STUDENTS ALLOCATION FOR PRACTICUM

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Abstract. The goal of this paper is to propose criteria for students' assessment for allocation of students for the practicum at the cooperating companies. Analysis of the up to now used way of allocation has shown that simple arrangement of students according their results during the educational process gives not satisfying final classification. To perform more precise way of classifying students in competition for a definite company the specific activities of the company should be taken into consideration. An experiment for allocation taking into consideration the students wishes and their results in disciplines that are connected to the activities of the company has been satisfying. The connection between each company and the studied disciplines has been proposed to be measured in two levels. The experiment has been successful. Additionally the influence of the students' performance at a practicum in a company from the abilities for group work and communication has been tested. The conclusion has been made that the performance of a group of students at the practicum has been influenced also by the presence of students with abilities to communicate and perform group work.

1. Introduction

For the completion of students' education it has been foreseen a practicum in different companies where each student would have the possibility to perform tasks and doing this obtain some additional knowledge and skills or apply the already assumed. Allocation of students for practicum is very important from the Problem based learning [1] point of view and strongly connected with the learning process management. Each year conclusions of agreement with different suitable companies willing to cooperate with educational institutions takes place. After that the students are allocated to these companies in groups for their practicum. At the end of the practicum each student receives a profile from the company where he has completed his practicum and from the other side each student fulfils questionnaire about the job done, the obtained new knowledge and skills etc.

The companies that cooperate with educational institutions have to be closely connected to the specialty that the students are going to obtain. Nevertheless the specific assignments for the students are different according to the company. That is why each company needs a number of students with specific thorough knowledge and skills able to perform an appropriate number of tasks and ready to extend their abilities in the field.

From the other side the students have different level of knowledge and skills compared to the wishes of the companies for the practicum. The simplest way in which the allocation of students to the companies is when each company has to pick up a number of the students for the corresponding assignment [2, 4, 5] taking into consideration the wish and the level of knowledge and skills of each student. This approach however is labor-intensive from one side and from other side there is risk that some students will remain outside of the process. Also the problem exists that the companies do not have the time to evaluate the abilities of all students. So this could be done only for a limited number of students and from a limited number of companies.

Another circumstance that should be considered is the students' desire to complete their practicum in a definite company. This is important because it is a strong motive for the performance of the students during the practicum.

In [6] a method of approach has been described in which the student's desire as well as his achievements in the appropriate disciplines connected to the announced theme is taken into consideration. This method concerns the allocation of competitive works, such as course works, project works, graduation works etc. It has been working very well but the announced topics have to be allocated individually – for every topic only one student should be allocated.

The problem is that for the practicum allocation not only one student should be allocated but a number of students desired from the definite company.

The process of forming groups of students for a company turned to be very important. In actual fact the level of collaboration of the students in a group proved to influence the performance and therefore the assessment of members of the group and their work.

2. Strategy for Students Allocation for Practicum

The process of allocating students for practicum in general includes:

- Submission of applications from the students for practicum in different companies. If more than one company is preferred they should be ordered by the individual wish (first wish, second wish etc).
- Allocation of students to companies according the pointed number of students for each company.
- Preparation of schedule for practicum.
- Gathering of profiles from the companies for the students' performance and the fulfilled questionnaire from the students.
- Generating of final papers for reporting the practicum.

The allocation of students for practicum could be performed conducting some activities ahead. The proposed strategy is as follows:

- Creating list with expected knowledge and skills for each company (if not available should be prepared). This action turns to be labor intensive at the beginning and it is highly recommended to be fulfilled including representatives from the corresponding company. Once prepared the list remains for further usage. Because of the rare changes in expected from the companies list of derived knowledge and skills it would turn to be rare to change the list and also it would be rare to add or remove a company and prepare a new list.
- Announcement of companies willing to take students for practicum. For each company should be created a list with the expected knowledge and skills (not always available) obtained by the students.
- Getting a list of studied disciplines on correspondence with the expected knowledge and skills (Figure 1). To each company according the prepared list has to be created a separate list of disciplines that reflect the expected grade of skills.
- Most of the listed from the companies expected knowledge and skills concern several disciplines and the connection could be presented at two levels – strong and weak. An example of preparation of such form of correspondence is to be prepared as:

> Discipline$_{N-1}$ – strong
> Discipline $_N$ – weak
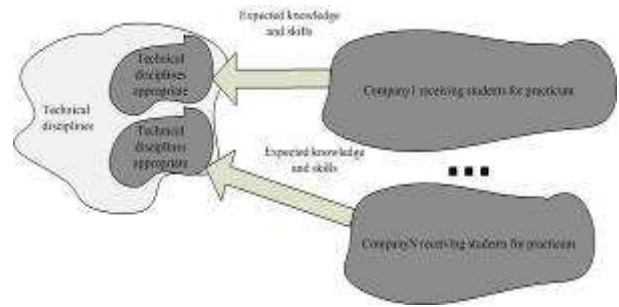> Discipline$_{N+1}$ – - (no)

Figure 1. Correspondence of the sets of studied technical disciplines and companies

- The students submit their applications [4] and the allocation of students to the companies has to be done on base of student's wish and his past performance during the education taking into consideration the related to each company subjects.
- The calculation of final result for each student according to his wish or wishes takes place after the announcement of companies' list for the practicum and gathering the applications from the students [3].
- The calculation of this final result should be performed on base of the received during the educational process marks corresponding to the listed required knowledge and skills. In this way for the definite company will be produced a number of students which would be in competition for the announced number of practicum's places.
- Allocation of student for practicum to companies according student's wish, calculated educational appropriate result and the number of practicing students for the company.

