

THESIS - Vol. 15, 2026

International Research Journal

ISSN: 1848-4298 (Print) **ISSN: 2623-8381**(Online)

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How to cite this article:

Hoti, K. & Xhaferi, B. (2026). The Role of Project-Based Assessment in Developing 21st-Century Skills. *Thesis, 15*, 1-25.

Published online: October 12, 2026.

Article accepted: October 2, 2026.

Conflict of interest: Author declares no conflict of interest.

The Role of Project-Based Assessment in Developing 21st-Century Skills

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Abstract
The area of education has seen significant development in recent years. New approaches to engage students and encourage learning are constantly being created, and one of them includes Project-Based Assessment (PBA). Hence, this research investigates how project-based assessment promotes the development of 21st-century abilities by motivating students to apply information, improve critical thinking, collaborate, communicate effectively, and solve real-world problems through meaningful learning assignments. In order to gather the data, this study used a combination of two methodologies: quantitative and qualitative. The results of this study reveal that students usually thought project-based assessment was beneficial in fostering 21st-century skills. They especially appreciated the opportunity to apply theoretical knowledge to real-world challenges while also developing teamwork, communication, research, and adaptability skills. Nonetheless, students noted difficulties with time management, unequal group involvement, unclear instructions, and limited supervision.

Keywords: 21st-Century Skills, Collaborative Learning, Critical Thinking, Higher Education, Project-Based Assessment

Introduction

The area of education has seen significant development during the past ten years since the skills needed for success in the twenty-first century go well

beyond traditional information-based capabilities due to major advancements in globalization and technology (Thorndahl, 2020). Many people believe that, in order for students to thrive in a complex, dynamic environment, they must possess analytical thinking, creativity, collaboration, interaction, and problem-solving skills. As a result, learning these abilities through innovative teaching methods has received more attention (Mahdi, 2020). New approaches to engage students and encourage learning are constantly being created in the ever-evolving field of higher education (Rodrigues, 2020).

A particular approach is project-based learning, which emphasizes interesting, hands-on learning and teaching experiences that teach students to work with peers, solve real-world issues, critically examine material, and develop 21st-century skills (Rehman et al., 2023; Yabis & Jamaludin, 2024). This approach differs from traditional education by putting students in actual situations, highlighting practical learning, teamwork, critical analysis, and creating an engaging learning atmosphere (Chistyakov et al., 2023).

Further, project and problem-based learning can strengthen students' ability to form reasoned positions and make decisions, which are key components of critical thinking (Bezanilla et al., 2019). These skills can be further supported through project-based assessment, as the assessment process provides students with opportunities to apply their reasoning, evaluate their performance, and identify areas for improvement. In this sense, the approach of project-based assessment can be considered as a formative approach since it helps students recognize their current level of performance (Singh et al., 2022).

In addition, it can be said that assessment can be incorporated into project work in order to assess students' understanding, skills, and achievement throughout the educational process since project-based learning emphasizes the practical application of knowledge and the development of diverse competencies. Consequently, this has led to the adoption of project-based assessment, which uses practical assignments and projects to evaluate students instead of depending just on conventional modes of examination. Additionally, project-based assessment is considered as another assessment technique that offers chances to evaluate students in a more student-centered learning setting (Van den Bergh et al., 2006). Moreover, there has been a growing interest in alternative and authentic assessment methodologies since the standard modes of evaluation could not adequately capture the range of information, abilities, and attitudes students are expected to develop (Litchfield & Dempsey, 2015).

On the contrary, it is generally known that traditional assessment techniques frequently focus on written tests, which may prioritize

memorization and replication of information, giving students fewer chances to exhibit higher-order abilities in real-world situations (Sotiriadou et al., 2020). Considering the importance of including new types of assessments, this research aims to investigate students' perceptions of project-based assessment and its role in developing key 21st-century skills, including critical thinking, problem-solving, analytical skills, creativity, innovation, independent learning, practical skills, and career preparation. By examining students' experiences, perceived benefits, and challenges, this study seeks to provide a more comprehensive understanding of the effectiveness of project-based assessment in higher education.

In order to accomplish the main aim of this research, three research questions are raised:

1. How does project-based assessment contribute to the development of students' critical thinking and problem-solving?
2. In what ways does project-based assessment support students' creativity, innovation, independent thinking?
3. How do students perceive the effectiveness of project-based assessment in developing practical skills and preparing them for future careers?

