Advanced Grading as a Modern Tool for Checking the Formation of a Competence or Elements of it

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Abstract.
The article examines modern grading tools in the electronic educational environment. We describe and analyze the advanced grading of student papers in teaching with the use of distance technologies. We outline the experience of the South Ural State University Institute of Open and Distance Education in applying advanced grading using evaluations of student papers in various technical disciplines as an example. We show the advantages of advanced grading over traditional grades, in which the teacher evaluates the work by a five-point system without specific criteria. We focused on the possibility of checking the formation of competencies by dividing the grade into criteria, which makes it easier for students to navigate their grades and understand what exactly needs to be corrected. The article analyzes the convenience of using advanced grading for teachers working in a learning environment using distance technologies. We aim to show the transparency of the advanced grading system and the possibility of extending this method to other disciplines, thereby forming an understandable picture of the development of a specific competence or part of it. Our results will be of interest to teachers working in an electronic educational environment, as well as those who continue to work in the traditional form.

Keywords [1]
Advanced grading, criteria, labor intensity, grading time, comments, transparency, distance educational technologies.

1. Introduction

The development of distance learning technologies and e-learning received a new impetus in 2020 due to the COVID-19 pandemic. Universities were forced to switch to new formats for lectures, practicals, seminars, and laboratory classes and follow the requirements of sanitary rules in a complex global epidemic situation [1,2]. With many years of experience in distance educational technologies, both in the humanities (law, economics, management) and technical areas (electric power and electrical engineering, construction, design and technical support of mechanical engineering industries, metallurgy, computer science), the South Ural State University (SUSU) Institute of Open and Distance Education (IODO) was fully prepared to implement these changes with consideration of all of the nuances of distance learning [3].

The trends of modern education include the emergence of new opportunities in the digital educational environment. Changes in the educational process include the transformation of the entire system of production and provision of services based on the use of information and communication technologies. According to the Federal Law On Education, distance educational technologies are understood as those implemented mainly via information and telecommunications networks with indirect (remote) interaction between students and teaching staff.

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Distance technologies have spread across higher education and are now widely used for both full-time and part-time programs.

2. Task Setting

The purpose of this article is to study modern grading tools for online courses. With all the obvious advantages of distance technologies, there are also difficulties in transferring the work from the classroom to an online portal (shell, environment). The most striking problem is the lack of direct contact between the teacher and the student, who may be located in different regions or even different countries. Of course, switching from a standard lecture to the video conferencing format allows educators to maintain live dialogue. However, when organizing practical classes, educators must use appropriate tools to ensure that students have access to detailed comments on the design and content of their practical assignments as they do the traditional classroom format, wherein assignments are checked individually and students write reviews and comments and point out mistakes [4].

In the standard classroom format, the most common mistakes in each assignment can be discussed, allowing the whole group to see and understand their assignment grade. When switching to distance learning, assignments are sent electronically (text file, photo, file, etc.) to each student. With a large number of students and assignments, the educator's workload increases sharply, as they must provide detailed comments and feedback, indicate what mistakes were made, and explain the grade given.

3. Method Development

Modern information technologies allow educators to use advanced grading, which is an excellent tool to increase time efficiency. Advanced grading allows the educator to evaluate the work of students according to specified criteria—either a specific competence as a whole or an element of it. For each criterion, the educator can set the maximum number of points that they consider necessary. The final grade is the sum of the grades according to the criteria.

When a student's work is evaluated with the help of advanced grading, it is easier for them to navigate and understand what exactly needs to be corrected to increase their overall grade for the assignment, because the student sees the criteria by which it was evaluated [4,5] Thus, the student gains an understanding of the reasoning behind their grade, and the educator gains flexibility in their grading.

The educator must create a rubric, in which they prescribe the grading criteria and the points awarded for the fulfillment of each criterion. In the simplest case, they can set one point for the fulfillment of a criterion. The number of criteria is not limited to the usual five-point assessment the educator automatically departs from the "five criteria—five points—top marks" system typically encountered in Russia. On the contrary, by increasing the set of criteria that are associated with the most common mistakes, the educator can expand the range of evaluation of the assignment and differentiate the mistakes made by students. Students can receive, for example, 7 points for one assignment by completing all seven criteria correctly. For the convenience of the students and the educator, these points are then translated into the standard five-point grading system. In complex tasks, the educator can apply deeper differentiation by setting several points for a certain criterion. Thus, the educator creates a clear, transparent mechanism for evaluating student work.

