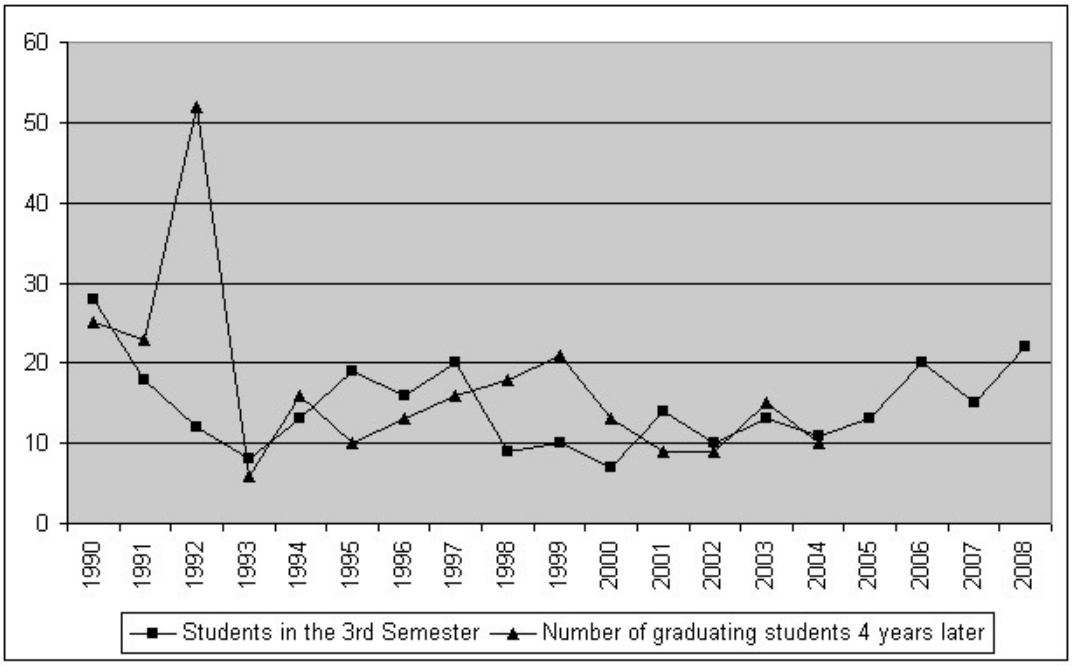

Fig. 2: Comparison of student numbers in the 3rd semester with the number of graduating students 4 years later

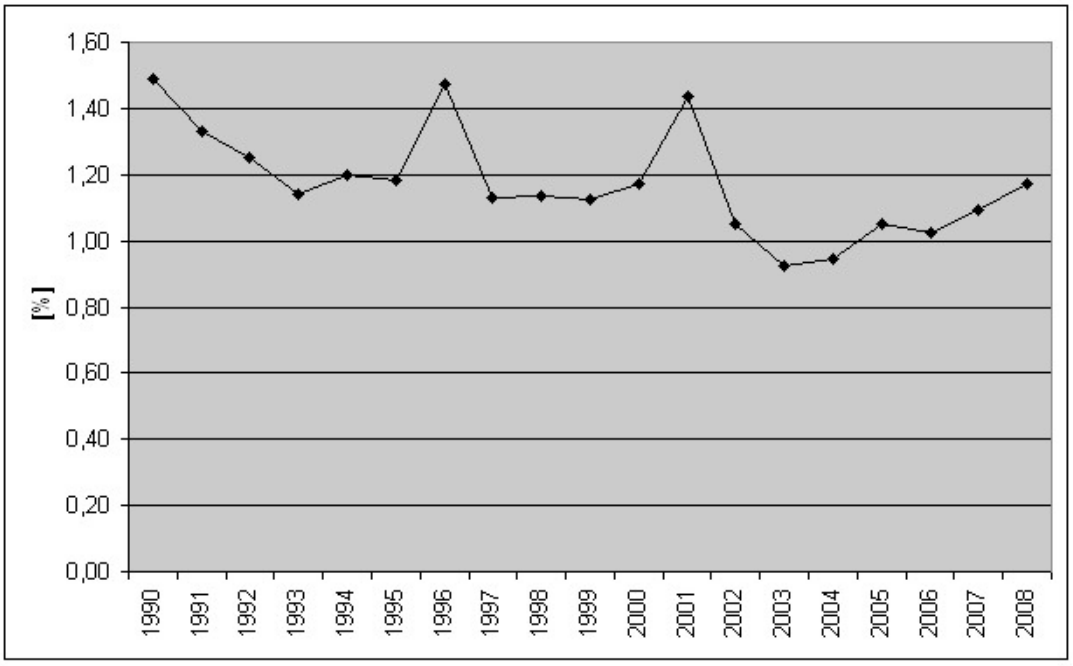

Fig. 3: Number of surveying students (without PhD-students) in percent of the total number of inscribed studies at the Vienna University of Technology

persons should also teach, the quality of the teaching will drop in the long run.

