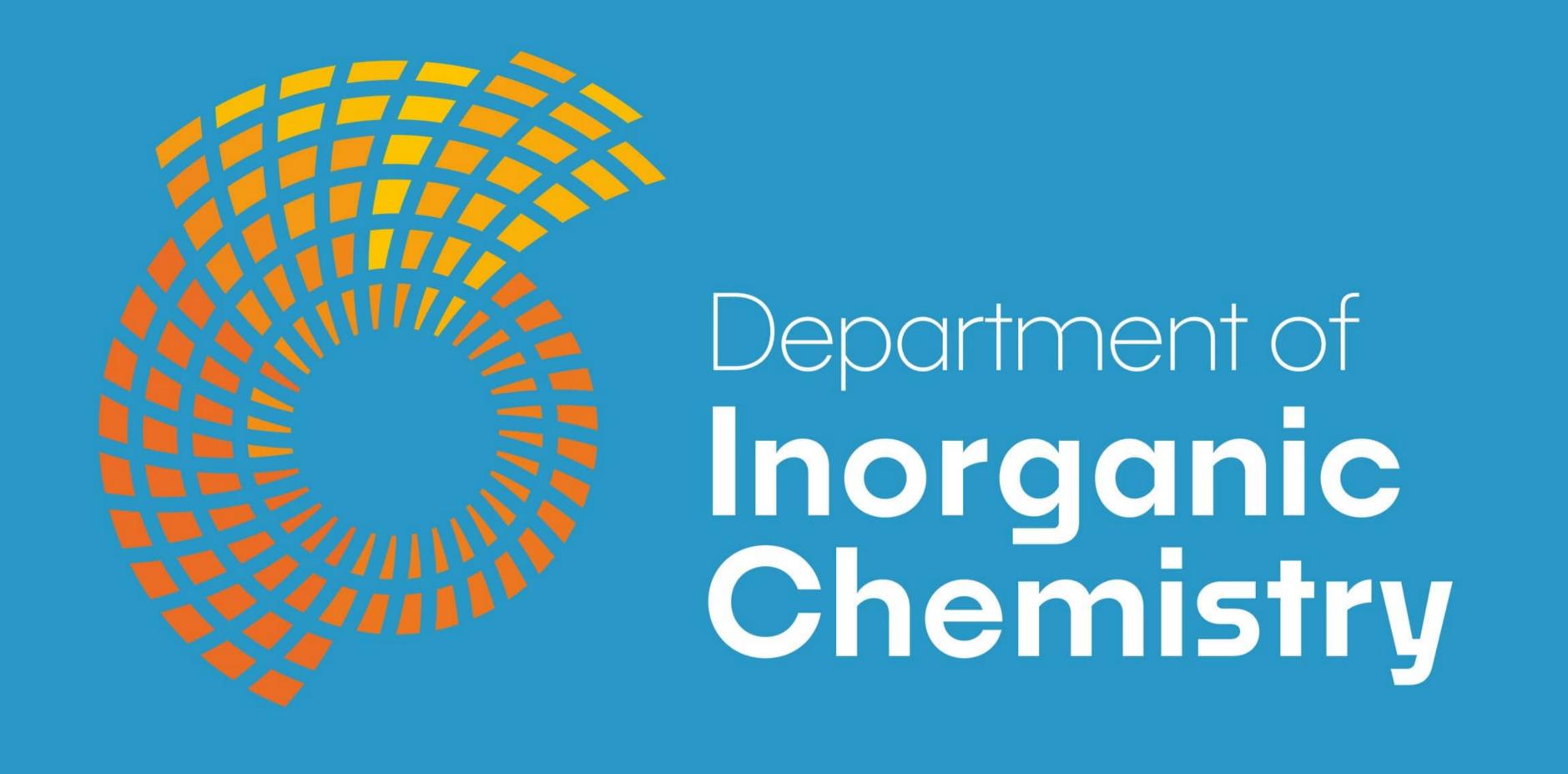
INUIT SCIENT OF Chemistry

Pass rate of students of Chemistry Teaching at final state exam:

Case study analysing influences on success rate of students with stress on distance learning during Covid-19 pandemic

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INTRODUCTION

Students of all chemically focused study programmes at Faculty of Science of Masaryk University in Brno finish their bachelor studies by defending the final thesis and passing the final state exam. This exam has a form of a written achievement test. The test is composed of five parts where each section covers a different area of chemistry.

