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COMPARISON OF EXAMINATION METHODS IN BACHELOR'S AND MASTER'S DEGREES OF STUDY DURING THE ONLINE FORM OF EDUCATION

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Abstract

The process of education is an integral part of the development of each student's personality. For this reason, it is also necessary to verify the knowledge acquired during the studies. The article deals with the examination in two material-oriented courses. One is taught at the Bachelor's degree and the other at the Master´s degree at the STU Faculty of Materials Science and Technology located in Trnava. The different approach to the examination results is evaluated, as both methods of testing produced comparable results.

Keywords

Education, Bachelor's study, Master´s study, examination, online teaching

INTRODUCTION

Education is an essential part of human development. In the past, only a few people were allowed to get education until the Empress Maria Theresia in 1868 introduced compulsory school attendance for children from 6 to 12 years of age [1, 2]. Since then, the education process has gone through various stages of development. Since 1922, compulsory eight-year school attendance was introduced in Czechoslovakia; after the end of the Second World War, up to nine years of primary school attendance [2, 3]. Education development took place also at higher levels, which also allowed the development of industry in various sectors, where qualified staff was also needed.

In 2020, studies went online unexpectedly quickly. Until then, various stereotypes were used for individual levels of study. This also applies to higher education, which had to adapt very quickly in teaching technically oriented courses, because this step was unexpected, and changes occurred in a very short time. The online mode requires the generally available

software as the main prerequisite. Since 2 000, the Slovak University of Technology (STU) Faculty of Materials Science and Technology located in Trnava has been utilising the Academic Information System (AIS) [4] which enables communication with students of individual courses in the online space. However, AIS is a not a fully sufficient tool for online form of education, although it does provide space for lecturing, designing test questions, and possibly also entering and collecting tasks.

With regard to online communication with students during the Covid pandemic, the STU Management recommended using other communication tools besides AIS, such as Google GSuite [5], Microsoft Teams [6] or Zoom [7]. In addition to lectures and exercises, the online space also provided the distance testing method. The article deals with the comparison of the applied methods of distance form of examination at the Bachelor's and Master's degrees with the results attained before the introduction of online examination.

EXAMINATION OF STUDENTS IN THE COURSE OF MATERIALS SCIENCE I

The "Materials Science I" (NoM I) course is taught in the Bachelor's degree of university studies is implemented in the 1st year of study, winter semester. The aim of the course is to introduce the students of the Faculty of Materials Science and Technology into materials composition, transformations in materials and alloys, testing the properties of materials and degradation processes, and applications of materials in technical practice. It is a complex and difficult course with a lot of information. For this reason, it is important to ensure a continuous monitoring of students' knowledge via available test questions from individual lectures and exercises in the AIS. The test questions are designed in various ways:

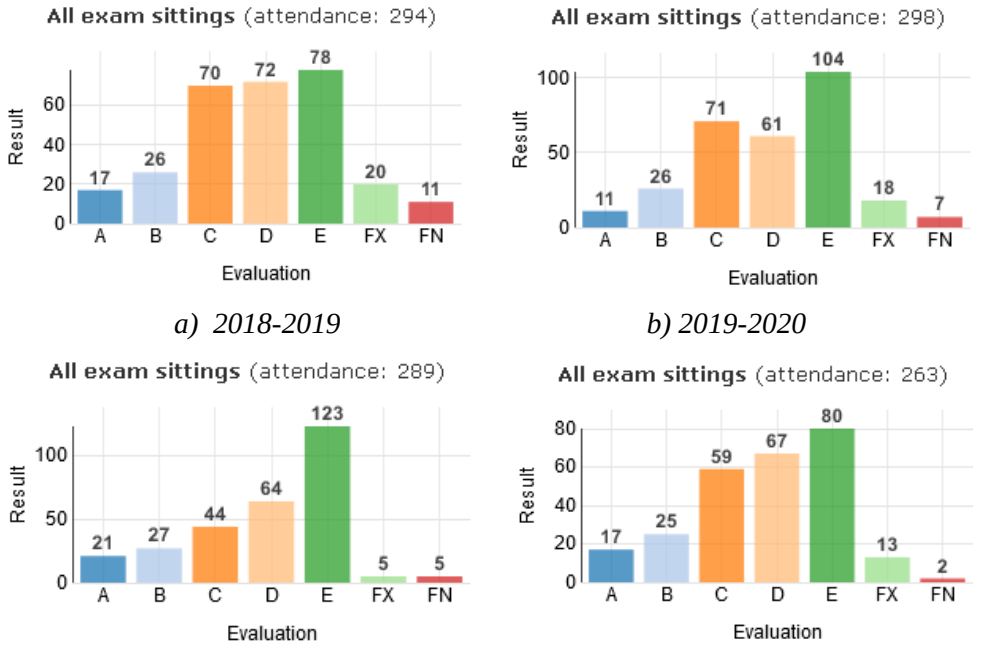
1. Multiple choice with only one answer correct,
2. Multiple choice with all answers correct, or all answers incorrect, or only some answers correct,
3. Yes-no questions,
4. Filling in the correct word, or choosing a word from the options provided,
5. Correct matching of answers,
6. Arranging the answers in the correct order, etc.

