The impact of Students' Scientific Conferences to the talents identification in the Hungarian microelectronics higher education

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ABSTRACT

In Hungary since the beginning of the 20th century the educational system continuously has focused on the identification of talented persons. Several gifted education programs were developed and used in the higher education as well. Almost every special education program rests on the so called master-pupil contact. In higher education there is not too much possibility to form face-to-face relation between teacher and student(s) and give gift education[1] to undergraduate students. Generally lectures mainly are held to more than one hundred students. The (laboratory) practice is a little bit better place to get to know students' skills, but unfortunately neither in this case remains enough time for every student.

The only solution and place recognizing talented undergraduates is the Students' Scientific Conferences. The first conference in Hungary was held in 1951. These conferences give a framework to help collecting and identifying gifted and motivated undergraduate students. In this article the role of the Students' Scientific Conferences in the gifted education will be introduced. The main benefits and the impact of the Students' Scientific Conferences to the identification of gifted students will be discussed as well.

1. INTRODUCTION

There are several well known and widespread methods in gifted education. The **differentiation** means modification of the talented students' curriculum to accommodate their specific needs and abilities. This can be done by changing the content or the complexity level of the materials. It means separate courses and classes, where only gifted students learn.

The **acceleration** means students complete the normal curriculum sooner than normal period of time. Within the framework of *partial acceleration* the students are advanced in one field, such as mathematics, without changing other studies. This is a real flexible approach and very popular in the secondary education. Gifted students get high-level curriculum which is commensurate with their ability and preparedness[2]. In the higher education acceleration would mean universities have to start separate courses for talented undergraduates which results shorter time of education than in the regular cases (*e.g.: Formerly on the Budapest University of Technology and Economics an accelerated education existed. It was 4 years long undivided, one-tier higher education system instead of the regular 5 years long*). It needs extra *staff costs* and other expenditures.

Within the framework of **enrichment** students spend all the time with their peers in regular classes, but receive extra material to solve them additionally. So this is done in addition and not instead of any regular school work. The problem is the gifted students have to do more work, not the same amount of work but at a higher level [2]. In higher education enrichment can be realized, but how do the teachers know who the gifted persons are in the beginning of the education? Unfortunately enrichment can be functional only if the teachers have enough time to get to know their students. It requires fewer students on the lectures and more (laboratory) practices in order to evolve a good master-pupil contact, which is not feasible under every circumstances. In the higher education, teachers meet minimum hundreds of students on the lectures. From 2005 in Hungary, the linear, two-tier higher education system was initiated. As it was expected the number of students in the BSc. level education has increased and simultaneously the number of undergraduates has grown on the lectures as well.

In most cases these previously mentioned methods can be applied only in secondary or elementary education. But the most important thing is the teachers get enough time to get to know their students in order to recognize the gifted undergraduates.

2. THE STUDENTS' SCIENTIFIC CONFERENCES

In Hungary there is an alternative way to create master-pupil relation and gifted education possibilities in the higher education; this is the Students' Scientific Conferences. These conferences organized in every year on the higher education institutes, mainly on the universities. On the *Budapest University of Technology and Economics* these institution conferences held in November in every year. There are several sections on every faculty. On the Faculty of Electrical Engineering and Informatics recently there were 12 sections and one of these is dedicated to microelectronics.

In every second year the National Conference of Students' Scientific Associations is organized. The national conference is always preceded by the institution conferences. The 1st prize winners of the institution conferences can apply for the attendance of the national conference.

[1] Gifted education is a term for special procedures, theories and practices used in the education of persons who have been identified as talented.[2]

The introduction and the possibility to give a presentation at the national conference brings mainly moral recognition, an opportunity which provides discussing, exchanging of ideas and collecting of experiences before a jury and the fellow participants.

3. THE GIFTED EDUCATION ON THE HUNGARIAN UNIVERSITIES

Within the framework of Students' Scientific Conferences, undergraduate students may start their research and development work in any fields and on any departments which they selected. The students mainly after the 6th semester start to feel interest in different research work running on the university. Principally the most gifted and motivated students expend time on extra work beside the regular university works and activities. They independently find the most competent teacher in the selected field and initiate the work. In most of the cases the students select from the declared topics can be found mainly on the WEB pages of the departments, but sometimes several undergraduates find out an own problem and try to find a consultant who can help them to solve that problem. *These initiative behaviors unambiguously indicate the presence of talents.*

On the *Budapest University of Technology and Economics* only on the *Department of Electron Devices* students can carry on R&D work in the fields of microelectronics. Students can deal with:

- analogue, digital, mixed-signal and RF integrated circuit design and simulation,
- MEMS design and simulation,
- IC and MEMS measurement and characterization,
- semiconductor physics, measurement and characterization of different semiconductor devices,
- thermal simulation, characterization and measurement of different electronic devices (packaged ICs, LED and other optoelectronics devices or complete electronic systems),
- development of new type measurement systems,
- research of new type optoelectronic, MEMS devices,
- semiconductor devices (sensors) manufacturing,
- fabrication process of semiconductor devices, etc.

Within the framework and during the preparation process of Students' Scientific Conferences undergraduates can deal with different microelectronics topics and may work in several actual projects on the Department. The students work separately or in small teams to solve real problems or develop new circuits or equipments. During the overall work the teacher acts like a tutor who controls, manages the students' work. Mainly one dedicated teacher who is outstanding in the field which was selected by the student(s) controls one or maximum two undergraduates.

Table 1 – The results of undergraduate students

Year of the graduation	Cumulative average of the last 5 semesters
2002	*3.07*
2004	*3.12*
2006	*3.33*
2007	*3.21*
2008 (BSc.)	*3.11*
2008 (Undivided)	*2.60*

For the students it is a good preparation for the future, for taking part in international conferences and by comparing their own work with those of others, students may obtain confirmation and new initiatives for their research work that often demands significant sacrifices.[3]

This work gives a possibility for the teacher to get to know the students and directs the most gifted undergraduates towards the research work and leads them on to continue their studies on Msc. and maybe on PhD. Professors and researchers can evaluate the knowledge of the students in the selected subject and thus it gives a possibility for better selection of PhD. Students. In Hungary, in the most of the cases the prerequisite of the PhD. programs is the students' activity on at least one scientific students' conference. This may contribute to the successful beginning of the scientific career of the students.

Comparing the results of those students who participated at least on one scientific students' conference to those students who don not shows the average of the last 5 semesters of their undergraduate education is higher approximately by one mark. In Table 1. the cumulative average of the undergraduate students can be seen. The average of those students who have participated on a scientific conference was 3.93 in the year 2007, and 3.65 in the year 2008.

4. CONCLUSION

The Students' Scientific Conferences are the best place for observing talented undergraduate students. During the preparation process of the conference the teachers may get to know their students and those who have special skills, motivation or interests in different fields which indicate the gifted persons. Additionally during the preparation work cooperation, engineering and system approach developed in the students as well.

REFERENCES

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