4. Results

Let us consider an example of the application of advanced grading for an assignment in a course entitled "Descriptive Geometry". One of the graphic assignments contains the following tasks:

1. Construct surfaces and planes according to the dimensions in the task;
2. Construct the horizontal or frontal projection plane, depending on the further choice of additional projection plane;
3. Construct an additional projection plane;
4. Transfer the images of surfaces and planes to an additional projection plane;
5. Determine the intersection points of the plane and surfaces;

6. Use additional cutting planes to determine the intermediate intersection points;
7. Transfer the obtained intersection points to the main projection planes;
8. Connect the obtained points, thereby determining the intersection line;
9. Determine the visibility of the intersection line;
10. Write down the algorithm.

For the evaluation, the educator created a rubric of seven criteria. Figure 1 shows a fragment of the rubric for this assignment (3 out of 7 criteria).

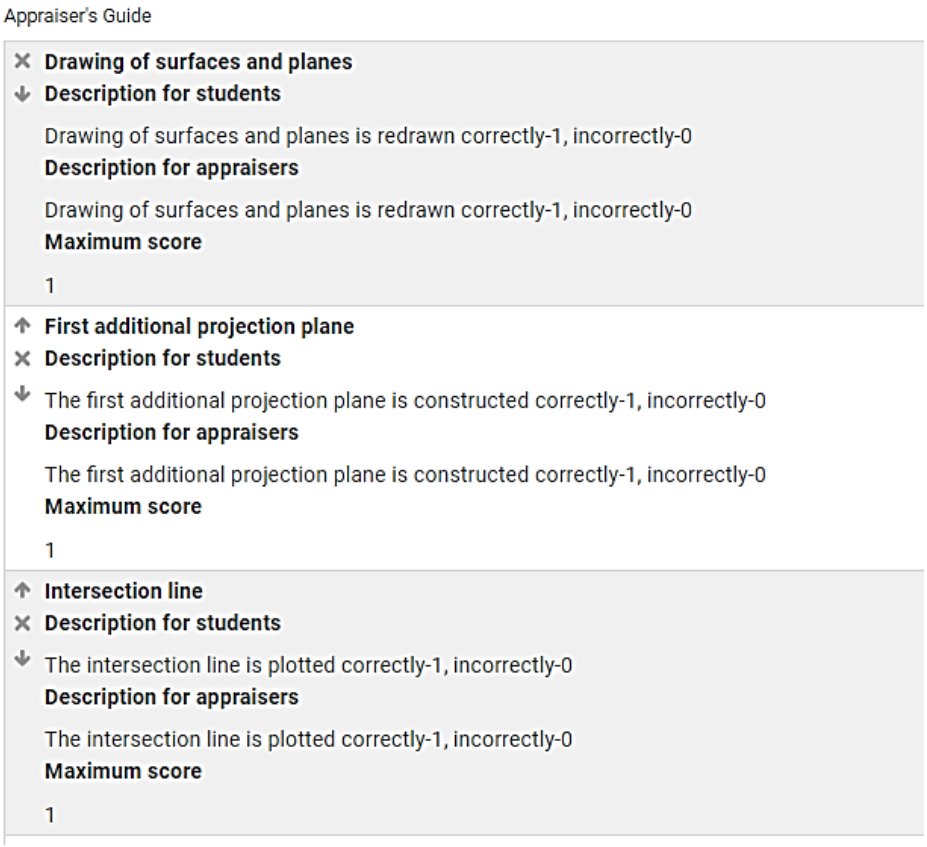


Figure 1: Fragment of the rubric

One point is awarded for each criterion in this task. The student sees their points, their grade, the mistakes they made (by which criterion they received 0 points) and, if desired, can correct them. Figure 2 shows a fragment of a student's answer which received 5 out of 7 points.

