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Research paper

The Data of the Initial Motivation – a Valuable Source for the Development of the Course Content. A Case Study in the Group of Business Students

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Abstract

This study continues the authors' previous search for key factors to determine the stickiness of different kinds of knowledge. In the authors' opinion, identifying the stickiness of every type of knowledge in the e-course it is possible to create the optimal distribution of the intensity of time and study materials, paying more attention to the more complex knowledge, while promoting the acquisition of the free flow of knowledge with some tasks aimed at collaboration between students. Also, our previous study showed that individual motivation plays an important role in students' success. That is why the scope of this study embraces the link of students' personal characteristics with their behavior and achievements in a learning environment. In this study, we are looking for key features for the future development of a more advanced learning system. Our scope of this study embraces the aspects of student's initial motivation – how to ascertain, define and then use it for the development of the further learning content. Students were divided into three groups, according to their plans for engagement in business projects. The study was conducted in the course, that's organized according to the blended learning delivery approach. Part of this course takes place in a classroom, while the other part is embedded in an electronic environment on an Open edX platform-based E-Learning environment.

Keywords: *collaborative learning; e-Learning; knowledge stickiness; knowledge flow; student motivation*

1. Introduction

This study continues the authors' previous search for key factors to determine the stickiness of different kinds of knowledge. In our previous study [1], we discovered that there was a variety of stickiness knowledge within the same e-course. The stickiness of knowledge describes the ease or difficulty of transferring knowledge, considering that sticky information is difficult to transfer [2]. The stickiness of knowledge affects the time and effort a student must spend on acquiring the necessary skills.

In the authors' opinion, through identifying stickiness of every knowledge set in the e-course it is possible to create the optimal distribution of the intensity of the course time and content. It helps to pay more attention to the more complex knowledge, while promoting the acquisition of the free flow of knowledge with some tasks aimed at collaboration between the students.

Also, our previous study [1] showed that individual motivation plays an important role in students' success. That is why the scope of this study embraces the link of students' personal characteristics with different skills. In this study, we searched for and identification of the features that would be used as the basis for developing a more advanced learning system. Referring to our previous study [1], in which we provide evidence that motivation is crucial to the success of students' learning, in this study, we looked specifically at this feature.

Our scope of this study concerns the aspects of students' initial motivation – how to ascertain, define and then use it for the development of the further learning content.

In our view, the knowledge about aspects of students' initial motivation, could be useful both to develop the course content and to plan motivation activities during the study process.

In the framework of this study, we were looking for answers to the following questions:

- Do initially motivated students learn better?
- Does an initially motivated student want to learn more?
- Are initially motivated students ready to study longer?
- Is the student able to evaluate the complexity of different kinds of knowledge?
- How to identify and evaluate students' initial motivation?

The objective of the study is to investigate the possibilities of students' self-assessment and other data provided and generated to use in the development of the content of the study course, creating an intelligent e-Learning system.

2. Methodology

The study was conducted in the course "Basic Business", organized according to the principles of blended learning. Part of this course takes place in the classroom, while the other part is

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embedded in an electronic environment on an Open edX platform-based E-Learning environment.

The course was designed to develop seven business competencies - actuality, technology, marketing, competition, finances, risks and the ability to implement a business idea. To find out the initial motivation of students who are enrolled in this course, we gave them the opportunity to complete questionnaires when they started this course. This questionnaire covered various questions, relevant to the field of study and the answers to them were used to achieve the objectives of the study.

The first part of the questionnaire contained a question that was aimed at determining the students' initial motivation - whether and to what extent the students were planning to engage in business. In answering this question, the students had to indicate whether their plans were related to the creation of his business, his participation in another business project, or his plans were not related to participation in business projects. The answers provided served as a benchmark for students' motivation to acquire knowledge.