Literature Review

Project-Based Assessment (PBA) is a comprehensive method of assessment that is increasingly being employed across various disciplines. It can help learners build higher-order thinking skills while also boosting a variety of academic and practical abilities. Despite its growing popularity and potential benefits, present research is fragmented, and a comprehensive, systematic review of the topic is still missing. Research shows that Project-Based Assessment, which integrates many forms of assessment through real-world projects and ongoing evaluation of the learning process, is based on constructivist ideas (Huang et al., 2026). According to a constructivist viewpoint, learning is an active process in which pupils create new understanding by connecting new experiences to prior knowledge, as opposed to merely taking in knowledge from the instructor (Richardson, 2003).

Moreover, PBA is regarded as an assessment method that is focused on learning. The results indicate that it is most frequently employed in practice-oriented fields and higher education, where it primarily concentrates on fostering higher-order thinking abilities through a blend of qualitative and quantitative evaluation techniques (Huang et al., 2026). Nonetheless, it is also worth mentioning that according to Vlachopoulos & Makri (2024), authentic types of evaluation can help students acquire a variety of 21st-century abilities, including critical thinking, problem-solving, cooperation, and employability. Consequently, project-based

assessment, as an authentic type of evaluation, can be utilized in higher education for the duration of a course, enabling students to apply their knowledge to real-world tasks and produce useful results. For example, Nguyen (2021) discovered that a nine-week project-based assessment of 124 university students enhanced their enthusiasm to learn. Other aspects such as their intercultural competence, problem-solving, and critical-thinking abilities were impacted as well. Therefore, these outcomes reflect the cognitive, interpersonal, and self-management competencies that are commonly recognized as essential components of 21st-century skills.

Further, project-based assessment is also strongly linked to the development of 21st-century skills such as cognitive, interpersonal, and self-management abilities, since it encourages students to use their disciplinary knowledge in authentic and extended tasks. These skills help individuals respond effectively to the changing demands of education, employment, and modern society (Voogt & Pareja, 2012). Research suggests that project-based assessment helps students strengthen their critical thinking, problem-solving, and analytical abilities by engaging them with real-world problems. Through this process, students are expected to collect and assess relevant information, consider different possible solutions, apply subject-specific knowledge, and explain the reasoning behind their decisions.

Similarly, Du Plessis (2025) suggests that project-based assessment allows learners to use their knowledge in meaningful assignments while developing critical and creative thinking, problem-solving, teamwork, and higher learner involvement. Another research shows that project-based assessment has been specifically linked to the development and assessment of higher-order thinking skills across a range of academic disciplines. Lestari et al. (2016) found a significant association among project-based assessment and students' critical-thinking abilities in science. Similar findings were reported by Christiana et al. (2014), who observed improved critical-thinking outcomes when project assessment was incorporated into the learning process.

Sukmasari & Rosana (2017) further designed a project-based assessment approach to measure students' problem-solving abilities, indicating that such assessment allows learners to demonstrate their reasoning through more extensive and meaningful tasks than traditional tests. Recent evidence from Ofianto et al. (2024) showed that online project-based assessment can effectively evaluate complex historical-thinking skills, including the use of evidence, understanding of causation, consideration of different perspectives, and interpretation. Furthermore, similar outcomes were reflected in the framework proposed by Goyal et al. (2022) for

assessing undergraduate projects, which included criteria such as critical reasoning, analytical inquiry, complex problem-solving, interpretation of results, and consideration of alternative solutions.

Gratchev (2023) also showed that substituting realistic project-based assignments for traditional exams enhanced students' performance and learning experience by giving them the opportunity to address difficulties in scenarios that more closely resembled the real-world application of information. Moreover, Lambert et al. (2026) discovered that students valued realistic, industry-relevant assessment for increasing work skills and employability since it allowed them to participate in tasks linked to professional practice. Hence, it can be said that these findings imply that project-based evaluation gives students the chance to use higher-order thinking in relevant circumstances, analyze evidence, and come up with solutions in addition to demonstrating their knowledge.

Further, giving students open-ended assignments and project-based assessment can promote creativity, autonomous thought, and self-directed learning. These assignments give students the opportunity to select suitable strategies, investigate various alternatives, plan their own work, and assume more accountability for their education. According to Ramdani et al. (2021), the use of project-based reading evaluation greatly enhanced students' capacity for creative thinking. Asikin et al. (2017) integrated creativity into a cooperative learning model that used project-based assessment and reported that the approach was valid, practical, and effective. Additionally, a MATLAB-based project assessment promoted students' active and autonomous learning through experimentation, inquiry, and self-directed discovery, as shown by Sunarso et al. (2020).

