Embracing Project-Based Assessments in the Age of AI in Open Distance e-Learning

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***Abstract*—Even while Artificial Intelligence (AI) has long been a part of our lives, it has recently received more attention thanks to the Chat Generative Pre-Trained Transformer (ChatGPT) introduction. Since its launch in November 2022, writers have discussed its advantages and disadvantages for society. Considering the various applications of this easily accessible instrument, a significant discussion centres on how it affects learning and the academic setting. This paper discusses using ChatGPT for project-based assessments in online teacher education. Therefore, this paper aims to guide lecturers using ChatGPT to challenge students in learning and developing critical thinking abilities through various project-based evaluation methods. The constructivist paradigm was used in this exploratory case study to assess lecturers' preparedness for project-based assessment, aligning with a qualitative approach. Twelve lecturers with at least five years of Open and Distance e-learning (ODeL) experience were purposefully selected, and data was gathered via e-mail questionnaires focused on project-based assessment. Inductive analysis, a qualitative researcher synthesising and making sense of the data, was used to evaluate the questionnaire-transcribed data. Assessment is a necessary teaching skill, one of the most important critical aspects of teacher preparation. More emphasis on project-based evaluations that emphasise knowledge application should replace traditional, memorisation-based exams. Through project-based learning, students can show that they can apply what they have learned and engage in critical and creative thinking. Findings reveal that academic institutions and individual scholars must prioritise exploring AI technology, such as ChatGPT, and its implications within educational contexts. Moreover, project-based assessments are highly effective in fostering critical and creative thinking. These assessments encourage students to solve problems, collaborate, and apply theoretical knowledge to real-world scenarios. However, many students lack proficiency in project-based skills and struggle to apply knowledge from traditional resources to develop new ideas. Academic institutions should incorporate generative AI technology alongside project-based learning methodologies to prepare students for the rapidly evolving workplace. This approach promotes creative and critical thinking, collaboration, and the practical application of knowledge.**

***Keywords*—artificial intelligence, ChatGPT, critical thinking skills, online assessment, project-based assessment, teacher training**

I. Introduction

Our technologies are progressing faster than our wisdom! Even though Artificial Intelligence (AI) has long been a part of our lives, the introduction of ChatGPT has brought AI back into the spotlight. Authors have discussed its positive and negative effects on society since its debut in November 2022 [1]. 2023 will go down in history as the year that Artificial Intelligence (AI)—more significantly, large language models, or LLMs—and their brazen poster child, ChatGPT, revolutionised everything [2]. Considering the various applications of this easily accessible instrument, one of the most critical discussions is on its disruptive effects on learning and the academic setting. Education and innovation experts have, however, urged lecturers and other education stakeholders to think again, arguing that since ChatGPT and other generative AI tools are here to stay and are part of young people's lives, ways must be found to integrate those technologies into educational settings. To deny our students these technologies – to withhold them from them in assessments – is not helpful, as we are not preparing them to remain students. Technologies are there to help us be better at our jobs [3].

The implications of using ChatGPT for assessment in higher education raise concerns related to plagiarism and ethical issues. However, according to Saunders [4], generative AI technology can benefit students and lecturers in both assessment and traditional pedagogical situations. If students utilise ChatGPT to create unique situations to which their exams would reply, academic users may find it helpful for creating scenarios for real-world, case study-based assessments. Because the assessment is unique and student-generated, this helps to ensure its validity and guards against plagiarism and other violations of academic integrity.

More emphasis on project-based evaluations that emphasise knowledge application should replace traditional, memorisation-based exams. Through project-based learning, students can show that they can apply what they have learned and engage in critical and creative thinking [5]. Students can exhibit their capacity to apply learned material and think critically and creatively through Project-Based Learning (PjBL). Educators worldwide support PjBL as a critical approach to content mastery, critical skill development, and the development of personal agency necessary for meeting obstacles in life and making a positive impact on the world. Critical thinking is the capacity to evaluate information and make decisions effectively [6–8].

