Introduction of peer evaluation in the study of computer graphics - observations on the possibility of involving students in the evaluation process of 3D visualisations

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Introduction

Peer-to-peer evaluation, also known as peer assessment, is an educational approach in which students evaluate each other's work based on predefined criteria. This method has gained prominence in recent years as a means of improving student learning outcomes, promoting critical thinking and encouraging active engagement in the educational process (Topping, 1998). The theoretical foundations of peer evaluation are rooted in constructivist theories of learning, which assume that learners construct their knowledge through active participation and social interaction (Vygotsky, 1978). Peer-to-peer evaluation is a valuable pedagogical tool that enhances learning by promoting critical thinking, student autonomy, and self-assessment skills. Its effective implementation can transform the learning experience, making it more interactive and student-centered. Future research should focus on the development of best practices and technological solutions to overcome the challenges associated with peer evaluation and ensure its effectiveness and acceptability in different educational contexts.

Problem Description

With the goal of making the class more interactive to evaluate and comment on the partial and final results of student projects in the Basics of 3D Modeling course, we introduced analytical and holistic assessment rubrics and asked students for their opinions on the implementation of the assessment. Thus, the focus of the study was to test the appropriateness of the implemented evaluation method in Computer Graphics, to evaluate the process of deriving such assessment lessons, and to gather opinions on the motivation for the continued use of peer evaluation during the pedagogical lessons of the course.

Methods

The experimental part of the study included the preparation of peer assessment forms, the preparation of a lesson using this type of assessment method, the implementation of an assessment lesson, the evaluation of the assessments received from the teachers of the lesson and from the students, the comparison of the results and a critical evaluation of the sense of introducing peer assessment and the determination of directions for future study lessons. The objectives of the study work in the subject were to create 10 visualizations on the topic of landscape, which included different levels of detail of the models. The work therefore included 3D modelling and visualisation using simple and more complex modelling techniques, texturing, determining materials, placing lights and cameras, and determining the optimal settings for use. Assessment surveys (MS Forms, Moodle workshop) were created for the mid-semester products, when students submitted concepts, ideas, references and designs, and for the final products. 60 students from the Basics of 3D Modelling course participated in the peer assessment, but this number decreased during the assessment process. Both analytical and holistic rubrics were used in the assessment. The analytical rubric is structured in detail and includes separate evaluation criteria. Each criterion is divided into several performance levels. The holistic rubric considers the entire product, without breaking it down into individual criteria.

Results

The results of the concepts and ideas during the semester and at the end of the semester in the form of renderings are shown in Figure 1.
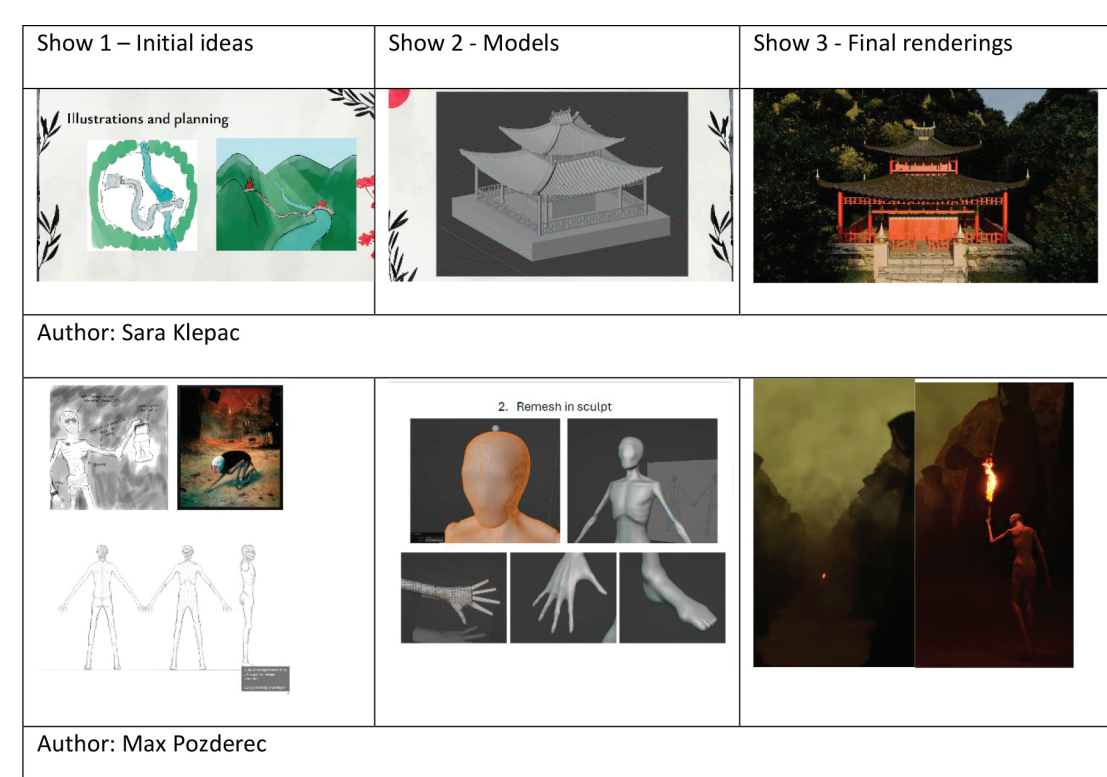