In a similar way, Izzah and Diana (2021) discovered that project-based assessment's beneficial impact on students' creativity was one of its key benefits. The study did, however, also reveal that some students had difficulty managing their time efficiently, underscoring the necessity of precise task structure, suitable coaching, and chances for peer and self-evaluation. As far as independent learning is concerned, Prasad and Raturi (2026) showed that when using the flipped project-based assessment students were able to have more control over their learning process and their education overall, which allowed them to be more independent and creative. In addition, Sa'adah et al. (2022) found that students' learning independence was strengthened through the use of project evaluation. Wakefield et al. (2024) reported that students experienced improvements in their confidence in academic performance, collaborative abilities, communication skills, and digital competencies following an authentic, project-based filmmaking assessment.

The development of contemporary project-based assessment (PBA) may also involve students making independent choices about how and when to use digital technologies. For example, Ofianto et al. (2024) developed an online project assessment in which students were given autonomy to demonstrate their historical reasoning skills. Charles et al. (2025), meanwhile, found that students undertaking a multimedia PBA used generative AI selectively, mainly to support the initial development of ideas and analytical processes rather than to generate their final written work. Taken together, these findings suggest that PBA can create learning environments in which students are encouraged to develop original solutions, exercise independent judgment, evaluate alternative approaches, and assume greater responsibility for planning and managing their own learning.

Students also recognised the connection between the project and their lives beyond university, suggesting that engaging in realistic project activities may help students develop transferable skills that can be applied in everyday life. Chambers and Broadbent (2025) found that students valued assessment activities that encouraged reflection and enabled them to connect their learning with their personal values and interests. Moreover, Parmiti et al. (2021), for instance, identified significant differences in science-process skills between students undertaking project-based assessment and those experiencing more conventional forms of assessment. Their findings suggest that PBA can offer students greater opportunities to demonstrate practical scientific abilities. Within higher education, Boey et al. (2023) found that technology-supported project-based assessment contributed to the development of transferable skills and the overall student motivation. In a similar context, Lutz et al. (2025) reported that participation in a collaborative biostatistics project assessment was associated with greater confidence in programming, data analysis, and working collaboratively with peers.

Moreover, project-based assessment can also strengthen students' skills, as far as their future careers are concerned, when the tasks reflect real professional situations. Sokhanvar et al. (2021) demonstrated that PBA can support students' employability by developing key competencies, including communication, collaboration, critical thinking, and problem-solving. Similarly, Petrov (2025) argues that project-based tasks can embed employability development within university curricula by providing students with opportunities to develop skills in problem-solving, communication, teamwork, critical thinking, reflection, and the creation of meaningful project outcomes. In addition, engagement in authentic project experiences may shape students' perceptions of their professional abilities

and career prospects. For instance, Beier et al. (2019) identified associations between students' participation in project-based university courses and their perceptions of STEM-related skills, the usefulness of their courses, and their career aspirations.

An additional example of such benefit is also shown by Gratchev (2023). In one of his courses, he substituted assignments based on actual site investigations for traditional exams. Students had to analyze data and solve real-world issues that were comparable to those encountered by engineers in the field. Since the evaluation made it easier for students to see how the course material could be used in real-world situations, they received higher average grades and had a more favorable opinion of it. Similar to this, another study by Gratchev & Jeng (2018) discovered that students who completed project-based coursework welcomed the opportunity to connect with the practical parts of engineering.

In accounting education, Venter et al. (2022) discovered that project-based assessment helped students develop teamwork and creativity abilities, which are becoming increasingly important in the industry, while also bringing professional education closer to real-world practice. All in all, these studies show that project-based assessment can help with job preparation by tying theoretical knowledge to practical experience, real-world problem-solving, teamwork, and abilities that employers value. In general, few academic studies have particularly studied students' opinions of project-based assessment as a strategy for acquiring numerous 21st-century abilities, despite the fact that previous research examined the application of projects in educational settings. Particularly in Kosova, minimal focus has been given to the joint development of critical thinking, problem-solving, creativity, independent thinking, self-directed learning, practical skills, and professional preparedness. Therefore, this research aims to address this gap by examining both students' quantitative evaluations and their qualitative experiences of project-based assessment during their studies.

Methodology

The main objective of this paper is to show the role of Project-Based Assessment in developing 21st-century skills among students by analyzing various aspects, such as its impact on critical thinking, creativity, innovation, and self-directed learning, as well as the effectiveness of PBA in preparing them for their future careers. In order to achieve the aimed results, the following methodology has been used.

Research design

In order to address the main questions of this paper, a combination of two methodologies was used: quantitative and qualitative. A mixed-methods approach combines qualitative and quantitative research methods within the same study, enabling researchers to utilize the strengths of both approaches (Creswell & Creswell, 2018; Johnson et al., 2007). Combining qualitative and quantitative approaches allows researchers to benefit from the strengths of each method while reducing the limitations of using either approach alone (Creswell & Creswell, 2018; Tashakkori & Teddlie, 2003). Quantitative methods generate measurable data that can reveal patterns and relationships, while qualitative methods provide deeper insights into participants' experiences, views, and perceptions. Bringing these types of data together can enhance the depth of the analysis, as findings from one approach can complement and support those from the other (Johnson et al., 2007; Greene et al., 1989; Östlund et al., 2011).