Students were divided into three groups, according to their plans for engagement in business projects. The total number of students surveyed was 63. Of these students, a clear view of their future intentions was expressed by 61, two students did not provide an answer to this question. As the number of students who did not give a clear answer about their future intentions is statistically inconclusive, a decision was taken not to further evaluate their responses.

As a result, three groups consisting of an equal number of students were acquired with different motivations – to apply or not to apply the knowledge gained during this course (to form their own business, engage in another business project, not to engage in business) Fig. 1.

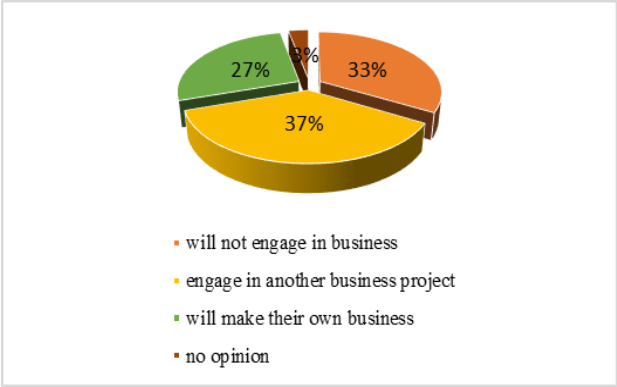


Fig. 1: Distribution of students according to their motivation.

To find the answer to the question to what extent initially motivated students learn better, we compared students' success in a test according to the predefined motivation groups. The test was organized after students had acquired the necessary acquiring skills on the topic studied. It covered all skills in the curriculum and its results were summarized according to a point system. The maximum number of points was 100.

To analyse the success of the students, we calculated the average points obtained by the groups in the test. We also evaluated the standard deviation of the test results, to determine how smooth and predictable the students' performance was.

A separate questionnaire section covered questions about the time it takes to learn a specific skill. Responses had to be given within relative time units - hours, days, months, years. The time required for acquiring knowledge in the questionnaire was also differentiated according to different levels of knowledge, by asking students to indicate their estimation about the time it takes to acquire knowledge at the level they need for themselves, at the level required to fulfill the requirements of this study course, as well as at the level required for real business activities.

Students responded by evaluating each skill separately. The following relative time unit score scale was used to assess student responses:

- hours - 1 point
- days - 2 points
- months - 3 points
- years - 4 points

Based on the assessment data we obtained, we analyzed the average time students indicated as necessary for acquiring specific skills. The purpose of this analysis was to answer the questions "Is a motivated student ready to study longer?" and "Is a motivated student ready to learn more?"

The authors measured Pearson's correlation coefficient to find out if there is a correlation between the assessment of the actual progress made by students in the past [1] and the opinion of students obtained in this study in the context of knowledge-stickiness. The correlation coefficient assumed the value ranging between -1 and +1 and the correlation close to 0 indicated no linear relationship. The correlation coefficients and the correlative degree values are shown in Table 1.

Table 1: Correlation Coefficients and the Correlative Degree [3]

Correlation Coefficients	Correlative Degree
0.8-1.0	strongest
0.6-0.8	strong
0.4-0.6	moderate
0.2-0.4	weak
0.0-0.2	weaker or none

In the framework of the study, we also conducted an analysis of students' actual performance. In our analysis, we considered the progress made by the students in their homework and test carried out. All these tasks included questions about all seven skills to be acquired within the course.

The results were compiled for two home works and one test. The evaluation of these tasks was done according to a 100-point scale, so that a student could get a maximum of 300 points.

The success of the students' studies and the points they had earned were evaluated in the context of the view expressed by them about applying their knowledge in practice to their future plans. The results were also evaluated in the context of the students' view of the time needed for learning different kinds of knowledge at different levels – the time it takes to acquire knowledge at the level they need for themselves, at the level required to fulfil the requirements of this this study course, as well as at the level required for real business activities.

The purpose of the analysis was to find out the optimal way of determining the level of students' initial motivation and the factors influencing it.