There are various benefits to using a language model such as ChatGPT in online assessment processes. According to Cyrus [9], automatic assessment facilitates prompt examination of students' responses, offering instant feedback and alleviating teachers' workload. Additionally, ChatGPT can be tailored to each student's needs, providing individualised assessments according to different learning styles and proficiency levels [10]. The time and money savings that come with automatic classification are very helpful to educational institutions. ChatGPT may improve online tests with efficient grading, timely feedback, and

customised experiences.

AI-based language models also enhance asynchronous communication, increasing student cooperation and engagement without requiring face-to-face interaction [11, 12]. By creating virtual study groups for assignments and projects, ChatAPIs can promote student cooperation and improve teamwork [13]. Furthermore, ChatAPIs provide remote learning for students who, for whatever reason, cannot attend in-person sessions [14]. These advantages show how ChatAPIs can improve accessibility, teamwork, and student involvement in the classroom.

Although ChatGPT has many benefits, using it for educational assessments has several noticeable drawbacks. Evaluations' impartiality and fairness may be impacted by biased replies from biased training data [15]. Because ChatGPT lacks contextual knowledge, it may respond to complex assessment tasks incorrectly or improperly [16]. Furthermore, higher-order cognitive skills like creativity and critical thinking are complex for AI-driven systems to evaluate [15]. Additionally, ChatGPT lacks emotional intelligence and common sense, which might result in illogical or inconsiderate responses [17–19]. Its inability to produce long-form content and use humour and sarcasm further restricts its usefulness [17–19]. Finally, problems such as possible biases, incomplete information, and technical difficulties emphasise the necessity of critical analysis and additional assessment techniques [20].

This paper reframes the discussion of ChatGPT's impact on teacher preparation and education, particularly regarding online assessment. The research question is: what is the feedback from lecturers when using ChatGPT in ODeL to develop critical thinking abilities through project-based assessment methods? Thus, this paper aims to guide lecturers on using ChatGPT in online project-based assessments to encourage students to learn and grow their critical thinking abilities.

II. Conceptual Framework

A. ChatGPT in Online Assessment

The emergence of AI by digital technology offers enormous potential for transforming teacher training methods in Open Distance and Electronic Learning (ODeL) institutions [21]. ODeL is a form of education provision that uses contemporary technologies to enable varied combinations of synchronous and asynchronous communication among learners, students, educators, or lecturers who are physically separated from one another for part or all of the educational experience [22].

Assessment is a necessary teaching skill, one of the most critical aspects of teacher preparation. Rethinking assessment techniques is crucial to effectively assess student learning and progress, as seen by the trend toward student-centred and experiential learning approaches [5].

However, the application of generative AI in higher learning raises questions relating to academic integrity. Because ChatGPT may produce essays without giving credit where credit is due, it challenges current plagiarism-detection systems and encourages essay outsourcing. Academic integrity is jeopardised when generative AI presents generated content as original work since it violates ideals like honesty and justice [23].

Hsuan-Tien Lin, a professor in the Department of Computer Science and Information Engineering at National Taiwan University (NTU), the island's leading university for AI research, said that when introducing machine learning to information retrieval or other fields, "we need to be careful in understanding what the technique is about to ensure the best use" [24]. Instead, many researchers rush to use machine learning without comprehensively understanding its techniques and limitations. They may not think clearly about training, validation, and test sets and "end up with a rough instead of a rigorous use of machine learning methods," Chih-Jen Lin said (in [24]). "The phenomenon of rough use of machine learning methods is common and sometimes unavoidable", as Sharma [24] notes. AI moves quickly from research laboratories to real-world applications, yet machine learning models that work well in the laboratory can fail in real-world use, with essential consequences [24].

The rapid integration of machine learning into various fields emphasises the importance of understanding its techniques and limitations to ensure rigorous application and avoid potential consequences in real-world scenarios.

B. Project-Based Learning and Assessments

1) Project-based learning

The foundations of Project-Based Learning (PjBL) can be traced back to the contributions of the philosopher and educator John Dewey [25], who is recognised as its pioneer by certain scholars [26, 27]. Dewey posits that students develop a vested interest in learning when they tackle "real, meaningful tasks and problems that mirror the work of experts in real-world scenarios" [28]. According to Kwietniewski [29], Dewey suggests that students will thrive in learning environments where they interact with both the curriculum and socially and where experiential learning is emphasised. Dewey's theories advocate for lifelong learning, in which learning unfolds through a learner engaging in real-life tasks [25, 26].