Consequently, a mixed-methods approach allows the research problem to be explored from multiple perspectives and supports a more comprehensive interpretation of the findings (Plano Clark & Ivankova, 2016; Creswell & Creswell, 2018). As a result, the current study used both quantitative and qualitative methodologies. Eight closed-ended questions made up the quantitative component, which was intended to investigate how students perceived the effects of project-based assessment on various facets of learning and 21st-century abilities. Four open-ended questions made up the qualitative component, which attempted to investigate students' experiences, perceived advantages, difficulties, and recommendations regarding project-based evaluation.

Participants

This paper includes 98 bachelor's students from the Evolution Academy, a higher education institution in Kosovo. Participation in the research was entirely voluntary, and students were informed of the aim of the questionnaire before submitting it. Participants were free to decide whether to participate in the study. Of these participants, 55.1% (54) were female, 34.7% (34) were male, and 10.2% (10) did not prefer to disclose their gender. As far as age is concerned, 25.5% (25) were 18–20 years old, 16.3% (16) were 21–23 years old, 43.9% (43) were 24–26 years old, and finally, 14.3% (14) were above 26 years old. Lastly, 21 students who participated were in their first year of studies, 51 were in their second year, and 26 were in their third year.

Instruments

Data were obtained by formulating a Google Forms questionnaire, which was then sent to the students. The questionnaire was created by the researchers specifically for the aims of this study. An examination of current worldwide academic literature on project-based assessment and 21st-century skills, as well as the research gap found in the body of existing literature, guided its development. The items were created in line with the primary goals of the research as well as the particular facets of project-based assessment that were examined.

There were three sections and fifteen items on the questionnaire. Three demographic questions on age, gender, and year of study were included in the first part. Eight closed-ended questions about students' opinions of the effects of project-based assessment made up the second part. Four open-ended questions about the experiences of learners, considered advantages, difficulties, and recommendations regarding project-based assessment were included in the third part. A five-point Likert scale was used to score the eight closed-ended items. The response options were 1 to 5, with 1 denoting "strongly disagree"; 2 denoting "disagree"; 3 denoting "neutral"; 4 denoting "agree"; and 5 denoting "strongly agree".

Students' agreement with statements about the value and efficacy of project-based assessment in relation to learning the 21st-century skills was conducted using this scale. The closed-ended questions included a number of topics related to 21st-century skills and project-based evaluation. These covered how students perceived their capacity for critical thinking and information analysis, problem-solving, creativity and invention, independent thought, time management, practical skills, and job readiness.

The primary dimensions found in the literature review and the research gap the study addressed were reflected in the formulation of the items. Respondents were able to answer in their own words to four open-ended questions in the third phase. Four primary topics were covered by the questions: how project-based assessment affected students' learning experiences; what features they thought were most helpful; the difficulties they faced when completing project-based assessments; and their recommendations for enhancing the use of project-based assessment. Students were able to expound on their individual experiences and provide viewpoints that were not adequately represented by the predetermined response alternatives thanks to the open-ended approach.

Data collection and analysis

The survey was sent electronically via Google Forms to Evolution Academy Bachelor students. Students completed the questionnaire online and offered feedback on their experiences and impressions of project-based assessments. The study's participants volunteered and remained anonymous. Students received notice about the study's goal before answering the questionnaire, and no personal data was gathered. The online structure made it possible to collect replies in a consistent way, as well as organize quantitative and qualitative data for research.

The quantitative data collected from the eight closed-ended questions was evaluated using descriptive statistics, namely frequencies and percentages. For every question, the percentage of participants who chose each response option was shown, and the appropriate percentages were calculated using the overall number of replies. The results were presented graphically, with charts depicting the distribution of responses from students across the five Likert-scale categories.The qualitative data collected from the four open-ended questions were examined by analyzing all of the participants' responses to each topic. The answers were analyzed to discover reoccurring themes, patterns, and frequently stated viewpoints. Similar comments were categorized based on their shared content, allowing the most common concepts and themes to be discovered for each topic.