3. Calculation of final results for practicum allocation

The calculation of final results of the students for the practicum in a definite company has to be done on the base of disciplines connected to the stated from the company requirements for knowledge and skills. For the purpose they have been presented in an appropriate table as shown in table 1.

The equation that has been used for the calculations is:

$$\text{Result} = \frac{\sum\limits_{i=1}^{n} M_i}{i} \cdot T_1 + \frac{\sum\limits_{j=1}^{m} M_j}{j} \cdot T_2 \qquad (1)$$

where

n - is the number of the technical disciplines which cover the field of expected from the company knowledge and skills with defined strong level of connection;

m - is the number of the technical disciplines which cover the field of expected from the company knowledge and skills with defined weak level of connection;

$n + m \leq$ number of all studied technical disciplines;

M_i - is the mark of the define student for the definite discipline;

T_1 - is the weight of the disciplines which cover the field of expected from the company knowledge and skills with defined strong level of connection;

T_2 - is the weight of the disciplines which cover the field of expected from the company knowledge and skills with defined weak level of connection.

Table 1. Form for correspondence between studied disciplines and companies

	Company1	Company2	...
Discipline1	strong	weak	
Discipline2	strong	-	
Discipline3	strong	weak	
Discipline4	-	strong	
Discipline5	weak	strong	
...	-	*weak*	

In this equation all the disciplines that are connected to the desired from the definite company knowledge and skills are taken into consideration. By that the strength of this connection is presented by the so called weight of the discipline. The disciplines with strong connection correspond to the weight T_1 and those with weak connection to T_2.

The values for T_1 and T_2 that have been experimented are shown in table 2.

Table 2. T_1 and T_2 experimental values

T_1	1.0	1.0	1.0
T_2	0.3	0.5	0.7

The experimental calculations of the results for 108 students have shown that using the value 1 for T_1 weight and value 0.5 for T_2 have been satisfying for the allocation purposes.

The process of forming groups of students that would work like teams for a company has shown that the simple calculations of final result are not enough.

4. Forming groups for practicum allocation

For forming groups for practicum at the different companies the following criteria should be used:

- calculated final result (as described above);
- communication abilities and abilities to work in group;
- preference for the definite company.

During the educational process there are number of projects where for each student his ability to work in group could be evaluated. This evaluation is important because the students that would be allocated to a definite company would have to work together. On a regular basis they do not receive individual tasks in the company. Usually in every company all of the students conducting their practicum receive one problem to be solved. In this way the students have to work like a team from this point of view.

In this team should be present some students with strong developed ability to work in group, to cooperate and even be leaders of the others. If the composed group of students has no such members even if the students' results are very high their work had turned to be not consistent and therefore not so useful for the company from one side and from another side not useful for the students themselves.

An experiment has been conducted for two years with 108 students for the first year and respectively 102 students for the second year and 17 companies for the first and second year. On the base of the created list of correspondence between companies and disciplines the final results for the students have been calculated.

Compared to the results from two previous years when the allocation had been realized only on the base of students' preference for companies and the calculated marks for all technical disciplines the gathered profiles from the companies for the students' performance have shown sensibly better results.

The second criteria – communication abilities and abilities to work in group, has been not evaluated as the other disciplines but only reported as 'yes' and 'no'. This criterion has been only observed during the experiment. It has not been used for the purposes of allocation up to now.

The gathered applications from the students have stated the preferences for practicum at a definite company in an ordered list.

The allocation has been realized [6]

according the preference of the student and the appropriate calculated result. The result of this activity – groups of students for each company has been analyzed according to the relation of students with communication abilities and abilities to work in group e.g. with 'yes' for the second criteria and the evaluation of the students work from the companies.

The highest evaluation from the companies' side has been made for groups of practicing students where for every group or subgroup of 3 students at least one has high communication abilities and abilities for group work – 56 for the first year and 55 for the second. Groups with more then one to three such students have excellent performance – 28 for the first year and 27 for the second.

The groups with no member showing communication abilities and abilities for group work have shown poor results in their practicum work – 24 for the first year and respectively 20 for the second.

These have confirmed that the ability to work in group and the ability of communication has also to be a criterion in the allocation problem.

5. Conclusions

The development and implementation of a system with the proposed criteria for students' assessment according the activities of each company would allow saving a lot of time for allocation of students for the practicum at the cooperating companies. The experiment has been made with 108 students for the first year and respectively 102 students for the second year and 17 companies for the first and second year. The allocation steps have to be predefined and précised.

The already used systems possess all data needed for the calculations and also for preparation and print out of all required documents and protocols for the practicum marks.

The calculation of the Result might be used for several other purposes where competition of students takes place. Also the idea of implementing the evaluation of the communication abilities and abilities to work in group of the students would raise the performance of the students during the practicum.

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