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Design of computer based exams with Moodle platform in the context of differentiated assessment

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ABSTRACT

A survey was conducted during the period of online teaching (school year 2019. / 2020.) on a sample of 49 students of two first grade at the Ante Kuzmanic Medical School, in Zadar. The aim of the study was to explore computer-based exams as assessment method at assessment of learning, in the period of pandemic. Over the period of four weeks, students were taught online; asynchronously-through digital content in *OneNote Class Notebook* and synchronously using video calls. The efficiency of online teaching had been checked by three computer-based exams, in time limited conditions, using Moodle. Each exam had precisely determined ratio of questions with different cognitive levels. After the students had taken their first online exam - level medium, they had to choose one of two other exams: level - basic or level - advanced. The results indicate that despite carefully planned instructional procedures, online teaching had a poor impact on student's learning outcomes, because students' achievement in every exam was lower than 50%. Contrary to the hypothesis students are most successful in first online exam (level – medium) and number of hours of online teaching had no effect on a student's achievement. Accordant to the hypothesis students are most successful in solving the questions of the first cognitive level. Nevertheless, considering these findings, by using the learning platform Moodle, the teacher can create a test bank what opens the possibility for differentiation of assessment process, accordant to different learning needs and interests of students.

Keywords: *computer-based exams; assessment of learning; cognitive level; differentiation; Moodle*

INTRODUCTION

Emphasizing the individual approach in the teaching and assessment process has posed a new challenge to teachers because the classroom is made up of an extremely heterogeneous group of students. If we want to evaluate students and decide on a written test, the question arises of the construction of such a written test, implementation, and assessment.

When planning a computer-based exam, the teacher should follow the same didactic-methodological guidelines as with the paper-pencil method. In the selection of educational outcomes whose adoption the teacher wants to check, care should be taken that the educational outcomes are harmonized with the way of teaching and assessing their achievement in the so-called curricular (constructive) alignment (Andersen, 2002). Creating a computer exam requires digital support, which in the narrowest sense consists of an assessment device (hardware, software) and a task bank (Howarth, 2015). In Moodle, the teacher creates a written test by typing in the name of the test and then determining all the other parameters of the test. Knowing the advantages and disadvantages of different types of tasks is a prerequisite for the successful construction of any written test. When designing tasks, it is also important that the task does not only test reproductive knowledge.

The conducted research aimed to investigate the possibility of using fast computer-based exams in the assessment of what was learned, in the conditions of a pandemic. Using questions of different cognitive levels, an attempt will be made to determine whether online teaching can affect the level of

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achievement of desired outcomes. It will also be examined whether computer-based exams can serve as a method in differentiating assessment, given that such tests can be of different levels of difficulty and thus adapted to the different needs of students in one classroom.

METHODS

Three variants of computer-based knowledge testing were developed, which tested the same educational outcomes, but with the difference that each variant contained a different ratio of tasks at different cognitive levels. Students first approached solving a medium level computer exam, after which they had the opportunity to choose the computer-based exam that best suits the personal assessment of the acquired knowledge and skills. In order to check the criterion validity of the computer-based exam as a measuring instrument, the achieved number of points of each student was compared with the final grade of the subject, in the e-Class Register.

Accordingly, the following hypotheses are set:

- when they have a choice, students most often choose a computer-based basic level exam
- students will achieve the greatest success in a computer-based basic level exam
- in all computer exams, students most successfully solve the tasks of the first cognitive level
- student achievement shows a correlation with the number of lessons in online teaching
- student achievement in computer-based medium level testing will be correlated with the final grade in biology

The research was conducted on a sample of 49 students from the first two grades of the vocational school, Ante Kuzmanic Medical School Zadar. In selecting the sample of respondents, the main criterion was that students should adopt the same educational outcomes, which are related to the structure and role of the nucleus and cell division. Although the educational outcomes of teaching were the same in both classes, the number of hours of online teaching differed according to their programs.

The Loomen e-learning platform was used to create the computer-based exams. After the opening of the course called Assessment of mitosis and meiosis (abbreviation NUCLEUS EXAM, Computer based exams available at: https://loomen.carnet.hr/course/view.php?id=12349), a task bank was created from which three variants of computer-based assessment were formed - basic level, medium level and advanced level. In all computer-based exams, only one type of task was used - multiple choice questions with one correct answer (MCQ), each question carried one point, so the maximum number of points in each test was eight points. All stages of the research were conducted online. Two *OneNote Class Notebook* applications were selected - for delivering digital educational content and *Microsoft Teams* - for asynchronous and synchronous communication. After an adjustment period, in which all students received their user accounts and passwords, an experimental process began on April 27, that included various teaching activities over a seven-week period, after which students proceeded to address computer-based exams.

RESULTS

A total of 49 students participated in the procedure, but one student did not take the second testing after the first exam. After the first computer-based exam, 38 students (79%) chose a basic computer-based exam level. Of all the computer-based testing, students achieved best results in medium level exam (M = 3.53), but in none of the computer-based exams, according to the arithmetic mean, students' achievement was lower than 50%. If students' achievements in solving the basic and medium level of computer-based exams are compared regarding the accuracy of the answers in each of the

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eight tasks, the deviations are related to the difficulty of the task. Comparisons of the success in solving the questions that check different cognitive levels show that students in all three computer-based exams best solved the tasks of the first cognitive level. There is also no statistically significant correlation between the number of distance teaching hours and the results of the computer-based medium level exam ($r = 0.14$, $p > 0.05$), while there is a statistically significant moderate correlation between the final grade in biology and the results of the computer-based medium level exam ($r = 0.51$, $p < 0.05$).

DISCUSSION AND CONCLUSION

The conducted research confirmed three hypotheses and rejected two. When students have a choice, they usually choose an easier variant of computer-based exam, in all computer-based knowledge tests students most successfully solve first-level cognitive tasks, and students' achievements in computer-based testing of medium level are correlated with the final grade in biology. In contrast, the greatest performance was not achieved in computer-based basic level exam, nor were student achievement correlated with the number of hours spent on online teaching. These two hypotheses were rejected.

The biggest drawback to using computer-based exams is certainly task design. When it comes to multiple choice questions, it should not be overlooked that the factors that reduce their quality are insufficient quality homogeneous distractors, the possibility of guessing the correct answer (Begić et al., 2019) as well as the possibility of cheating. Although the greatest success was expected in the basic level computer-based exam, it is obvious that better constructed tasks in medium computer-based level exam led to the best success. Despite carefully planned instructional procedures, educational outcomes were not achieved at the expected level, which means that distance learning brings limitations. What should certainly be pointed out is the statistically significant correlation between student achievement from computer-based exams and the final grade for the subject ($r = 0.51$, $p < 0.05$), which implies the possibility of greater application of online assessment for formative and summative assessment.

The conducted research confirmed that computer-based exams as an assessment method have advantages and disadvantages. In terms of distance learning, rapid computer-based testing can provide the teacher with useful information on the level of achievement of educational outcomes and thus offer an alternative when other assessment methods are not feasible.

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