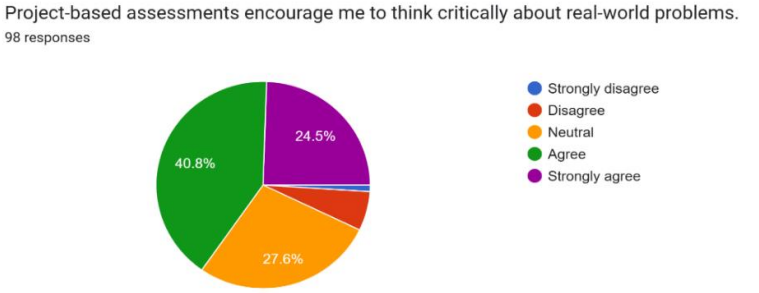
The results were then compiled and shown in regard to the four topics covered by the open-ended questions: experiences with learning, perceived advantages, obstacles, and recommendations for improvement. To maintain each respondent's original answers, selected replies reflecting frequently expressed views were provided identically in the results' section. The phrasing of these answers was not changed. These qualitative comments were utilized to supplement the quantitative findings, providing more specific information on students' experiences and perceptions of project-based assessment.

Results

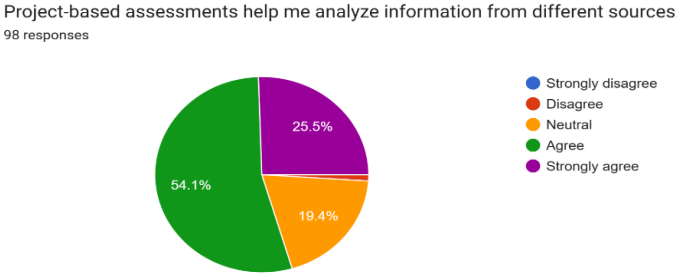
The findings of this study are presented in three main sections, organized according to students' responses to the research topic. The first section examines the contribution of project-based assessment to the development of students' critical thinking, problem-solving, and analytical skills. The second section focuses on how project-based assessment promotes creativity, innovation, independent thinking, and self-directed learning. The final section presents students' perceptions of the effectiveness of project-based assessment in enhancing practical skills and preparing them for

future careers. Following the presentation of the findings, this chapter also provides a discussion and interpretation of the results.

The Development of Critical Thinking, Analytical Skills, and Problem-Solving
The first statement was "Project-based assessments encourage me to think critically about real-world problems", for which 1% of the students who were part of this study strongly disagreed, 6.1% disagreed, 27.6% were neutral, 40.8% agreed, and 24.5% strongly agreed.

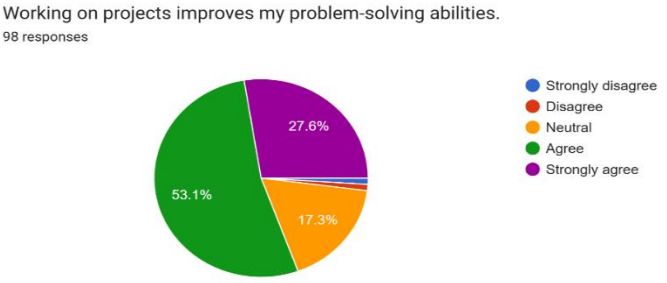


The second statement in the questionnaire was "Project-based assessments help me analyze information from different sources", for which none of the students chose the option 'strongly disagree', only 1% of them chose to disagree, 19.4% were neutral, 54.1% agreed, and finally, 25.5% strongly agreed.



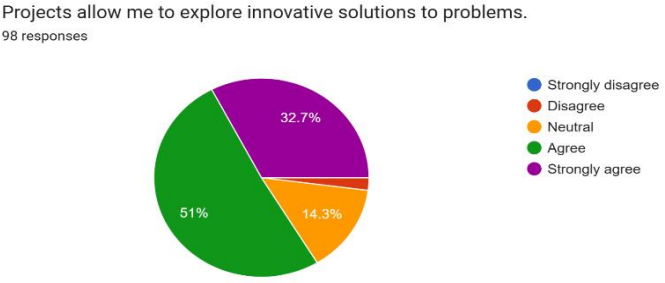
The next statement included the fact that working on projects improves problem-solving skills. Similar to the previous statements, only a minority of students chose the options strongly disagree and disagree. 1% of the students chose to strongly disagree, and another 1% chose the option disagree, whereas 17.3% of the other students were neutral. Nonetheless, the majority of students think that working on projects is actually beneficial,

with 53.1% of the students choosing the option ‘agree’, and 27.6% choosing the option ‘strongly agree’.