Figure 1

Initial ideas, models and final renderings using the example of two students' project work.

In answering the survey, we focused on questions directly related to the implementation of peer assessment and the use of ICT in the course. Students used a number from 1 to 5 to indicate how much they agreed with the following statements. Value 1 stands for the answer "I do not agree at all", value 2 for the answer "I do not agree", value 3 for the answer "I can not decide", value 4 for the answer "I agree" and value 5 for the answer "I completely agree". Figure 2 shows the extent to which students were involved in the use of ICT technologies during the course semester.

Here in Figure 2, activities 1-4 represent the following statements:
Activity 1 – "Involved in a real-time (formative) test of knowledge with the help of ICT, which allowed you real-time feedback", Activity 2 – "Involved in the final (summative) assessment of knowledge with the help of ICT", Activity 3 – "Evaluating the work of peers using ICT", Activity 4 – "Evaluating your own work using ICT".
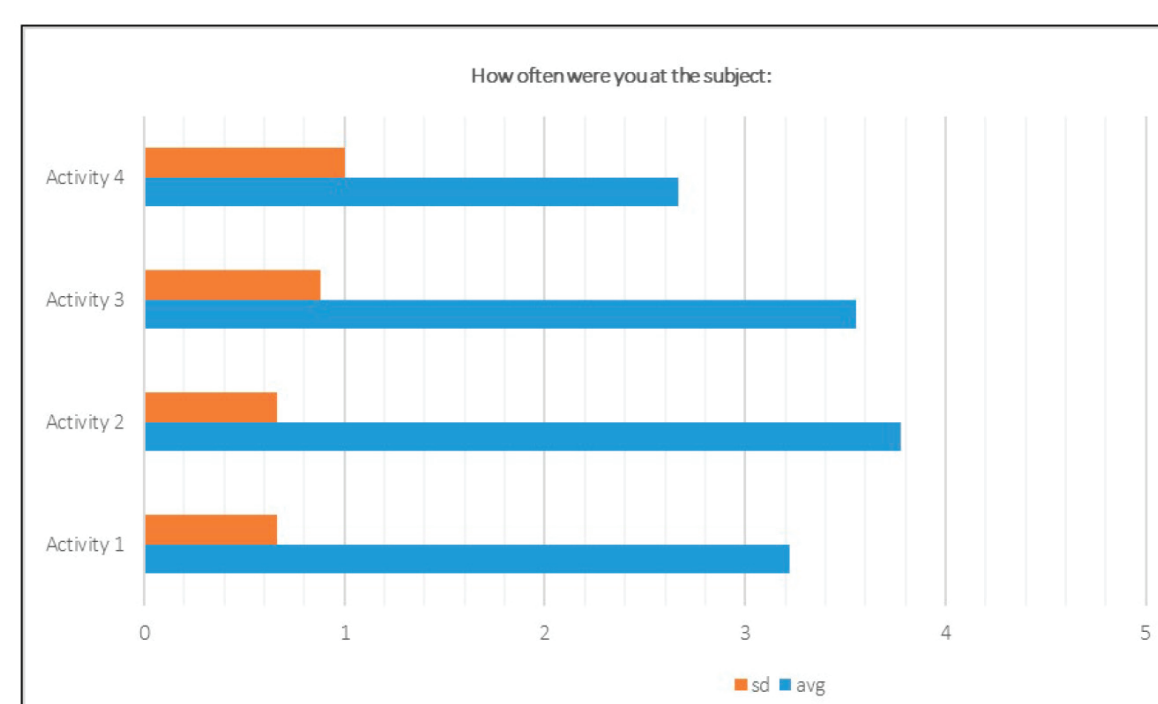

