The OSCAR PUBLISHING Services
American Journal of Applied Science and Technology

VOLUME Vol.06 Issue 06 2026
PAGE NO. 7-11
DOI 10.37547/ajast/Volume06Issue06-02

On Clothing Modeling and Construction Competency Assessment Methodology: Rubric Development Based on Cad Technologies

Ergasheva Dilafruz Chori qizi
Shahrisabz state pedagogy institute, Art history department, Uzbekistan

Received: 26 April 2026; **Accepted:** 20 May 2026; **Published:** 10 June 2026

Abstract: The assessment of competencies in clothing modeling and construction within higher education remains a methodologically underexplored area, particularly in the context of Computer-Aided Design (CAD) technology integration. This study presents the development and validation of a rubric-based assessment methodology for evaluating CAD-based clothing modeling and construction competencies among pre-service fashion technology teachers. An experimental research design was employed with 62 students at Shahrisabz State Pedagogical Institute (Uzbekistan), divided into control (n=31) and experimental (n=31) groups. The proposed rubric encompasses five competency dimensions: technical proficiency, design creativity, spatial reasoning, problem-solving, and reflective practice. Pre-test and post-test results demonstrate statistically significant improvements in the experimental group ($p<0.05$). The findings suggest that structured rubric-based assessment not only enhances transparency and objectivity in grading but also serves as a pedagogical tool that improves student motivation and learning outcomes in CAD-integrated clothing construction courses.

Keywords: Competency assessment, clothing construction, CAD technology, rubric development, fashion education, pre-service teacher training, higher education, Carabidae, fauna, biodiversity, species richness, population density, ecology, habitat, Northwestern Uzbekistan.

INTRODUCTION:

In the modern higher education system, digital technologies are gaining increasing importance in teaching clothing modeling and design disciplines. In particular, computer-aided design (CAD) programs have radically changed the clothing production process, and educational institutions are also forced to adapt to these changes.

However, the penetration of technology into education also brings with it new challenges. In particular, how can one objectively and consistently assess the competence of clothing modeling based on CAD? Traditional assessment methods — reviewing the results of practical work or a written exam — are not sufficiently effective in this field. This is because the ability to work in a CAD environment is multidimensional and requires technical skill, a creative approach, spatial imagination, and the ability to solve problems simultaneously.

This problem is particularly relevant in higher education institutions in Central Asia, including Uzbekistan, as scientifically grounded assessment methodologies in this field have practically not been developed. This study, conducted using the example of the Shakhrisabz State Pedagogical Institute, is aimed at filling this gap.

The main goal of the study is to develop a rubric methodology for assessing competence in clothing modeling and design based on CAD technologies,

conduct its experimental verification, and prove its effectiveness.

LITERATURE ANALYSIS

A number of important works have been carried out by foreign scholars in the field of competency assessment methodology. The Bloom taxonomy, revised by Anderson and Krathwohl (2001), distinguishes the cognitive, affective, and psychomotor dimensions of competence, which serves as a theoretical basis for developing assessment rubrics in applied fields such as clothing design.

In recent years, there has been a growing interest in studying the issue of evaluation in fashion education. Ruan et al. (2022) argue that the implementation of virtual prototyping programs in educational institutions necessitates a revision of traditional assessment methods. Similarly, Conlon and Gallery (2024) proposed new approaches to assessing digital skills based on virtual 3D prototyping. Regarding the rubric-based evaluation methodology, Stevens and Levi (2013) conducted a comparative study of the advantages of the developer and analytical rubrics. According to their conclusion, analytical rubrics provide a more accurate and objective result in assessing practical skills. This approach can also be applied to the field of clothing design.

In the context of CAD education, a bibliometric analysis conducted by Izzara et al. (2024) shows that the number of studies on integrating CAD technologies into fashion education is growing, but there are still very few works on assessment methodology. This further confirms the relevance of the problem within the framework of this study.

In Uzbek pedagogical science, this issue has not been studied. Bobomurotov and Ergasheva (2025) studied the development of professional competence through the use of multimedia tools, but no special attention was paid to the assessment methodology. This study serves to fill this gap.

METHODOLOGY

Research design. A quasi-experimental design was used in the study. 62 2nd-year students of the Shahrisabz State Pedagogical Institute studying in the field of "Modeling and Design of Clothing" were divided into two groups: the control group (n=31) was trained according to the traditional assessment system, and the experimental group (n=31) was trained according to the developed rubric methodology.

Rubric structure. The evaluation rubric developed within the framework of the study includes the following five dimensions of competence:

Table 1. Rubric for assessing competence in clothing modeling and design

Competence size	4 — A'lo	3 — Yaxshi	2 — Satisfactory	1 — Unsatisfactory
1. Technical skills (in a CAD environment) work)	All commands and functions independent , without error uses	Home functions uses , rarely mistake	Support with main from functions uses	Home also performs functions can't
2. Design creativity	Original, aesthetic in terms of mature design	From standard difference doer design	Traditional design , less creativity	Creativity not visible
3. Spatial thinking	Go from 2D to 3D complete independent will do	Minimum support with will do	Support with will do	Done can't

Competence size	4 — A'lo	3 — Yaxshi	2 — Satisfactory	1 — Unsatisfactory
4. Problems solution to grow	The problem independent determines and solves	Many problem independent solution does	The problem determines , in the solution support need	The problem understand can't
5. Reflexive practice	Own work complete analysis does , improves offers gives	Own work analysis does	Partially analysis does	Analysis no

Data Collection. The following data collection methods were used during the study: (1) a previous test (pre-test) conducted at the beginning of the semester; (2) the next test at the end of the semester (post-test); (3) observation protocols; (4) a semi-structured interview with students. All results were processed in the SPSS 26.0 software.