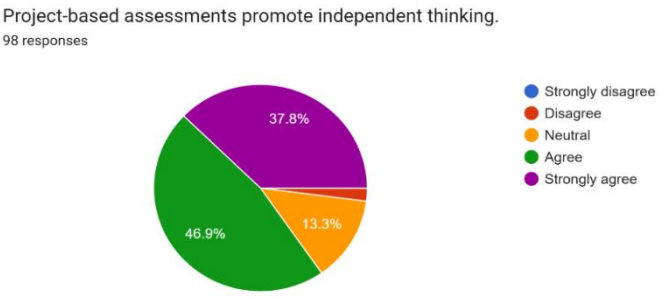


Creativity, Innovation, and Independent Learning in Project-Based Assessment

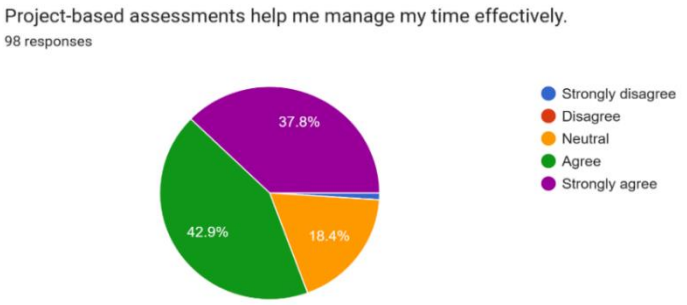
Moving to the next statement, which was “Projects allow me to explore innovative solutions to problems”, we have yet similar answers as the previous ones. None of the students chose to strongly disagree, and only 2% of the others chose the option ‘disagree’. On the other hand, 4.3% were neutral, 51% chose to agree, and 32.7% chose to strongly agree.



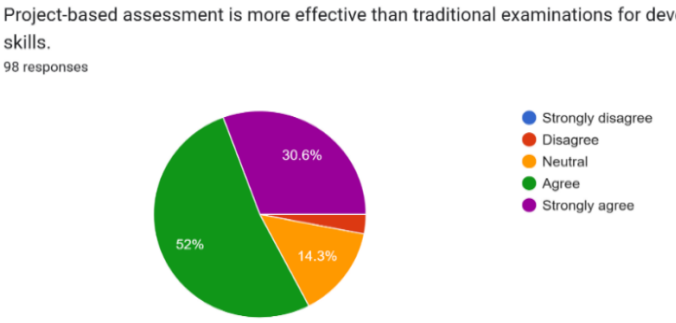
Further, the following statement shows that students mainly agree that project-based assessments promote independent thinking. 37.8% of the students strongly agree with this statement, 46.9% agree, 13.3% were eutral, and only 2% disagreed. Regarding the option ‘strongly disagree’, none of the students chose it.



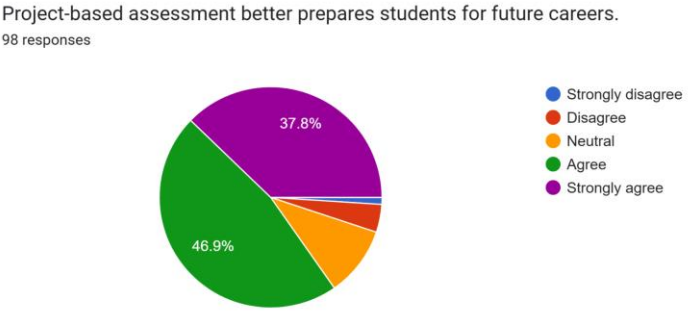
Next, the following statement was related to managing time effectively: "Project-based assessments help me manage my time effectively". Only 1% of the students chose to strongly disagree with this statement, none of them chose to disagree, and 18.4% were neutral. On the contrary, 42.9% chose to agree and 37.8% chose to strongly agree, indicating that this type of assessment helps students manage time in an effective way.



Further, results show that project-based assessment is more effective than traditional examinations for developing practical skills, and regarding this statement, we have no students strongly disagreeing, only 3.1% disagreeing, and 14.3% who are neutral. On the other hand, 52% agree and 30.6% strongly agree, showing a strong opinion and preference toward PBA.



Finally, the last figure shows us students' opinions on PBA better preparing students for future careers. Regarding this statement, 1% of the students strongly disagree, 4.1% disagree, and 10.2% are neutral. Nonetheless, the majority of the students agree with this statement. 46.9% of them chose the option 'agree', and 37.8% chose 'strongly agree', showing us that PBA has an impact and is beneficial for the future as well.