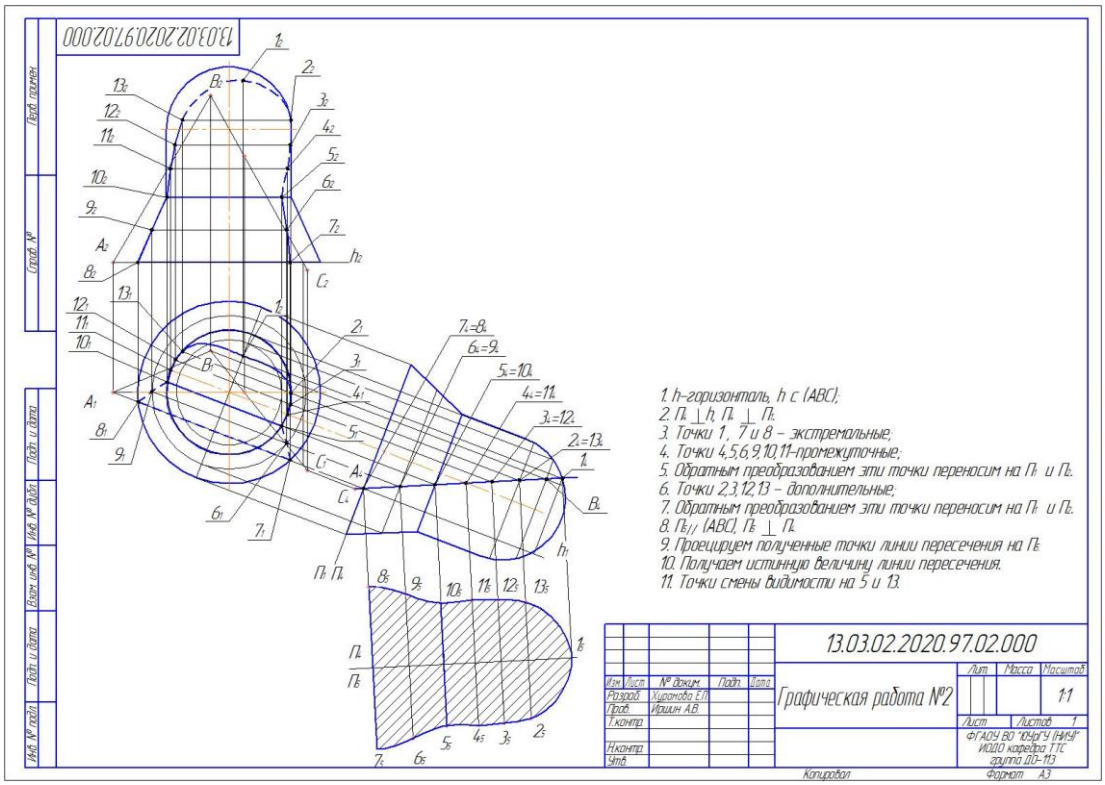


Figure 2: Example of a student answer

In this example, the student made two mistakes—they incorrectly fulfilled two criteria, for which they received 0 points. Figure 3 shows a fragment of the educator's assessment for one of the unfulfilled criteria.