As one of the aspects analysed was also the extent to which an e-learning system developer can rely on the information provided by the students and in which situations it would be better to use student-generated data or the combination of both.

3. Results

3.1. Do initially motivated students learn better?

To understand the students' performance and the impact of their motivation on the performance level, we conducted an analysis of the test results. This assessment considered predetermined groups of students, according to their information about their future intention for practical business activities – an indication whether

their plans were related to the creation of their business, their participation in another business project, or their plans were not related to participation in business projects.

After analyzing students' achievement by their test results, we found that the average result in the group of motivated students was significantly higher than in the other two groups. In this assessment, the second-best rating was in the non-motivated group of students. The results obtained are shown in Fig. 2.

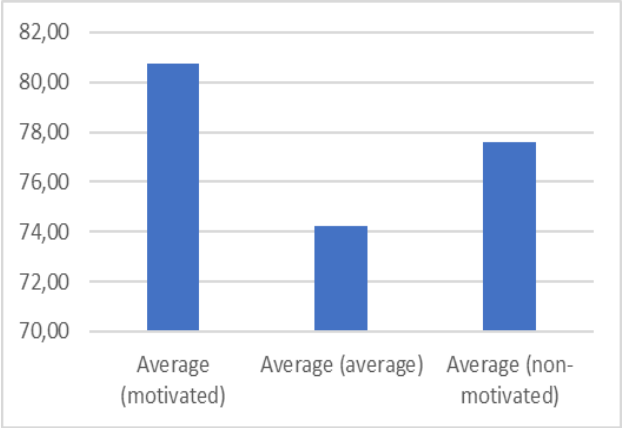


Fig. 2: Average points obtained for the test in different student groups

Evaluating the range of the results achieved and calculating their standard deviation, we discovered that the group of motivated students had also the most compact results. In our opinion, it is important to note that in this aspect the next best group was the group of non-motivated students. The results obtained are shown in Fig. 3.

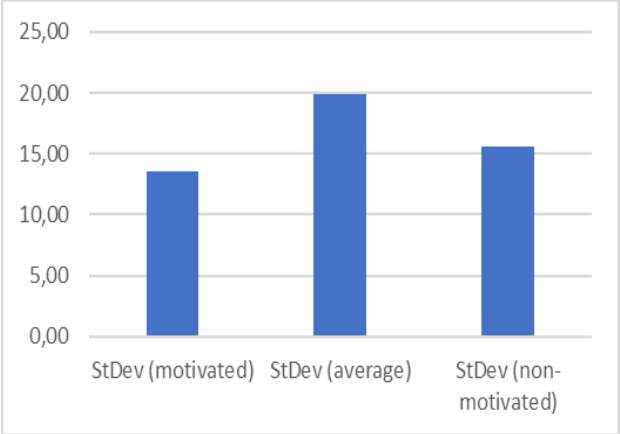


Fig. 3: Density of results in the test in different student groups

We conducted a more detailed analysis to understand the distribution of excellent results between different student groups. The results obtained were encouraging – it turned out that despite the average figures, the greatest success was achieved in the non-motivated group of students (Fig. 4).

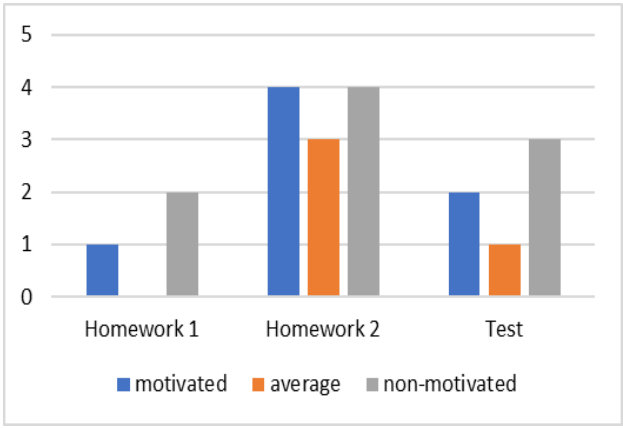


Fig. 4: The amount of students who have obtained a maximum score in their tasks (according to student groups)

This makes it necessary to consider whether the commonly asked question "Are you planning to apply the knowledge of the course in practice?" is useful and provides a true picture of the students' motivation.

