

## THE RESEARCH OF STUDENTS ADVANCEMENT IN GRAPHICAL SUBJECTS

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**Abstract.** The paper presents the research of graphical subjects teaching. Graphical disciplines are one of most important disciplines delivered in first year of technical universities curricula. The correlation of mark of examination in University and mean of school-leaving diploma was set up. The recommendations of learning and teaching process improvement for graphical disciplines in Kaunas University of Technology are presented

**Key words:** Engineering Graphics, Computer Drawing, Preparation in Secondary School, Advancement of Graphical Subjects.

Any technical course of lectures in University of Technology have the aim of delivering functions of knowledge, ability to do and skills to students, what orients young engineers on solution of practical professional tasks and problems. That is why the first requirement for course of lectures is construction and structure of course must activate professional interests of students. If course follows these requirements general principals of course structuring serves to several aims simultaneously: they help student to master themselves with special structure of knowledge, abilities to do and skills. Students themselves can transfer all this to different subject of studies; it becomes a main tool of professional activity of engineer in solving of practical problems.

In the line with the mass higher education tendencies, higher schools have to direct their activity towards the application of effective flexible didactic systems, the stimulation of studying process the constant search for new and excellent study forms and methods with the emphasis not only on fundamental or applied knowledge, but learning the activity methods and problem solving.

Systematical structure of special courses creates abilities to form systematical orientation of future engineer in environment of objects, and allows him to be on the level of professional tasks of modern practice. But generally speaking all special courses start from 4<sup>th</sup> term. Many investigators said that development of professional interests must start at the first term and professional orientation of students must be organized as permanent process.

The problems of students' advancement are essential in graphics subjects as well. The latter are highly specific and therefore they are difficult to study. If compared to other general subjects, the graphic subjects are in worse position, because drawing is among the free-chosen subjects in secondary schools of Lithuania. Moreover, the studies of graphic subjects require a special attention not only to material content, but the development of creative thinking, imagination and spatial preception [1,6]. Knowledge, skills and abilities obtained in the course of graphic subjects are necessary for studying the speciality disciplines and preparing the course projects as well as final works [2].

Different authors reveal a great variety of objective and subjective factors that influence students' advancement in graphic subjects. One of the factors is insufficient students' motiva

tion and superficial knowledge about the speciality at Kaunas University of Technology (KUT) [3]. Students' attitude towards technology from the social point of view is considered to be insufficient. Some researchers [4] point to the irrelevant preparation for graphic studies in a secondary school. The attendance is another important factor that influences student's advancement. The students who cancelled their studies tend to miss the lectures and practical seminars of engineering graphics [5].

The general problems of adaptation are being analyzed as well, because engineering graphics is taught for the first year students who usually lack the skills of self-directed work, making notes or using the sources of literature.

Superficial ideas about profession are not fulfilled that time. There is why we started development of professional interests of students during the first term and selected graphical subjects such as engineering graphics (descriptive geometry and technical drawing) and computer graphics. The process starts by studying of graphical subjects exist as a main part of few special disciplines and it is used for generating of items and diploma projects. All knowledge and skills, developed in studying of graphical subjects are absolutely necessary in future teaching and engineering practice.

Let us analyze the influence of graphical subjects on the profession mastering of future engineers. There are some theoretical reasons.

In such a case the advancement problems in graphic subjects are of great importance, especially bearing in mind that, on the one hand, there is a tendency to decrease the amount of engineering graphics classroom activities, while, on the other hand, the rapid development of computer technologies and automatic project systems demands for the high competence specialists.

Studying of graphical subjects develops volumetric thinking and habits of true logical thinking. Developing ability of students recreate the body of three flat projections, graphical subjects prepare future engineers prepare for studying of special subjects and for technical creativity – making of projects, development of professional interests.

So, the following research question has been set: is it possible to solve the advancement problems in graphic subjects while matching the above mentioned requirements and striving for a new learning paradigm?

The student candidates put a strong emphasis on “the significance of higher education diploma” as well as “striving for higher education”. The factor of “aspiration for career” is also highly evaluated. But they are not acquainted enough with their future professional activity and requirements for the contemporary specialists. Such a subject competence should be developed in a secondary school. That is why one of the main factors influencing the first year students' advancement in engineering graphics is their preparation in a secondary school.

Engineering graphics, when compare it with other common science subjects, is in worse situation in our country, because pupils are learning physics, chemistry, mathematics in secondary schools of Lithuania and drawing is quite forgotten at this moment, only in some schools drawing is a selective branch of science.

It is possible to judge about preparation for studies of graphics branches of science from the average number of school-leaving certificate. In this way, having data about preparation of students in secondary schools, it is possible to forecast of assimilation of graphics branches of science already at the beginning of the 1<sup>st</sup> term.