Second additional projection plane

The second additional projection plane is constructed correctly-1, incorrectly-0

The second additional projection plane is constructed correctly-1, incorrectly-0

Note to the criterion Second additional projection plane

1 /1

Actual value of the intersection line

The actual value of the intersection line is plotted correctly-1, incorrectly-0

The actual value of the intersection line is plotted correctly-1, incorrectly-0

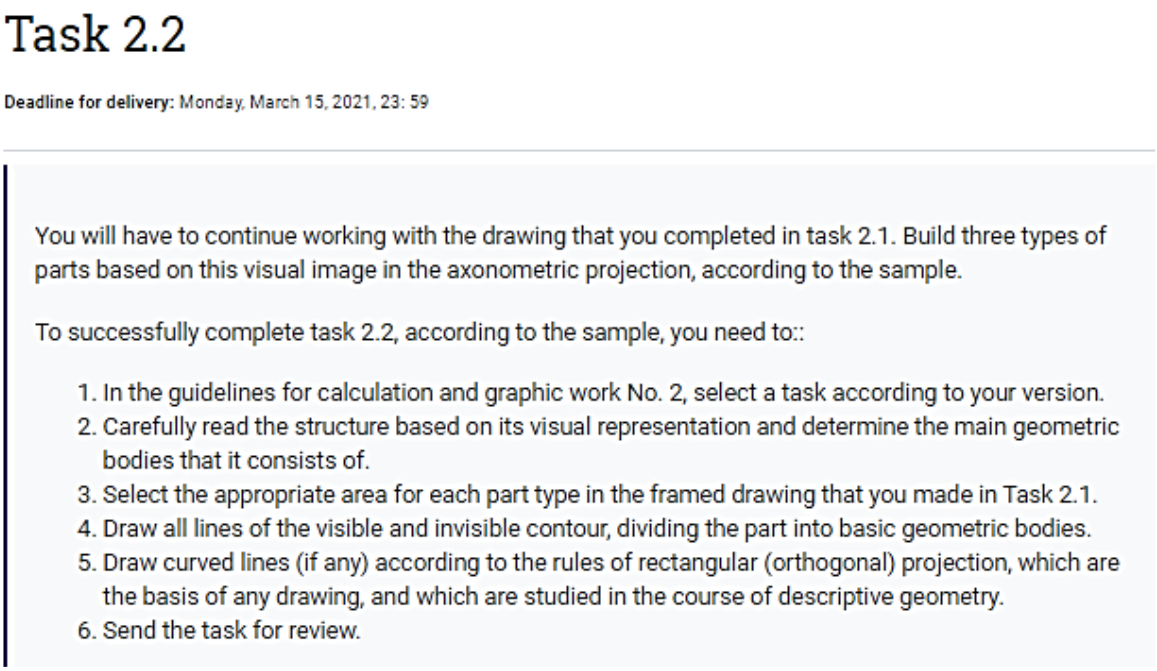
Note to the criterion Actual value of the intersection line

At points 5 and 10 there should be a refraction of the intersection line

0 /1

Figure 3: Educator's assessment for incorrectly fulfilled criteria

Let us consider another example of advanced grading of tasks in the course Engineering Graphics. The task is shown in Figure 4:



Task 2.2

Deadline for delivery: Monday, March 15, 2021, 23: 59

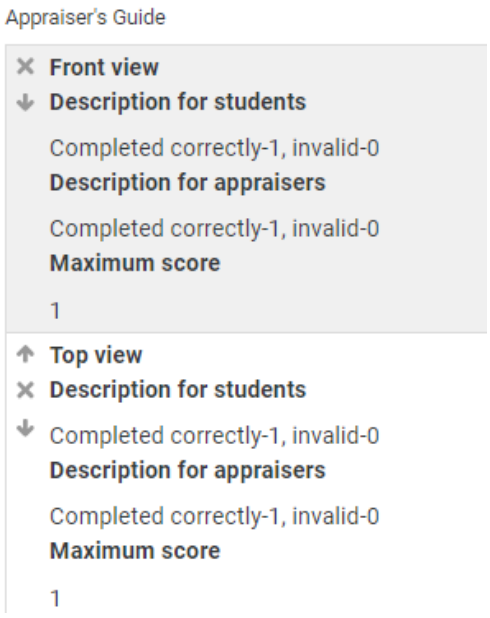
You will have to continue working with the drawing that you completed in task 2.1. Build three types of parts based on this visual image in the axonometric projection, according to the sample.

To successfully complete task 2.2, according to the sample, you need to::

1. In the guidelines for calculation and graphic work No. 2, select a task according to your version.
2. Carefully read the structure based on its visual representation and determine the main geometric bodies that it consists of.
3. Select the appropriate area for each part type in the framed drawing that you made in Task 2.1.
4. Draw all lines of the visible and invisible contour, dividing the part into basic geometric bodies.
5. Draw curved lines (if any) according to the rules of rectangular (orthogonal) projection, which are the basis of any drawing, and which are studied in the course of descriptive geometry.
6. Send the task for review.

Figure 4: Example assignment for the discipline Engineering Graphics

In this case, the educator created a rubric of five criteria. Figure 5 shows a fragment of the rubric (only 2 criteria out of 5 are shown).



Appraiser's Guide

Front view

Description for students

Completed correctly-1, invalid-0

Description for appraisers

Completed correctly-1, invalid-0

Maximum score

1

Top view

Description for students

Completed correctly-1, invalid-0

Description for appraisers

Completed correctly-1, invalid-0

Maximum score

1

Figure 5: Fragment of the course rubric settings

Figure 6 shows a fragment of a student's answer which received 4 out of 5 points.