For us it seems to be related with the findings of the previous chapter that even a group of motivated students is not ready to learn long enough for them to successfully apply the acquired knowledge in practice.

The results of our study show that the students' motivation aspects are complex. Motivation does not come only as consciousness - "I need it in the future" or "I plan to use the acquired knowledge practically". Therefore, the answers to these questions cannot be used as the only substantiation for the initial motivation of a group of students or for adapting the learning content to students' needs.

In our view, to determine student motivation, it is primarily necessary to evaluate the student-generated data in an e-Learning environment rather than the information presented by the students in different questionnaires.

3.2. Students' ability to evaluate the complexity of different kinds of knowledge

Students' ability to assess the complexity of their knowledge has been assessed in advance in an earlier study that was done on the same course. During this study, students had to evaluate their knowledge of each specific skill. In the study, it was found that at the beginning of the study course, students evaluate themselves in a very broad range, which is rapidly decreasing after the start of the study. The authors of the study explained this by the fact that shortly after the start of the studies, students adjust their opinion according to the actual requirements of the course. The researchers concluded that there were three different groups of students - those who do not appreciate themselves, those who overestimate their abilities and those who are aware of their genuine knowledge [4].

In our study, we also observed that students' estimation of the time needed to acquire knowledge had a very wide range. For example, non-motivated students' estimation, of how much time they would need to acquire the skills needed to complete the course is reflected in Fig. 5:

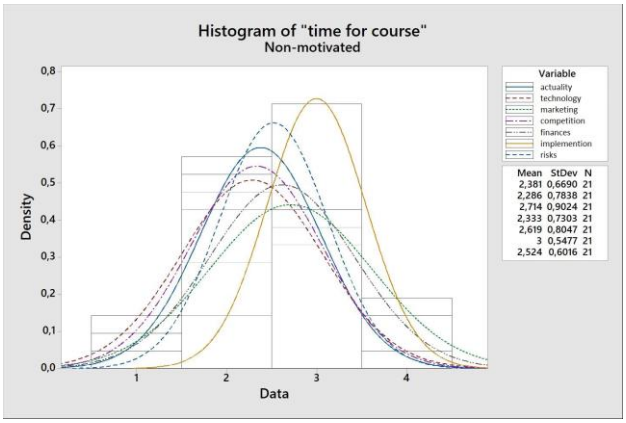


Fig. 5: Distribution of non-motivated students' answers: the time needed for acquiring skills to complete the course.

A similar trend has been also observed in other student groups and in other rating categories (time needed by yourself, the time it takes for a successful business). A summary of these results can be found in the Table 2.

Table 2: Student Response Analysis - Standard Deviation

Skill (for themselves)	Students (non-motivated)	Students (average motivation)	Students (motivated)	All
Actuality	0.9437	0.7057	0.7719	0.8047
Technology	0.9636	0.9472	0.7274	0.8914
Marketing	0.7303	0.5108	0.7524	0.6515
Competition	0.8309	0.7223	0.6172	0.7425
Finances	0.9437	0.7141	0.9393	0.8732
Ability to implement a business idea	0.8367	0.491	0.5737	0.6893
Risks	0.6016	0.7674	0.8921	0.7771
Skill (for the course)	**Students (non-motivated)**	**Students (average motivation)**	**Students (motivated)**	**All**
Actuality	0.669	0.6713	0.6642	0.677
Technology	0.7838	0.8435	0.6191	0.7629
Marketing	0.9024	0.6564	0.7188	0.7966
Competition	0.7303	0.6564	0.8944	0.7346
Finances	0.8047	0.6624	0.6292	0.7179
Ability to implement a business idea	0.5477	0.6381	0.5737	0.5717
Risks	0.6016	0.6683	0.6191	0.6798
Skill (for successful business)	**Students (non-motivated)**	**Students (average motivation)**	**Students (motivated)**	**All**
Actuality	0.8309	0.8245	0.7719	0.8091
Technology	0.8309	0.8779	0.8269	0.8314
Marketing	0.7003	0.7332	0.6831	0.7432
Competition	0.9207	0.7332	0.8489	0.8418
Finances	0.727	0.7777	0.8539	0.8072
Ability to implement a business idea	0.5606	0.583	0.4697	0.5388
Risks	0.8646	0.7141	0.9663	0.8397