Change of average number of school-leaving certificate and results of engineering studies in period of 5 years is represented in table 1.

Table 1

	Faculty	Year				
		7/98	8/99	9/00	0/01	1/02
Average of school-leaving diploma	M		8	8	8,	8
	E	,27	,40	,49	53	,56
	DT	,84	,91	,72	63	,59
	M		6	6	6,	6
Evaluation of examination	E	,35	,95	,63	08	,05
	DT	,50	,77	,47	08	,83
Students who had their exam in time (%)	M		7	7	6	5
	E	9,1	9,8	2,3	1,3	9,2
	DT	0,8	5,4	1,0	8,7	6,1
	M		2	2	3	3
Students who have dropped out (%)	E	2,7	0,9	7,8	7,0	8,7
	DT	3,5	2,1	3,5	5,3	6,4

Presented data show, that though average number of students entering Mechanical (ME) and Design and Technology (DT) faculties reduced a little bit. Academic record of students, while studying engineering graphics, has a tendency to decrease.

So, a close relationship exists between the preparation in the secondary school and students' advancement results in engineering graphics. This meets the hypothesis set at the beginning. Aiming to define the relationship between the arithmetical mean of school leaving diploma and students' advancement in engineering graphics, the correlation coefficients ( $r$ ), their significance level and regressive equation were established. In all cases the determinant coefficient  $r^2 > 0,25$  confirms the suitability of regressive model. It means that knowledge obtained in a secondary school is one of the main factors determining the success of engineering graphics studies.

The number of dropped out students' increases. Besides, it must be stated that 62% of them attended lectures and practical occupations bad: that is they missed more than 50% of practical occupations. That shows, that first-year students have not only poor knowledge from secondary school but that they lack habits of independent work, they adapt themselves with difficulty the new conditions of work. Obviously holders of school-leaving certificate are not acquainted sufficiently with the elements of future specialty and specific feature of learning at higher school.

The increasing number of drop-outs is also a very important problem. The number of such students has grown tremendously of late schooling years. 22% of all drop-outs have their school leaving diploma evaluated over 9 grades. The biggest part (48%) of drop-outs is those students whose diploma grade is between 8 and 9. However, the distribution of student candidates' diploma grades shows that 21% and 32% accordingly fall on these students groups. This relatively indicates that students with diploma grade under 8 tend to rupture their studies.

The results of the research that focuses on a student as an individual reveal that his/her advancement is being influenced by the level of spatial and logical reasoning, adaptation processes and other subjective factors. All they, nevertheless, do not reject a hypothesis that considers the preparation in a school to be the essential factor. Knowing the level of student's readiness, a teacher should pay more attention to the development of spatial imagination, encourage submitting all the tasks in time. In this case it is highly recommended to give the tasks that are less time consuming, but developing a spatial perception. Recently with the growing numbers of students who have no state financing, the missed lectures number has been increasing. The analysis of practical activities of the late years revealed that students missed 16% of activities on the average, and 41,9% of students were dropouts. The meaning of correlation coefficient of exam evaluation and missed activities  $r=0,397-+0,066$  is not very high; the determinant coefficient is  $r^2 > 0,25$ , so rectilinear regressive model is questionable. The hypothesis that attendance influences the results of engineering graphics is confirmed, because Student criterion  $t=-0,073$  and  $p=0,529 > 2\alpha$ , when significance  $\alpha=0,05$ . Surely, the research on the attendance factor with influences students' advancement should be continued and the reasons of non-attendance should be considered with the focus on students' argumentation of their non-attendance.

The analysis of the students' advancement in the second session revealed that the exam results of computer drawing are better than in other general technical disciplines (the mean equals 5,48 points). Most probably, it is related to students enjoyment to work with a computer and to the fact that computer drawing is more application rather than theoretical discipline. This conclusion allows assuming that the reasons of students' non-attendance could be found in teacher activity when the subjects mentioned above are being taught in the context of traditional teaching paradigm.

The students do not perceive the practical usefulness of knowledge obtained and its application to the solution of real activity problems is not emphasized. A teacher is highly recommended to carry out self-analysis of his/her teaching activity by employing reflection skills and shearing his/her ways to seeing with the colleagues and students.

## Conclusion

The five years period results indicate that the diploma mean of student candidates has been constantly decreasing. The most probable influence in that case is made by ongoing school reform, redesigned curriculum and examination procedures as well as orientation towards traditional teaching paradigm.

The students' advancement is being influenced by the following problems of study process: adaptation problems, inability to study in consistency during the whole term, the lack of independent study skills, insufficient preparation at a secondary school with a special focus on student's subject competence enabling to study specific modules in a university.

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