Whereas Figure 1 shows the absolute numbers, Figure 3 shows the relative importance of surveying at the Vienna University of Technology. The leaders of curricula with a large number of students will have a higher impact in organizational decisions than the leaders of small curricula. The relative number of surveying students decreased from 1990 (1.5% of the students in Vienna) to 2003 (0.9%). Since then surveying is regaining relative importance. This indicates that there is a positive trend but the relative importance is still at an unsatisfactory level. This problem even increases the monetary problems because everybody needs more money and the budget is at best at a constant level. Thus everybody tries to argue that his group is more important. Numbers of students and graduates are easy to count and are thus often used. Probably a side effect of this problem is the dropping number of places offering surveying education. In the last years, for example, Delft and Berlin closed their curriculums in surveying. Similar developments can also be found in other parts of the world (e.g., in Africa [8]).

4. How to Increase Student Numbers in Austria

A key factor to improve or even keep the educational quality is therefore raising the number of students in surveying. However, actions are only possible if the problem areas are known. Thus we should perform a thorough analysis of the interests of surveying students in Vienna. Based on this analysis we could then start focused marketing actions to increase the number of students [9]. I did not do such an analysis. I just want to show some observations I did in the recent ten years.

A large fraction of surveying students is formed by children of surveyors. Later in their academic career they either want to take over the office of their parents or at least work in a similar environment. They have a clear picture of the job and selected the studies because this is what they want to do. Marketing in this group of possible students is not necessary.

Other students had other contacts with surveying:

- summer work in a surveying office or with the Austrian Federal Office for Metrology and Surveying,

- presentations given by researchers at schools, or
- other promotion material.

Whereas the first two possibilities are obvious, the last one might be interesting. In Austria there is an annual exhibition where pupils can get information on a wide variety of jobs. The Austrian universities are also present at this exhibition and researchers explain to interested pupils the curriculum and chances in the job market. A study as done in Sweden [10] could be helpful to communicate the chances in the job market because good chances may increase the interest (compare [11]). Typically, some of these interested pupils become students of surveying. Other promotion material includes also folders (see Fig. 4) with information, which are sent directly to schools. As far as I know there are no reliable numbers of pupils who actually see and read the folder.

Fig. 4: Promotional folder

Typical students in surveying in Vienna are interested in mathematics and high precision of measurements. Undoubtedly, high precision measurements are necessary and interesting. For some fields, however, a different kind of students would be better suited. Surveying students in Austria, for example, seem not to be interested in thinking economically. However, this is a major requirement to become a licensed surveyor or create new information products. We esteem ourselves as the experts for geometrical and geographical data. This conflicts with successful products like Google Earth where the impact of surveyors seems to have been minimal. Otherwise it cannot be explained that the georeferencing was not done correctly. However, this technical flaw did not prevent a world-wide success of the service.

It seems that we fail to attract enough students who want to perform such creative development tasks. These students seem to study different fields like computer science, spatial development, or civil engineering. These graduates then move to companies and will pull colleagues into the company. Surveyors only rarely manage this step. A successful story is BMW where a small group of surveyors is employed. Still, it took large personal effort by colleagues from Munich to place the first one. The others just followed and even competitors saw the benefits of having surveyors in the company. Such an operation would be much simpler if surveyors were known for something else than just accuracy.

5. Conclusions

Student numbers are a problem for surveying curricula. The first guess is usually the financial aspect of the problem: A low number of students results in a low budget. However, there is a more indirect aspect of the problem, too. Since the majority of teachers should come from the group of surveying graduates, a low number of graduates limits the quality of the teaching. This again leads to lower quality of the education. Thus, attracting new students must be a priority goal. Changing the name from “geodesy” to “geomatics” does not help [9] and therefore we must start focused marketing. This, however, requires a clear idea which kind of students we want to attract and where they can find suitable jobs.

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