Thus, the results of our research confirm that the evaluation given directly by students of their skills and the time required for their development without further processing is not applicable to the development of the selection algorithm of the learning material.

At the same time, during the study, several aspects were identified in student self-assessment results that could be useful for developing such an algorithm. In our previous study [1], we found that there was a different level of knowledge stickiness for every evaluated skill. Some knowledge and skills in the student group flow faster than others. These differences were found by analyzing the mean value and the standard deviation of the progress achieved by the student for each of the skills.

In this study, we noticed significant differences in the results of the time planned for learning different skills for students of different groups. We decided to perform the correlation between the mean and standard deviation values obtained during the previous study [1] and the mean and standard deviation values of this study in relation to the time students consider necessary to reach a specific level of knowledge.

Such a decision was taken because in both situations standard deviations and mean values characterize the stickiness of knowledge. In one case, these values were determined on the basis of the actual assessment of students' performance, while in the second situation, it was determined on the basis of students' ratings. However, in both cases, one set of seven business skills was considered.

To make this assessment, the Pearson correlation was calculated on the basis of the difference in students' progression obtained from the previous study on each skill and the students' assessment of the time required to acquire knowledge. We compared the mean and standard deviation values for each of the skills.

Analyzing the results, we considered that the achieved progress values calculated for different groups of students were more important than the values of the time students consider necessary to reach a specific level of knowledge. Nevertheless, we found a significant correlation between these indicators for the non-motivated group of students, and the correlation was observed in both – the results that reflected the time needed for the acquisition of knowledge at the level necessary for the students and the results, that reflected the time required to complete the study course requirements.

For the mean value, this correlation was also observed in terms of the time it takes to acquire knowledge at a successful level of business realization, but in this situation no correlation with the standard deviation values was found – this correlation was found in the group of average motivated students. A summary of these results can be found in the Table 3.

Table 3: Correlation Analysis – Knowlegde Stickiness

Learning goal	Motivation	Correlation (Mean)	p-value (Mean)	Correlation (StDev)	p-value (StDev)
For themselves	Motivated	0.235	0.613	-0.122	0.794
	Average motivation	0.184	0.693	0.166	0.722
	Non-motivated	0.566	0.185	0.809	0.027
	All	0.364	0.423	0.300	0.513
To complete study course	Motivated	0.304	0.507	0.318	0.487
	Average motivation	0.175	0.707	0.345	0.449
	Non-motivated	0.479	0.277	0.671	0.099
	All	0.371	0.412	0.518	0.234
To run successful business start-up	Motivated	0.351	0.440	0.077	0.870
	Average motivation	0.267	0.563	0.610	0.146
	Non-motivated	0.477	0.279	-0.086	0.854
	All	0.430	0.335	0.214	0.644

In our view, these results still require further evaluation, but we can maintain that to some extent there is proof of the robustness of knowledge stickiness. Perhaps after a more extended research, this

relationship could serve as the basis for the development of a useful e-learning system algorithm. However, in the context of other conclusions drawn from this study, it is necessary to specify the mechanisms for determining the motivation of the students and the respective distribution among the groups beforehand.