In the spring term 2022, the abnormally low pass rate of bachelor students of Chemistry Teaching at final state exam occurred. For this reason, the inquiry was launched to map the situation and identify the causation.

RESEARCH METHODS

Within the case study, two research methods were used:

Statistical analysis of the test results

- only results of Chemistry Teaching students were analysed
- determining the location and scale parameters of the test and its individual sections
- determining difficulty and sensitivity of each test part and the individual test tasks

Questionnaire survey for involved students

- expression of experience, opinions and feelings related to their present study at the university
- questions dealt with overall assessment of the study and also with evaluation of individual core subjects
- some of the questions were focused on implementation of distance learning during the Covid-19 pandemic

Characterisation of analysed test:

- exam test consists of five parts inorganic, analytical, physical, organic chemistry, and biochemistry
- each area includes tasks for 8 points, and hence maximum score is 40 points
- inorganic, analytical, physical chemistry and biochemistry parts are composed of multiple-choice tasks
- organic chemistry section is composed of open-ended tasks (drawing structures)
- 20 students of Chemistry Teaching took part
- limit for passing the exam is 45 % in total, i.e. 18 points

Comment to analysed test: The final state exam in 2022 was held in two dates. In February, when 6 students of Chemistry Teaching took part and in June, when 20 students took part. Therefore, the statistical analysis deals only with the results of June test variant when majority of students attended.

Characterisation of used questionnaire:

- questionnaire consists of 18 items
- items involve Likert-type scale, dichotomic (yes/no), open-ended, and multiple-choice questions with multi-select answers
- 18 respondents (out of 26 students) participated
- responses are anonymised