RESULTS AND DISCUSSION

Previous test results. At the beginning of the study, no statistically significant difference was found between the two groups (p=0.73), which proves that the baseline levels of the two groups are equal.

Table 2. Previous test results (pre-test)

Competence size	Nazorat guruhi (o'rtacha ± SD)	Experiment group (mean ± SD)	p- value
Technical skill	2.13 ± 0.52	2.16 ± 0.49	0.81
Design creativity	1.97 ± 0.61	2.03 ± 0.58	0.69
Spatial thinking	1.87 ± 0.55	1.90 ± 0.53	0.84
Problems solution to grow	2.06 ± 0.48	2.10 ± 0.51	0,73
Refleksiv amaliyot	1,74 ± 0,63	1,77 ± 0,60	0,85
UMUMIY O'RTACHA	1,95 ± 0,44	1,99 ± 0,42	0,73

Follow-up test results. In the subsequent test conducted at the end of the semester, the experimental group showed statistically significantly higher indicators than the control group across all dimensions (p<0.05).

Table 3. Post-test results

Competence size	Nazorat guruhi (o'rtacha ± SD)	Experiment group (mean ± SD)	p- value
Technical skill	2.48 ± 0.61	3.32 ± 0.54	0.001*

Competence size	Nazorat guruhi (o'rtacha ± SD)	Experiment group (mean ± SD)	p- value
Design creativity	2.19 ± 0.55	3.16 ± 0.58	0.000*
Spatial thinking	2.23 ± 0.59	3.10 ± 0.52	0.000*
Problems solution to grow	2.35 ± 0.51	3.23 ± 0.47	0.000*
Reflexive practice	1.97 ± 0.62	2.97 ± 0.55	0.000*
OVERALL AVERAGE	2.24 ± 0.46	3.16 ± 0.43	0.000*

* p < 0,05 — statistik jihatdan sezilarli farq

Growth dynamics. Gain score analysis shows the following results:

Table 4. Growth dynamics in the control and experimental groups (%)

Competence size	Control group growth (%)	Experiment group growth (%)	Difference (%)
Technical skill	+16.4%	+53.7%	+37.3%
Design creativity	+11.2%	+55.7%	+44.5%
Spatial thinking	+19.3%	+63.2%	+43.9%
Muammolarni hal etish	+14,1%	+53,8%	+39,7%
Refleksiv amaliyot	+13,2%	+67,8%	+54,6%
	+14,9%	+58,8%	+43,9%

The above data show that in the experimental group using the rubric-based assessment methodology, the overall growth was almost 4 times higher than in the control group. In particular, the largest growth was observed in the dimensions of reflective practice (+67.8%) and spatial thinking (+63.2%).

Interviews with students showed that providing the rubric in advance helped them clearly understand the goal: "After seeing the rubric, I know what to pay attention to" (student from the experimental group). In the control group, however, students often noted that they were unaware of the evaluation criteria.

CONCLUSION

Based on the results of this study, the following conclusions can be drawn:

First, it has been experimentally proven that the developed five-dimensional rubric is an effective methodological tool for assessing CAD-based competence in clothing modeling and design. The indicators of the experimental group improved statistically significantly across all parameters ($p<0.05$).

Secondly, the rubric serves not only as an assessment tool but also as a learning tool. After familiarizing themselves with the rubric, students focused their educational activities more specifically, which led to an increase in motivation.

Thirdly, this methodology is adapted for pedagogical institutes in Uzbekistan and is ready for implementation in regional educational practice. In the future, it is recommended to conduct a large-scale inspection in other universities.

In terms of limitations, the fact that the study was conducted in only one institution and with a small sample requires a cautious approach to the results. In the future, it is advisable to conduct large sample and longitudinal studies.

REFERENCES

1. Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's educational objectives. New York: Longman.
2. Bobomurotov, Z. R., & Ergasheva, D. (2025). Developing the professional competence of future drawing teachers through the use of multimedia tools. Shakhrisabz: SHDPI edition.
3. Conlon, J., & Gallery, C. (2024). Developing digital skills: a fashion business masterclass in virtual 3D prototyping with Style3D. International Journal of Fashion Design, Technology and Education, 17(1). https://doi.org/10.1080/17543266.2023.2247425
4. Izzara, W. A., et al. (2024). Exploring global research on fashion pattern innovation through Computer-Aided Design: A bibliometric analysis. Al-Ishlah: Jurnal Pendidikan, 17(4), 7806–7819.
5. Mueller, J. (2012). Authentic assessment toolbox: Rubrics. North Central College.
6. Nitko, A. J., & Brookhart, S. M. (2011). Educational assessment of students (6th ed.). Boston: Pearson.
7. Ruan, X., et al. (2022). Digital transformation in fashion education: Implications for curriculum and assessment. Fashion Theory, 26(3), 321–345.
8. Stevens, D. D., & Levi, A. J. (2013). Introduction to rubrics: An assessment tool to save grading time, convey effective feedback, and promote student learning. Sterling, VA: Stylus Publishing.
9. Wiggins, G., & McTighe, J. (2005). Understanding by design (2nd ed.). Alexandria, VA: ASCD.
10. Xu, B., & Reed, P. (2017). Application of virtual simulation in fashion design education. International Journal of Fashion Design, Technology and Education, 10(2), 210–218.