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Abstract: The exam results of Applied Mathematics for IT have been worsening from the year 2012, so we are constantly thinking about how to better prepare students for the exam. Specifically, how to better present the exam test and context of this question. It seems, that for students to connect the different parts of the knowledge is very difficult. That's why we create the new Big-test for the year 2019/2020. Its successful passing is also condition for receiving a credit. The Big-test consists of a complex example with practical and theoretical questions related to one example. Unlike of it, the Self-test consists of partial small questions without any context. However, the questions are very similar. To prevent students from cheating, the Big-test is designed for the University Test Centre. The goal of this paper is to find out whether the Big-test had an impact on the students' results or not, and to analyse the difficulty and discrimination of the Big-test as well.

Introduction

Periodic testing of students is an important part of pedagogical activities, it serves to verify students' knowledge and their knowledge deficiencies. Students can focus on their shortcomings and improve their knowledge. Periodic testing of students serves as motivation to learn for the final examination.

Because student numbers are increasing and information and communication technologies are developing, e-testing is an appropriate way of testing, especially self-tests with multiple-choice questions. Electronic self-tests allow students to test themselves in their homes. This obviously has advantages and disadvantages. The advantages are: providing direct and immediate feedback for the student, improving student performance, reducing the time and effort of the teachers, decreasing the cost for the institution (Alruwais, Wills and Wald, 2018). The disadvantage is that it is very easy for students to cheat.

It is necessary to find out whether the tests are well designed, how difficult they are, how they can distinguish between well prepared and less prepared students.

This paper is focused on testing students of subject Applied Mathematics for IT (AMIT) at the Czech University of Live Sciences Prague (CZU) and follows previous research and improvement of self-tests (Borozova, Rydval and Horakova, 2014; Rydval and Brozova, 2017). The students of this subject are getting worse and worse results in the final examinations (Brozova, Rydval and Horakova, 2014), despite the fact that the conditions of the currently used self-tests and the conditions for enrolment for the exams have been tightened (Rydval and Brozova, 2017). Due to insufficient results of students by the final examination, a new complex test (Big-test) was created for students, situated in the Test Centre of the CZU.

The main goal of this paper is to find out whether the newly introduced Big-test had an impact on the students' results or not and to analyse the difficulty and discrimination of the Big-test as well.

Results

Final Examination Test Results

The average exam mark shows a steady worsening trend. There is only a slight improvement in the first attempts in the academic years 2017/2018 and 2019/2020. This could be probably due to a change in the staff of examiners in the year 2017/2018.

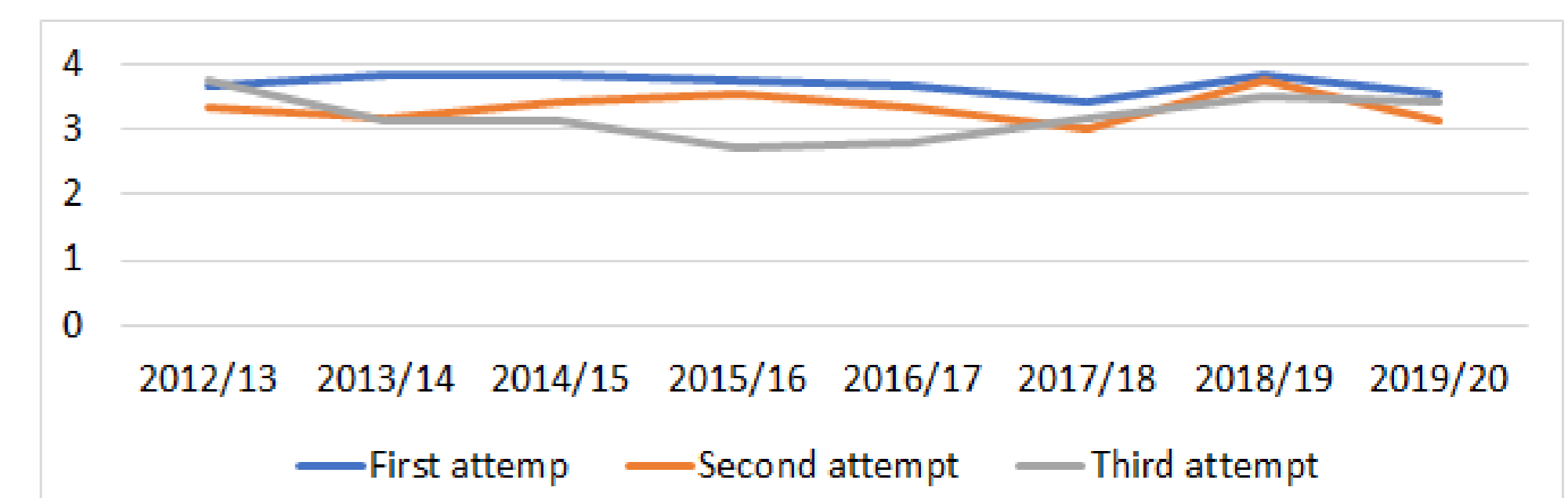


Figure 1: The mean of the marks in the first, second and third attempt

A slight melioration in the average of marks is also evident in the academic year 2019/2020 (especially compared to 2018/2019). This fact could be caused probably by a implementing the Big-test and corresponding change in the conditions for obtaining credit and to be enrolled for the exam.