3.3. The effect of initial motivation on the planned amount of learning

Analyzing the average indicators for the time that various student groups have indicated as necessary for the acquisition of different skills, taking into account their motivation, we did not find any significant differences in the estimated learning time. We noted a remarkable feature that highly motivated students who would like to start their own business by initiating a relevant training course were not motivated to learn so long as they deemed necessary to successfully manage their business Fig. 6.

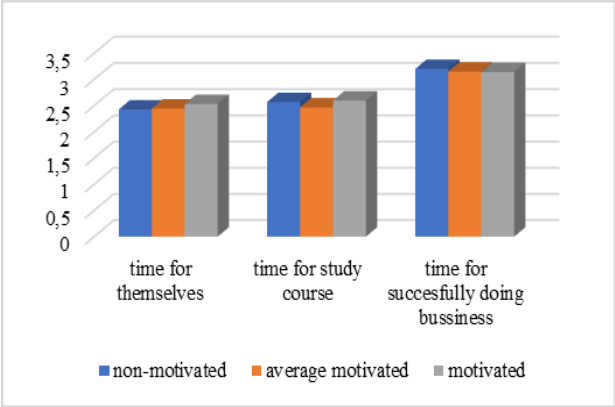


Fig. 6: Students' initially expected time for studies

By making a more detailed analysis and looking at the answers given about specific skills, we found that there were some aspects that were worthy of in-depth research.

We were looking for those students who were ready to learn as long as they think it was necessary for successful business start-ups. It was important for us to understand if there were any such students and which groups.

We identified those students who indicated the same scheduled learning time for "myself" and for "successful business" for one or more skills in the survey. As a result, we found out that there were few students who were ready to learn all the necessary skills on the level they admitted as necessary to run successful business. Also, assessing the achievements of these students in the learning process, we can say that they are excellent.

At the same time, it should be noted that there are also differences in opinion among students in this section as to how long it takes to acquire specific skills. Though students are ready to learn as long as they think it is necessary, this time is not definitely longer if compared to the average. Similarly, the time scheduled for learning is different for different skills, also the level of interest in these skills is different (Fig. 7.).

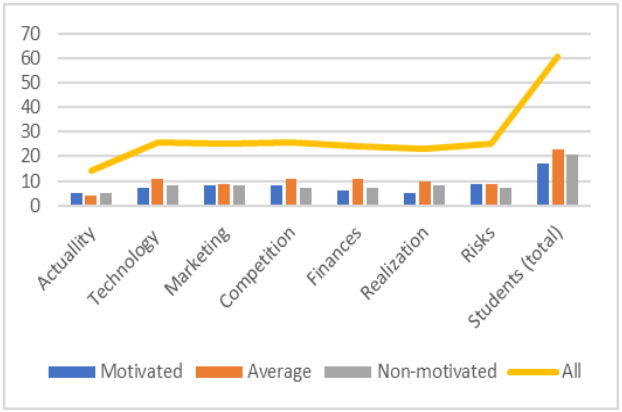


Fig. 7: Students' who indicated the same scheduled learning time for "myself" and for "successful business" interest in different skills

It is noteworthy that there is no student who has indicated that he/she is planning to start his/her own business among those who have indicated the same learning time "for myself" and for "successful business start-ups". One of those students has indicated that he has no intention of engaging in the business, while two others maintain that they consider the opportunity to engage in another person's business project.

In general, for a considerable interest in the skills to be acquired, we adopted a situation where a student indicated the same learning time "for myself" and for "successful business start-ups" for at least 5 out of 7 skills. This student group includes 14 students, representing 23 of the student population (Group 1). According to the information they provided above in the questionnaires at the beginning of the course, six of them plan to start their business in the future, three students plan to engage in another person's business project, and five students do not plan to engage in business at all (Fig. 8).