Enhancing Practical Skills and Preparing Students for Future Careers

Furthermore, the last part of this study's results consists of the answers provided by students in the final part of this questionnaire. Considering the fact that the questions were open-ended, the answers will be presented as a summary. The first question was "In your opinion, how has project-based assessment influenced your learning experience?" The most common answers are as follows: "Project-based assessment has improved my learning experience by helping me apply knowledge to real-world situations, develop problem-solving skills, and understand topics more deeply through practical work rather than only memorizing information"; "It allows me to explore independent thinking, using observation methods

to come to a logical critical conclusion"; "Very good". Other students also mentioned that PBA helps them in applying the knowledge they get in real-life as well. "Project-based assessment has improved my learning by helping me apply theoretical knowledge to practical tasks. It has also increased my creativity, problem solving, and research skills"; "It helped me develop practical skills, improve teamwork, and better understand the topics I studied"; "It has definitely improved my grammar and writing skills" are the other answers.

The second question was "What aspects of project-based assessment do you find most beneficial?" Students frequently mentioned teamwork and collaboration among the most beneficial aspects of project-based assessment. The main answers include: "Teamwork and collaboration"; "The most beneficial aspects are teamwork, critical thinking, and the opportunity to connect learning with real life situations"; "The adaptability aspect. You become more adaptable to situations due to it promoting your individual thinking and enhancing problem solving abilities"; "The most beneficial aspects are applying knowledge in practice, developing problem-solving skills, and improving teamwork and creativity"; "The most beneficial aspects are creativity, independent research, problem-solving, and the opportunity to demonstrate my understanding in practical way"; "I find most beneficial the chance to develop critical thinking"; "The most beneficial aspects are time management skills, developing problem solving, communication skills and being creative in general".

The following question was "What challenges have you experienced while completing project-based assessments?" Students mentioned a couple of challenges they face when completing project-based assessments such as time management, coordinating with group members, finding reliable information, understanding project requirements, meeting deadlines, and balancing project work with other academic responsibilities. The main answers to this particular question are as follows: "Finding reliable information"; "The main challenges are time management, coordinating with team members, and balancing project work with other academic responsibilities"; "One of the main challenges I have experienced is managing time effectively, especially when projects require extensive research and preparation. Working in groups can also be difficult when team members have different levels of participation. Additionally, understanding project requirements and meeting deadlines can sometimes be challenging"; "My challenges when completing project-based assessments was my time"; "Challenges include time management and getting used to the new approach as many students are accustomed to traditional form of assessment"; "Some challenges I have experienced while completing

project-based assessments include managing time effectively, coordinating with group members, meeting project requirements, and balancing the project with other academic responsibilities".

Students' Suggestions for Improving Project-Based Assessment

Finally, the last question was regarding the ways project-based assessment should be improved to better support student learning and skill development. Several students mentioned the need for more detailed directions and regular feedback throughout the project process and the following answers that support this are as follow: "Project-based assessment can be improved by providing clearer guidelines, regular feedback, and enough time to complete projects effectively"; "Project-based assessment can be improved by providing clearer instructions, regular feedback, and more support throughout the project process"; "Project-based assessment can be improved by adding more practical and creative activities"; "Can be improved by getting clearer answers and enough time to complete the project"; "It can be improved by providing clearer instructions, regular feedback, and more support from teachers"; "Project-based assessment can be improved by providing clearer guidelines, regular feedback from instructors. Finally, sufficient time and resources were also mentioned in the responses. Students referred to the need for "enough time to complete projects effectively" and "sufficient time and resources to complete projects successfully."

Discussion

According to the findings, students believe that project-based assessment is a good way to improve their critical thinking, problem-solving, and analytical skills. Through project work, they get more actively involved in real-world challenges, assess information from many sources, and apply their expertise to find appropriate answers. These findings correspond with Nguyen (2021), who discovered that PBA helped pupils develop the same skills. The findings also imply that project-based assessment takes students beyond simple memorization by requiring them to analyze material, evaluate multiple options, and make decisions throughout the learning process. Goyal et al. (2022) provide more evidence for this interpretation, emphasizing critical reasoning, analytical investigation, discovering interpretation, complicated problem-solving, and examination of alternate answers. It also incorporates the broader cognitive competencies highlighted by Voogt & Pareja Roblin (2012) as critical 21st-century skills. To summarize, students appear to recognize the greatest gains in information processing and problem solving, although the growth of critical

thinking may be less obvious for other students and may necessitate more explicit instruction and evaluation.

Further, the findings show that project-based assessment can foster creativity and innovation by allowing students to evaluate many approaches and design their own solutions. Instead of being constrained to a single method, students are given the opportunity to test ideas, make decisions, and investigate other ways of accomplishing their tasks. Students' perceptions that project work provided them with the freedom to try new ideas and build their own solutions are consistent with the findings of Ramdani et al. (2021) and Izzah and Diana (2021), who related project-based evaluation to the development of creative thinking. The current study's findings also imply that this type of evaluation promotes independent thinking by pushing students to make their own judgments, decisions, and accept greater responsibility for how they finish a task. These outcomes align with the results provided by Sunarso et al. (2020), who found that project work promoted active and independent learning through experimentation, inquiry, and self-directed discovery. In addition, the higher level of responsibility students took for making decisions, organizing their activities, and managing their learning supports the findings of Prasad & Raturi (2026) and Sa'adah et al. (2022), who linked project-based assessment to enhanced learner independence and self-reliance.