RESULTS AND DISCUSSION

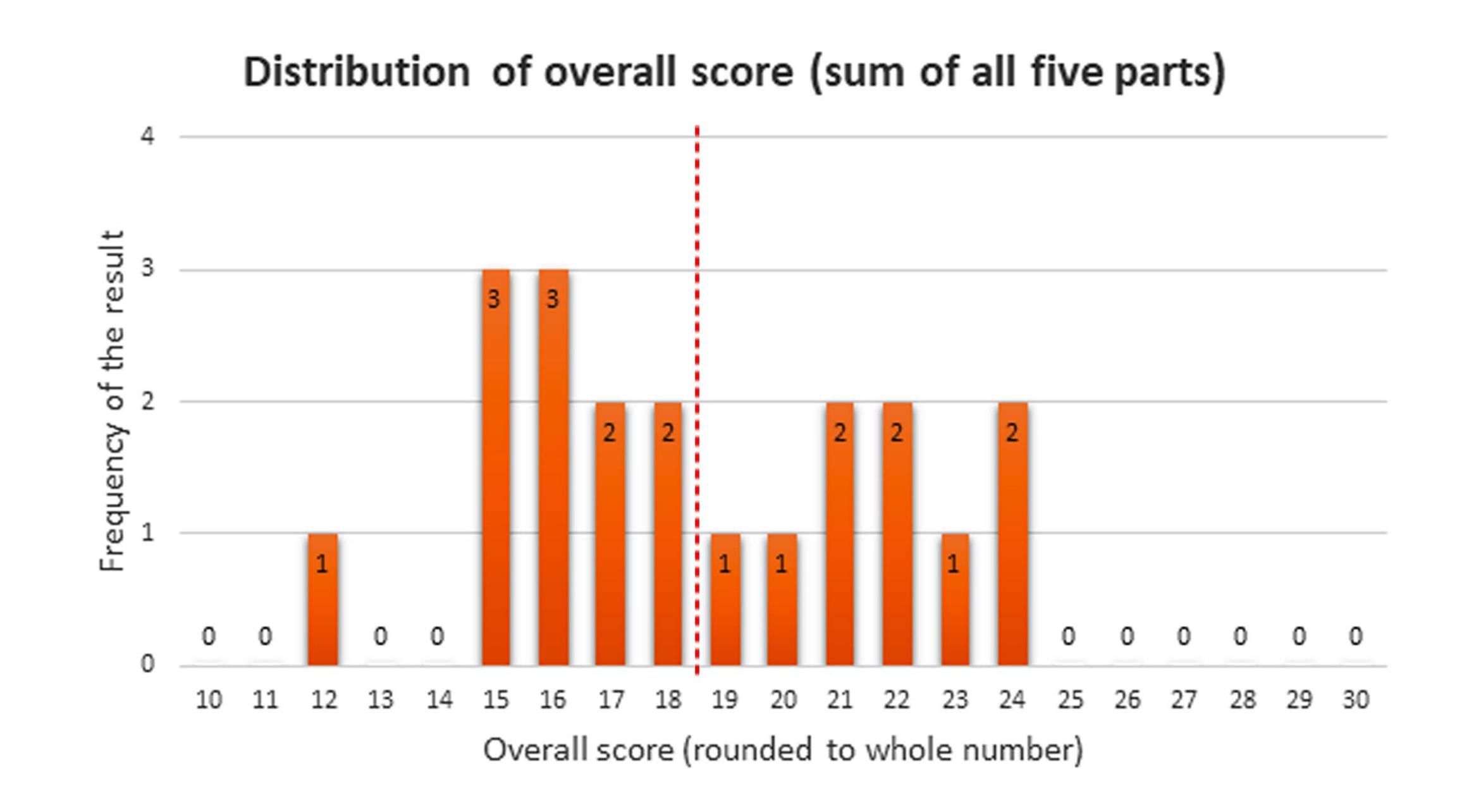
Distribution of overall score shows that only 9 students successfully passed the final state exam test. Unfortunately, remaining 11 students failed. Basic location and scale parameters of the test are following:

arithmetic mean: 18.58 points

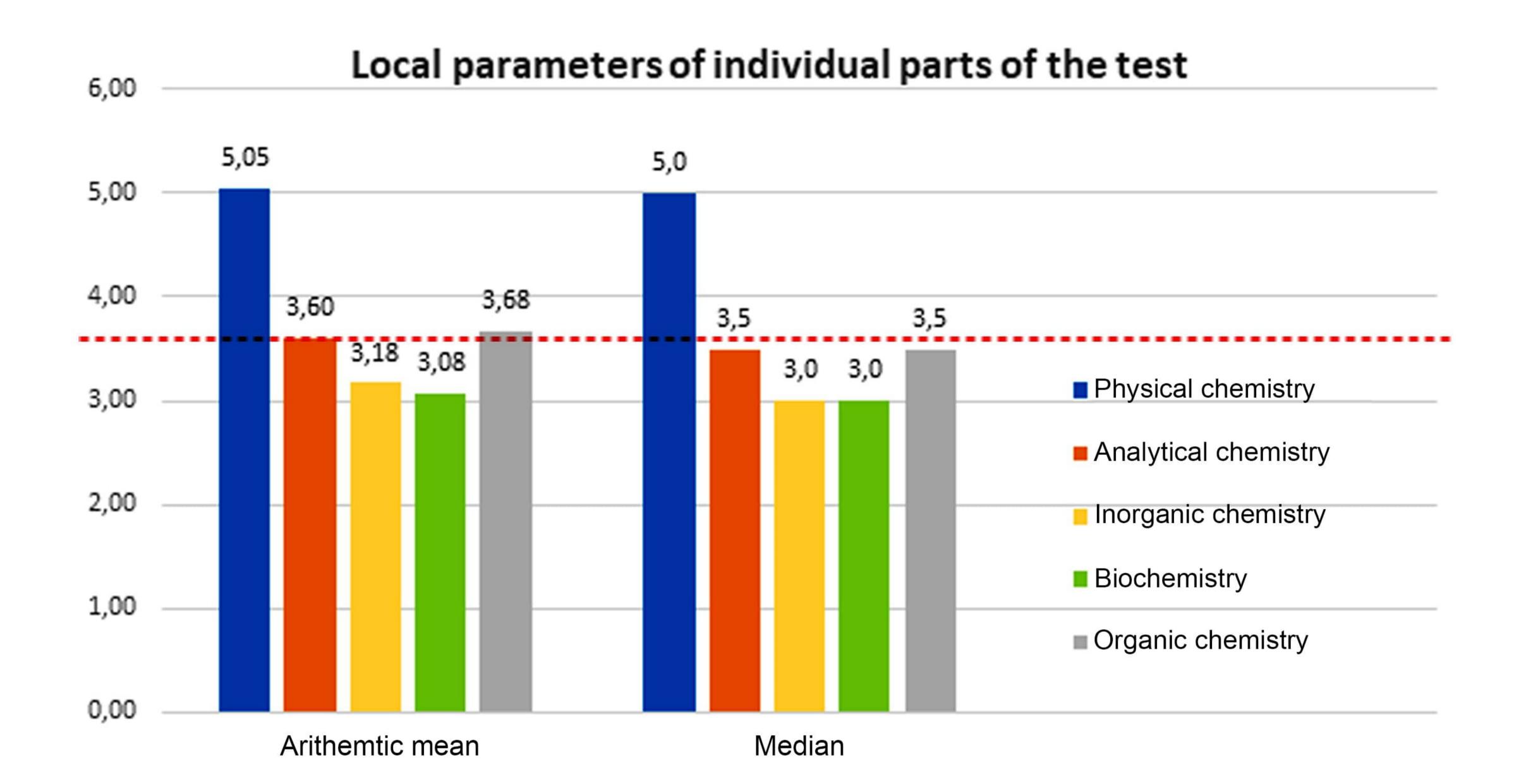
median: 17.70 points

standard deviation: 3.19 points

coefficient of variation: 0.172, i.e. 17.2 %



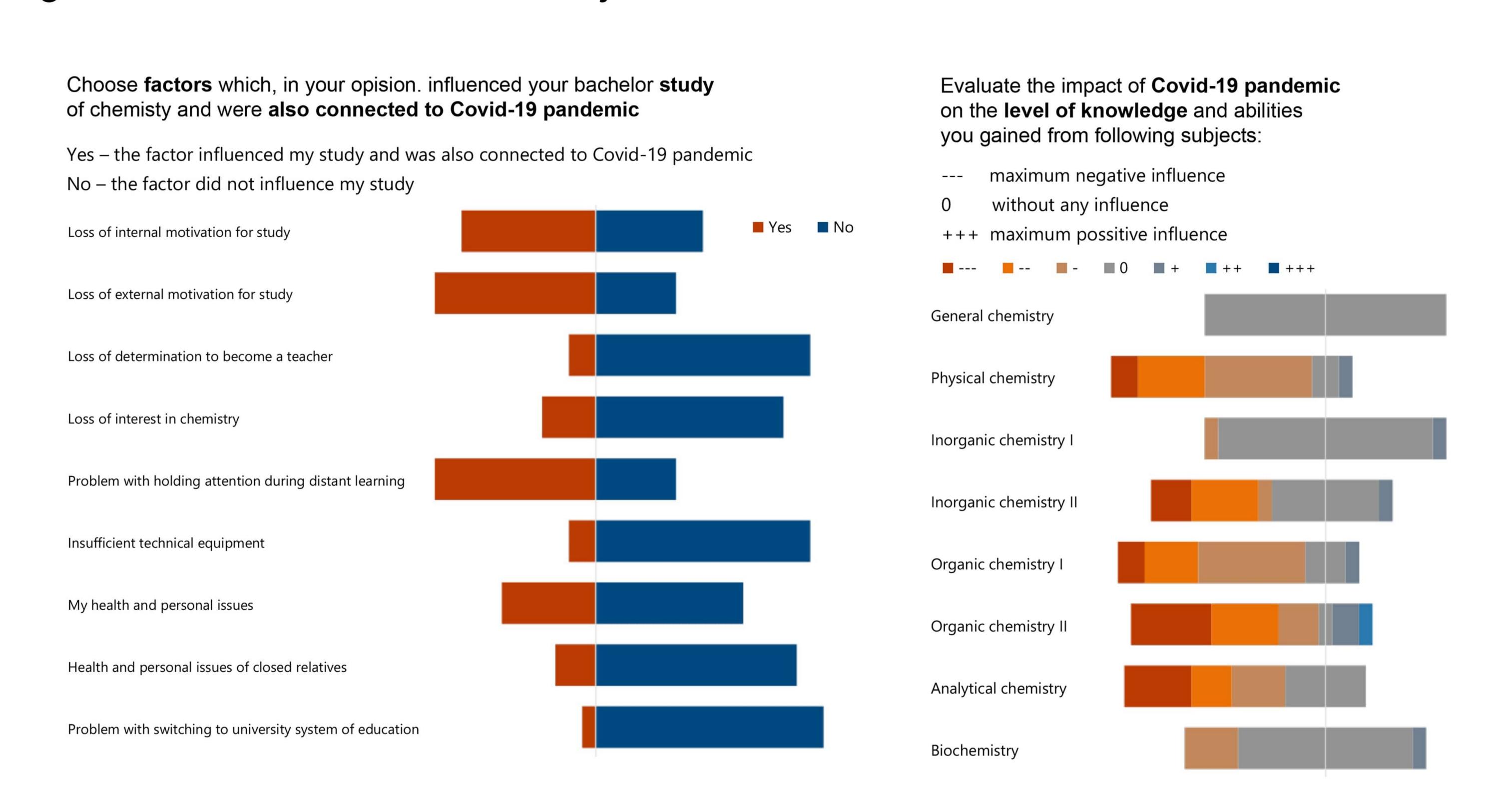
Regarding individual sections of the test, it was obvious that the difficult fields for students were biochemistry and inorganic chemistry. Average score of both mentioned areas were significantly under the 45 % (3.6 points).



Especially in the case of biochemistry, the analysis revealed further problems. Determined values of the coefficient of discrimination for tasks from this section are very low (average value is close to zero). It means that this part of the test does not have an ability to discriminate, and hence is not sensitive. This indicate that some students might even reply in a random manner.

Based on questionnaire replies, we were able to identify several trends in opinions of participating students. In terms of distance learning during Covid-19 pandemic, students experienced the loss of both internal and external motivation. They also mentioned problems with concentration and holding attention. This finding corresponds with the results published in articles focused on education at universities via distance learning (mentioned in References).

With regard to impact of Covid-19 pandemic, students also stressed out the negative effect of distance learning on the level of knowledge and skills they gained from individual core subjects.



Comment to the graph on the right: Involved students attended the subjects General chemistry and Inorganic chemistry I during first term of their study before Covid-19 pandemic.

CONCIUSION

The results obtained from both research methods were compared and summarised. Subsequently, several modifications concerning organisation of final state exam and content of the used tests were suggested. As an illustration, the optimisation of test construction in biochemistry part was proposed. The reason was that both statistical analysis and questionnaire survey pointed out problems related to this area of test.

After discussions between organisers of exams, some of the proposals were accepted and introduced. In this and following years, we are planning to continue gathering data to evaluate impact of the implemented changes, formulate further conclusions, and potentially suggest another optimisation.

Acknowledgements:

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References:

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