Analysis of Big-tests

The new Big-tests are more difficult than the currently used Self-tests. The comparison is made only for the final evaluation of Self-tests and Big-tests. The mean number of points of the Big-test is 49.38 and the mean number of points of the Self-test is 74.74 (Figure 2).

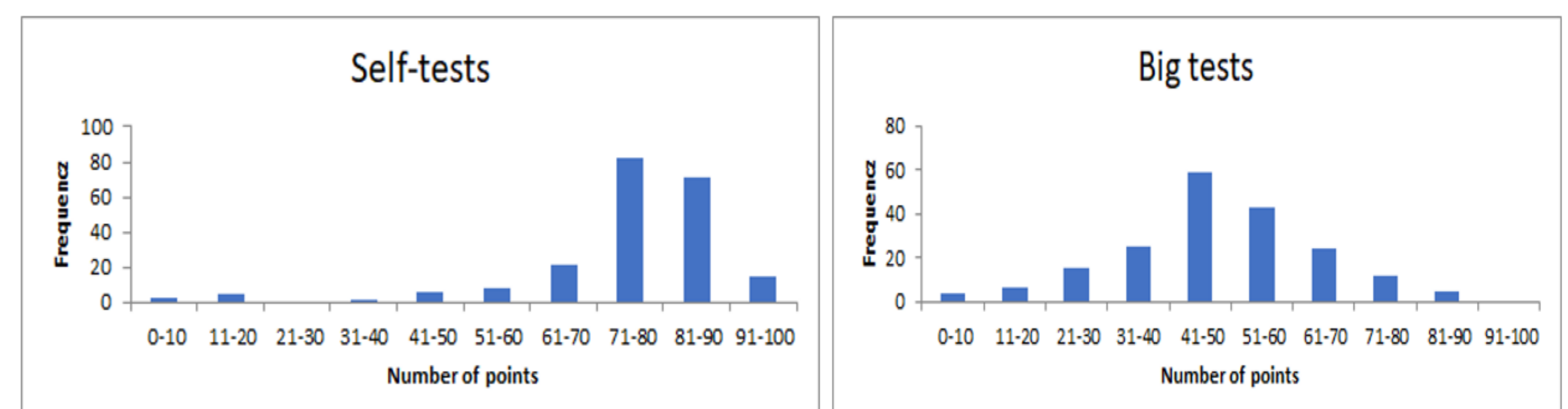


Figure 2: Histograms of achieved points from the Self-tests and Big-tests

The Big-tests may possibly force students to better preparation for the final examination. We created two basic types of Big-tests, one type for linear programming models and the other for transportation problems. There is no statistically significant difference between the difficulty of both types of Big-tests (Figure 3).