Moreover, the open-ended replies show that students generally thought project-based evaluation was a meaningful and practical learning experience. They valued the ability to apply theoretical knowledge to real-world circumstances, investigate issues more extensively, and demonstrate their mastery via practical activity rather than depending solely on memorization. Students' enjoyment of applying theoretical knowledge to real-world problems backs up Gratchev (2023) and Gratchev and Jeng (2018), who discovered that authentic projects helped students recognize the practical significance of course material. Students cited teamwork, communication, problem-solving, creativity, research, adaptability, and independent thinking as significant advantages of this type of evaluation. These observed benefits are consistent with Venter et al. (2022), who demonstrated that project-based evaluation can help develop competencies that are more valued in the work environment.

Nevertheless, students did not always describe their experiences as favorable. They commonly noted difficulties in managing their time, finding reliable material, coordinating group activities, and dealing with unequal contributions, balancing project work with other academic commitments, and understanding what the tasks required. These difficulties indicate that project-based assessment places a high level of responsibility on students

and may be less successful when expectations are unclear or guidance is limited. These findings are partly consistent with Izzah and Diana (2021), who also reported time-management challenges and highlighted the need for well-structured tasks and adequate support. Even though Gratchev (2023), Gratchev and Jeng (2018), and Venter et al. (2022) mainly focused on the practical and career-related advantages of a project-based assessment, the current study's findings indicate that these advantages are heavily dependent on how well the evaluation is designed and implemented. Students' demands for more concise instructions, frequent feedback, plenty of time and resources, and better guidance from instructors indicate that project-based assessment works best when autonomy is accompanied by a proper framework and guidance.

Limitations of the Study

When evaluating the results, it is important to take into account the many limitations of this study. First, the study only included 98 college students, which can restrict how broadly the findings can be applied to students in different schools, fields, or learning environments. A more comprehensive knowledge of students' experiences with project-based assessment would be possible with a bigger and more varied sample.

Second, students' self-reported perceptions gathered via a questionnaire served as the primary basis for the conclusions. The study did not directly test changes in critical thinking, problem-solving, creativity, or other 21st-century skills, despite the open-ended questions offering extra insight into students' experiences. As a result, rather than providing objective proof of progress, the results represent students' perceptions of skill advancement.

Lastly, the study recorded students' opinions at a certain moment in time. Through repeated exposure to project-based evaluation over an extended period of time, a longitudinal approach may offer a greater understanding of how these skills evolve.

Conclusion

This study investigated how project-based assessment aids in the development of students' 21st-century competencies. In general, students found it to be an effective and useful technique that encourages critical thinking, problem-solving, analytical skills, creativity, independent and self-directed learning, practical skills, and career preparation. Regarding critical thinking and problem-solving, the findings show that project-based assessment allows students to work on real-life problems, gather information from many sources, examine potential solutions, and apply

their knowledge in practical circumstances. Students appeared to benefit the most from problem-solving and information analysis, whereas developing critical thinking may require more structured reflection, guidance, and feedback.

Project-based assessment also appears to promote creativity and learner independence by allowing students to evaluate alternative approaches, make their own judgments, organize their work, and take responsibility for their success. Students valued the ability to combine theoretical knowledge with practical activities, and they identified teamwork, communication, research, adaptability, and independent thinking as major benefits. These abilities can help students transition more comfortably from academic learning to the demands of future professional life. Students did, however, confront a number of challenges, including time management, group work coordination, unequal contributions from team members, unclear task requirements, and difficulty accessing reliable materials. These issues suggest that project-based assessment works best when students are given clear instructions, adequate support and resources, and regular feedback throughout the process. In conclusion, when properly developed and supported, project-based assessment can be a useful alternative or addition to traditional exams.

In conclusion, the results indicate that project-based assessment can serve as a valuable alternative or enhancement to conventional assessment methods. When projects are accompanied by clear guidelines, suitable support, adequate time and resources, and ongoing feedback, they can offer students significant opportunities to utilize their knowledge and cultivate skills pertinent to both academic pursuits and future careers. Since this study mainly reflects students' perceptions, future research could use direct measures of skill development to provide more robust evidence of how project-based assessment contributes to 21st-century skills.

Disclosure statement

No potential conflict of interest was reported by the author.

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