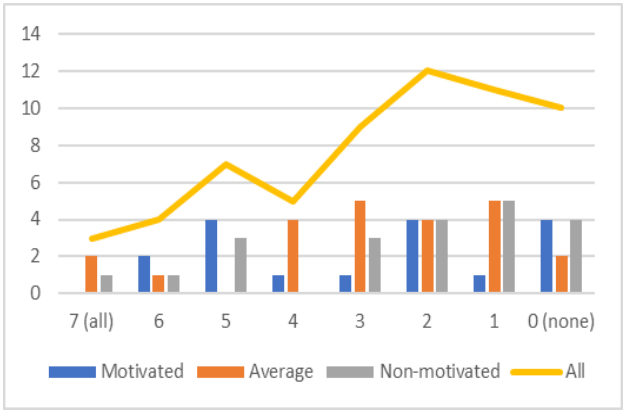


Fig. 8: Overview of the number of skills for which students indicated the same scheduled learning time for "myself" and for "successful business"

At the same time, we found out that 14% of students did not indicate the same learning time "for myself" and for "successful business start-ups" for any of the skills (Group 2). This group of students consists of 10 students, among them, according to the information they provided above in the questionnaires at the beginning of the course, four of them plan to start their business in the future, two students plan to engage in another person's business project, and four students who do not plan to engage in business at all.

We decided to compare the performance of both groups in two aspects - the average grade and the ratio of completed / skipped tasks. To measure these results, we considered the assessment of two home works and a test. In both groups we found that there were students who had not completed all three tasks (Fig. 9.).

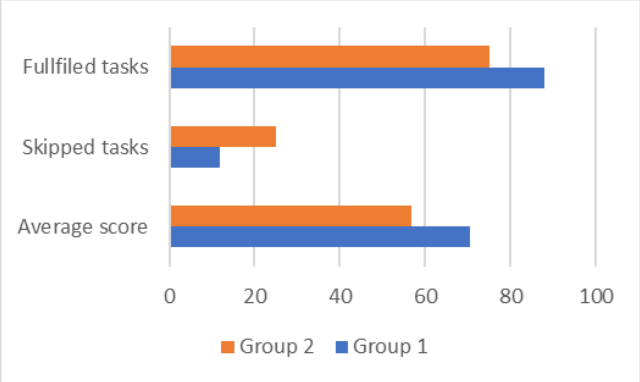


Fig. 9: Overview of student response rate and grades

At the same time, there were significant differences between those two groups. Group 1 students showed a better average score compared to group 2, and in Group 1, the percentage of students who did not fulfill one or two of the tasks was significantly lower than in Group 2.

It makes us to consider, that it could be the way to get a more realistic picture of students' initial motivation. In our view for planning the curriculum it is important to find out, who of the students are ready to learn at present and in what amount. The information about their future intentions from this aspect is secondary and cannot be applied directly.

4. Conclusions

We found out that there were motivated and non-motivated students in the course, and their level of motivation impacts their study success. We also found out that to determine the students' initial motivation, there are several aspects that should be considered.

The results of our research confirm that the evaluation given directly by students of their skills and the time required for their development without further processing was not applicable to the development of the course content and to the learning material selection algorithm.

The results of our study show that students' initial motivation aspects are complex. Therefore, the answers in the questionnaires should be used as the only substantiation of the adaptation of the learning content to the students' needs. Also without additional data this information in not useful for grouping students according to their motivation.

In our view, to determine students' motivation, it is primarily necessary to evaluate student provided data in the context of student-generated data in an e-Learning environment rather than student presented information in different questionnaires.

It leads us to consider, that the way to get a more realistic picture of students' initial motivation is to analyze their willingness to learn. In our view, it is important for planning the curriculum to find out, who of the students are ready to learn at present and in what amount. The information about their future intentions from this aspect is secondary and cannot be applied directly.

In our view, the knowledge about aspects of initial student motivation, could be useful both to develop the course content and to plan motivation activities during the study process.

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