The answers are mixed up when generating each new test, i.e. the test comprises the same questions, but the answers are in different order (except yes-no and fill-in questions). Therefore, 1156 questions from all lectures and exercises were prepared for the exam. The exam always consists of two steps (even before the online examination was implemented). The first step is the assignment of four basic questions, of which at least three must be correctly responded by the student to achieve positive evaluation (more than 56 %) of the total exam points, which consists of the score obtained during the semester for four control tests and completed assignments (max. 60 %), and the test during the examination (the test is allotted a maximum value of 40 %). Continuous control tests were written during the face-to-face exercises with related teachers. During the online mode, the evening testing time common for all NoM I students was posted. As mentioned above, the goal was continuous preparation of students during the semester for the exam so that they learned to answer the questions in the test correctly. There were 76 questions out of the total of 1156. The probability that two students would take the same test is extremely low. Even if they were assigned certain types of questions, the order of answers was changed (in random order). In the case of more possible correct answers and lower number of displayed answers, there could be completely different answers to the same question. [4]

The first part of the face-to-face examination consisted of a written form and the preparation of answers in a very short time provided, about 10 minutes. During the online

examination, this first part was implemented using Google GSuite, the Classroom module [5], where four basic questions were assigned. Two of the questions had to be elaborated using computer (select the correct answer), while the other two had to be written down on a paper and, in a certain time interval, the correct answer to the relevant question should be uploaded (including also the student's name and surname and the date of the exam). During this time, the PC camera and microphone of each student were switched on.

A comparison of the results of the face-to-face and on-line forms of the examination is shown in Figure 1. It can be seen that there was not a significant difference in success rate of both methods used.



a) 2018-2019 *b) 2019-2020*

c) 2020-2021 (online examinations) *d) 2021-2022 (online examinations)*

***Fig. 1** Comparison of examination results in the course of Materials Science I [4]*

The results of passing the NoM I exam in individual academic years are as follows: 2018/2019 => 54.7 %; 2019/2020 => 56.0 %; 2020/2021 => 56.4 % and 2021/2022 => 58.8 %. These results show an increase in the success rate of the students in the NoM I course.

EXAMINATION OF STUDENTS IN THE COURSE OF METALLIC AND NON-METALLIC MATERIALS

The course of "Metallic and Non-metallic Materials" (KNM) is taught in the Bachelor's degree of university studies in the 1st year of study, winter semester. The aim of the course is to introduce the technology and materials-oriented students of the Faculty of Materials Science and Technology into the material composition, possible transformations in materials, alloys, testing the properties of materials, and degradation processes, and their use in technical practice. During the semester, students accomplish a certain part of the examination by completing assignments and control tests (max. 60 %). In the exam, they can get 40 % maximum.