Figure 2

Students' evalutation of the invovlement of ICT methodologies (sd-standard deviation, avg-average value, No. of respondees=10)

Figure 3 presents methods for assessing student satisfaction with teaching:
Method approach 1 – The assessment method of this course (e.g. live, distance learning, combined study method, hybrid study method), Method approach 2 – Implemented activities with ICT- supported peer assessment in the course, Method approach 3 – The use of ICT-supported peer assessment to support the learning process, Method approach 4 – Communication with peers (classmates) during the assessment (interim and final results) of the course.
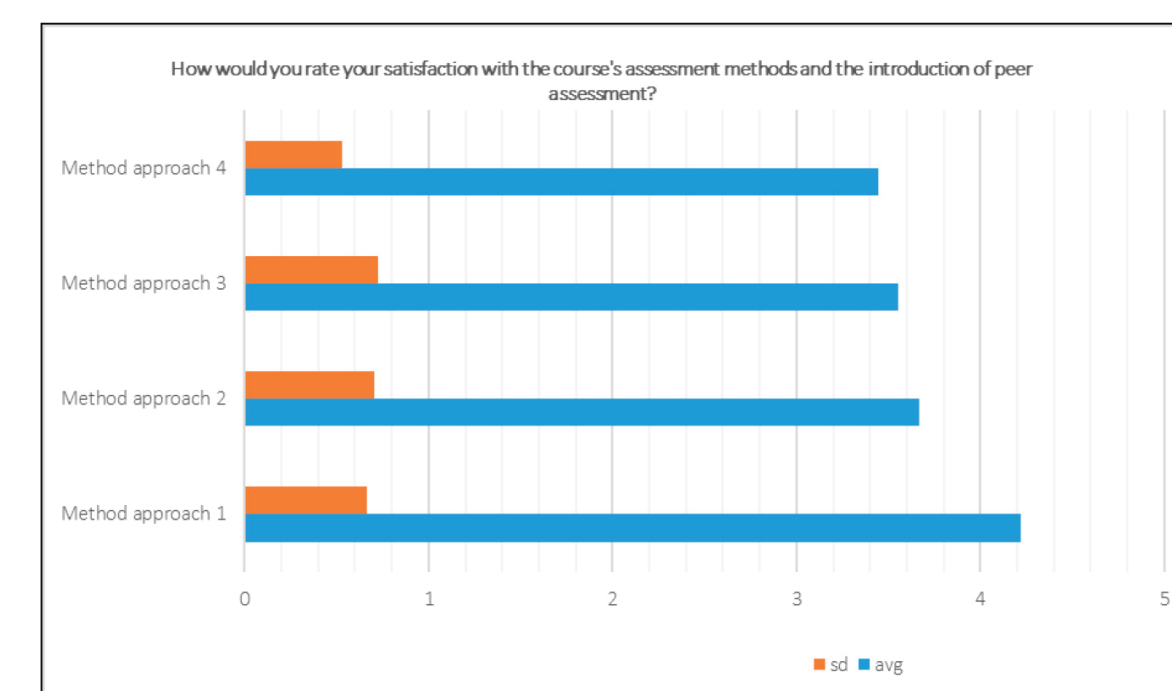

Figure 3

Course's assessment methods (sd-standard deviation, avg-average value, No. of respondees=10)

Discussion / Conclusion

The survey results presented show that students actively participated in the ongoing and final assessment of knowledge using ICT. They also actively participated in evaluating the work of their peers. Results show that the students were very satisfied with the method of assessment in the subject Basics of 3D modeling by the teachers. They were slightly less and therefore moderately satisfied with the activities carried out with ICT-based peer assessment in the subject and with the use of ICT-based peer assessment to support the learning process. They were least satisfied with the communication between the peers during the assessment. We propose that in the definition of the assessment approaches, categories, criteria and rubrics, the basics of educational sciences should be involved as the didactics is crucial beside technical part for the quality of the assessment. Based on our results, the students of the course of 3D modelling are highly confident with the use of ICT technologies. As expected, the students are significantly including ICT in studying occupations of 3D computer graphic.

Based on the results of the introduction of the rubrics and evaluation criteria for peer assessment, we believe that the method is important for the development of the course and especially for the more active participation of students in self- and peer-evaluation, which also increases their motivation to deepen their work in the course. We see possibilities for improvement in the redefinition of analytical rubrics, a clearer presentation of the goals of peer evaluation, a reorganization of the submission and evaluation method in MS Teams, and motivational strategies that would engage students more seriously in the evaluation process for the duration of the entire class period devoted to evaluation.

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