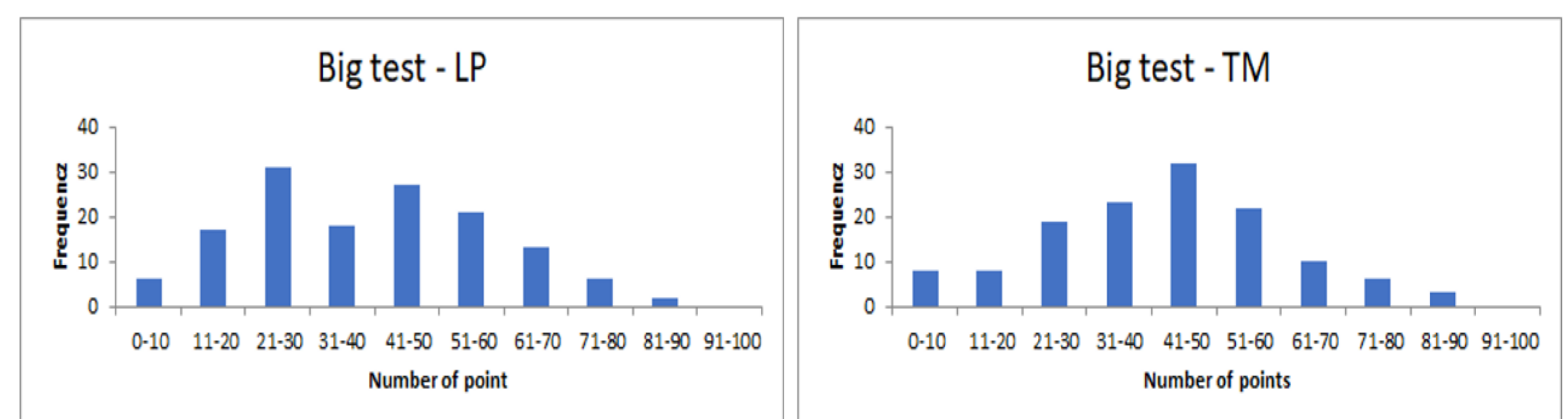


Figure 3: The mean of the final marks of the Big test - LP and Big test - TM

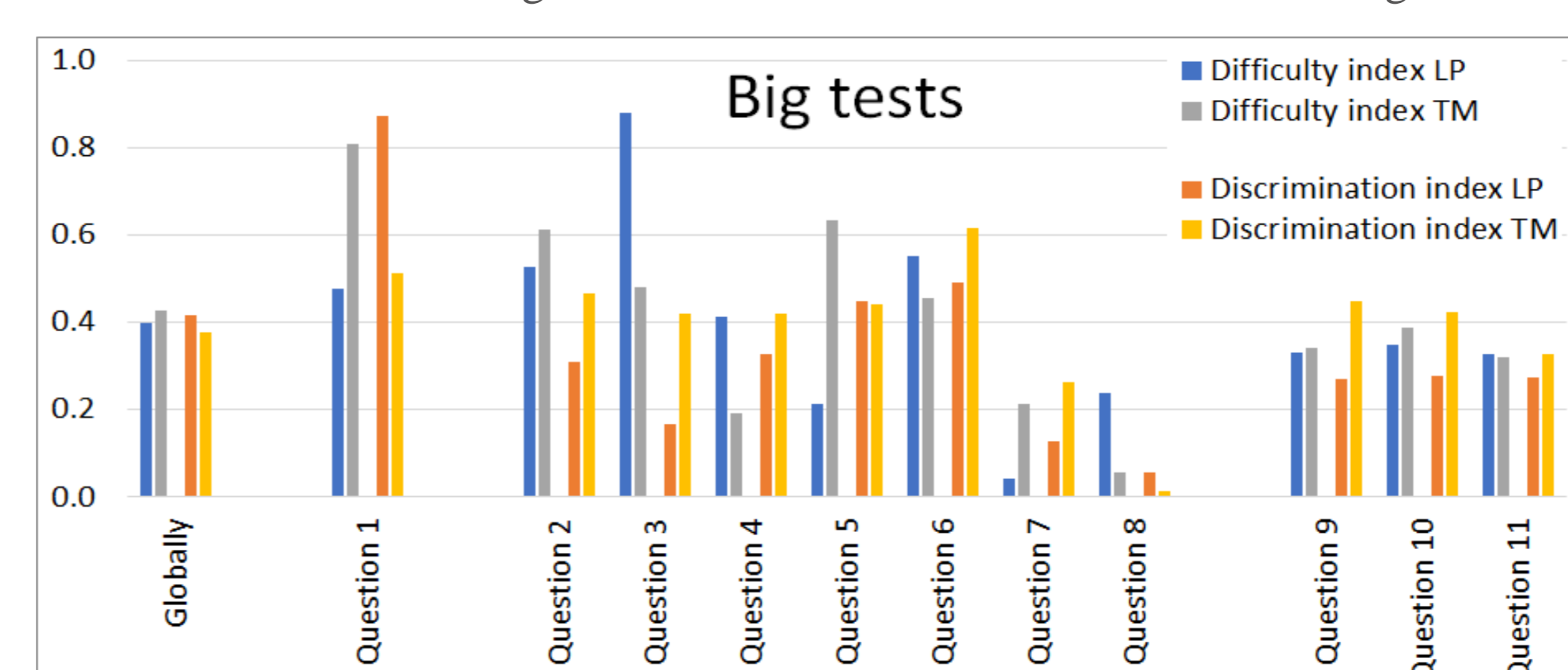


Figure 4: Difficulty and discrimination of the Big-tests

The individual questions of the Big tests (Figure 4) show that all questions are approximately quite equally slightly difficult and have a good ability to distinguish between well prepared and less prepared students. Only some questions from groups Q1, Q3, Q7 and Q8 require

some reformulation to correct the difficulty and discrimination.

References

Conclusion

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To participate in the final exam, students have to pass the Big-tests at the University Test Centre reflecting selected areas of the subject AMIT in addition to the self-tests. The new Big-test and the University Test Centre force students to prepare more carefully and thoroughly for the final examination. In summary, we can say that the Big-tests are well-prepared, and their difficulty is higher than the difficulty of current used self-tests, they have a good ability to distinguish between well-prepared and less-prepared students. Therefore, they serve as a good motivation for better students' preparation for the final examination.