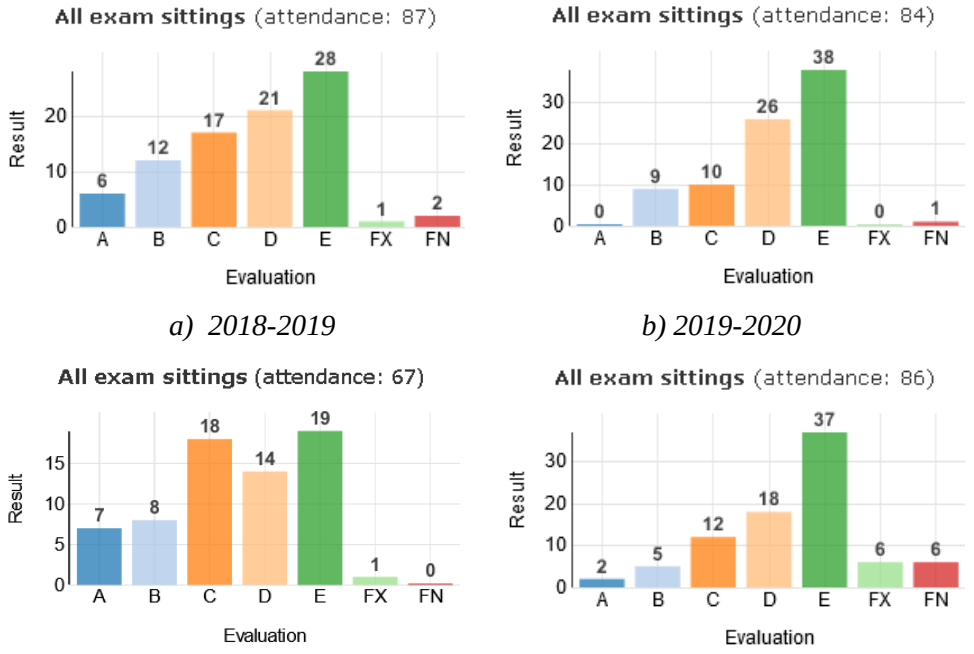
The face-to-face exam consisted of a written exam - five comprehensive questions from lectures, exercises, and practical examples. The written test was evaluated. The final part was an oral exam also from lectures, exercises, and practical examples. The success rate for each question was evaluated by the scale from 0 to 100 %. These results were averaged with each

other, multiplied by a coefficient of 0.4, and the result was added to the assessment achieved from the exercises, thereby determining the final grade from the KNM exam.

The online form of exam was enabled using Google GSuite, the Classroom module [5]. At the beginning, two short questions were asked, and students sent their written answers via Classroom for evaluation. The students should obtain 50% to proceed to the oral part of the exam, using camera and microphone on their PCs. Each of the students was assigned three questions from the lectures, exercises and practical examples. Each answer was evaluated during online discussion with the student, and the final grade in the KNM course was determined.

In both cases of examination form, the students dissatisfied with the resulting grade could take a third part of the examination, where two random questions from the lectures and from the exercises were assigned. Evaluation/grading of the answers was added to the previous results, and a new grade was determined, which, however, could be better or worse than the previous grade.

A comparison of the results of the face-to-face and on-line forms of examination is shown in Figure 2. It can be seen that the students' success rate did not change significantly.



a) 2018-2019 *b) 2019-2020*

c) 2020-2021 (online examination) *d) 2021-2022 (online examination)*

***Fig. 2** Comparison of examination results in course Metallic and Non-metallic Materials [4]*

The success rate of the KNM exam in individual academic years are as follows: 2018/2019 => 80.0 %; 2019/2020 => 81.4 %; 2020/2021 => 78.6 %, and 2021/2022 => 66.6 %. These results show a decrease in the success rate of students in the KNM course. Online oral examination and assignment elaboration seems to be problematic for students.

CONCLUSION

Each of the testing methods mentioned provides certain benefits. When testing the course "Materials Science I", there was a four-question entrance test that decided whether the exam result will be positive or negative, i.e. whether the student passed or failed the exam. This approach resulted in a slightly increased success rate of students during online examination. In

the case of the "Metallic and Non-metallic Materials" course, oral examination was a part of the overall examination. The oral exam was conducted one-to-one, i.e. one examiner one examinee on the screen and other students just present, so that the examiner could monitor the students' mimics and reactions to the question, and deduce possible cheating. The different methods of testing of Bachelor´s degree students (course of Materials Science I) and Master´s degree students (course of Metallic and Non-metallic Materials) were used due to the different knowledge obtained during the study. The results show that each of the methods used was justified, even if the passing rate for the course of "Metallic and Non-metallic Materials" during the online examination decreased.

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