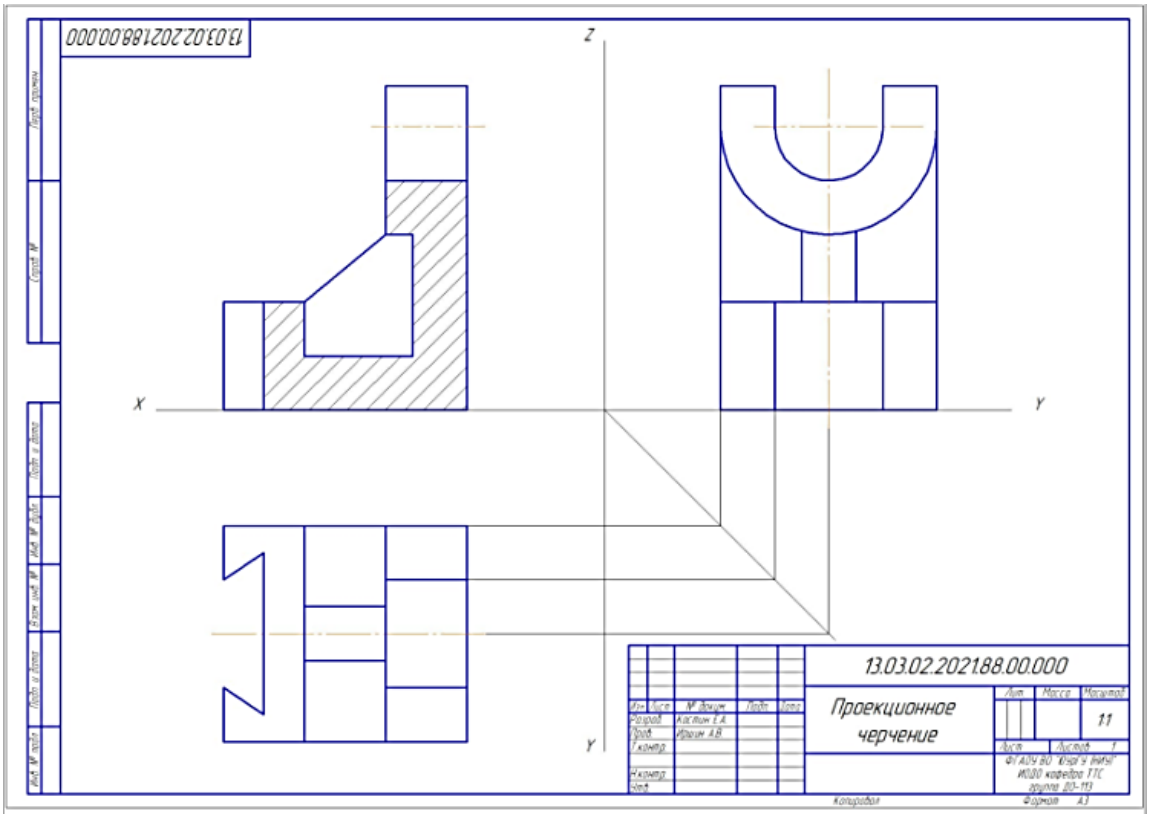


Figure 6: An example of a student response

In this example, the student made one mistake—they incorrectly fulfilled one criterion, for which they received 0 points. Figure 7 shows a fragment of the educator's assessment for one of the incorrectly fulfilled criteria.

Projection communication lines

Completed correctly-1, invalid-0

Completed correctly-1, invalid-0

Note to the Projection Links criterion

The front view does not have a single line of communication with other views

0 /1

Figure 7: Educator's assessment for incorrectly fulfilled criteria

A similar method of advanced grading of student works is also possible for other assignments in different disciplines (courses). It is widely used by educators of the Department of Engineering, Technology, and Construction of the SUSU IODO.

5. Conclusion

Advanced grading allows educators to make their grades more understandable, transparent. By setting a certain list of criteria, the educator forms a clear picture of the development of a specific competence or element of it. Students immediately understand what exactly to pay attention to when working on mistakes, and they can therefore better master a specific competence. As a result, students' academic performance gradually increases, because the assessment is no longer a final result, but a

point from which a new round of personal development begins. Thus, advanced grading acquires the characteristics of constructive feedback.

By implementing advanced grading, the educator is no longer required to spend their time writing comments to each student on their mistakes. The evaluation criteria are formulated just for the most common mistakes. Also, the educator has the opportunity to analyze which competencies are most difficult for students to master. This, in turn, allows them to see the shortcomings in their work, and to work on improving the course.

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