Educators globally endorse PjBL as a crucial instructional approach that fosters content mastery, cultivates skills essential for future endeavours, and nurtures the personal agency required to confront life's challenges and contribute to the world [30–32]. PjBL entails an inquiry-based instructional approach [33, 34] that involves students in "constructing knowledge through meaningful projects and creating real-world products" [34], presentations, or performances within a specified timeframe [33].

These projects typically entail students researching complex problems, questions, or challenges as extensions of classroom learning and presenting their findings in project form [35]. A collaborative learning environment is fostered where students work in teams or pairs under the guidance of an educator, facilitator, or mentor [36, 37]. Krajcik and Shin (2014) in [38] delineate the following six key elements of the PjBL environment: (1) a driving question, (2) a focus on learning goals, (3) engagement in educational activities, (4) collaboration, (5) scaffolding with learning technologies and (6) the creation of tangible products.

PjBL also encompasses learning activities centred on

students [39], integrating real-world problems and practices [40]. Cooper, DelliCarpini, Fyfe and Nguyen [41] and Guo *et al.* [34] posit that PjBL involves using settings and instructors or community members (i.e., clients) as facilitators to help students apply their learning to challenging problems and develop creative problem-solving skills within authentic contexts. It incorporates soliciting client feedback and student reflection on projects to enable knowledge transfer to other contexts [41].

Moreover, in PjBL, students investigate significant questions, gather information, and engage in critical thinking [42]. This approach allows learning driven by interest and motivation as students apply new knowledge to problem-solving contexts [36]. Fini, Awadallah, Parast, and Abu-Lebdeh [42] assert that PjBL enables diverse student groups to collaborate on solving practical problems and presenting and defending their approaches and solutions, promoting intellectual and social development. In addition, it necessitates active student participation in knowledge acquisition, improving communication and interpersonal skills and enhancing leadership and creativity [42].

Hence, PjBL, rooted in Dewey's [25] philosophy, emphasises assigning real-world tasks to foster students' interest and learning agency. It integrates inquiry-based approaches, collaborative environments, and authentic problem-solving, promoting intellectual and social development while nurturing essential skills for future undertakings.

2) Project-based assessments

Project-based assessments enable students to showcase their capacity to apply acquired knowledge and engage in critical and creative thinking [5].

Traditional methods of teaching and learning are significantly impacted by Artificial Intelligence (AI), and this development has led to a change towards more experiential and student-centred instruction. One example is PjBL, which pushes students to use their knowledge and abilities to solve real-world problems and projects. Thus, PjBL gives pupils a context for their abilities and enables them to comprehend how to apply them in daily life [5].

As a student-centred pedagogy, PjBL is a dynamic classroom approach that enables students to gain more profound knowledge by actively examining current issues and difficulties. Students learn about a subject by devoting significant time to researching and solving a challenging question, challenge, or problem. The shift towards project-based assessment promotes critical and creative thinking skills by emphasising the application of knowledge in real-world contexts. It is an inquiry-based, active learning approach. PjBL poses questions, challenges, or scenarios in contrast to teacher-led education or paper-based, rote memorisation that offers predetermined facts or presents an easy road to knowledge.

A key component of curricular studies and design education is project-based assessment, the method used to evaluate students' performance in the subject. Students must complete several design tasks using the project information to provide design solutions. The assessment focuses on introspection and evaluations of oneself and others. Kokotsaki *et al.* [39] indicate that regular monitoring and recording of evidence of development is necessary.

A student-centred approach, project-based learning encourages the active exploration of complex questions and challenges, fostering more profound understanding and skills development through inquiry-based methods and reflection.

3) Lecturers' experiences in online assessment using ChatGPT

AI-driven grading and scoring solutions have improved examinations' objectivity, effectiveness, and scalability. They have mostly proved helpful in large classes, where manual grading can be labour- and time-intensive.

On the other hand, depending only on AI for assessment may result in a lack of rich, customised feedback and human connection, both essential for students' growth and development. Concerns exist over the fairness and correctness of AI-powered assessment instruments, especially regarding subjective assignments like essay writing [5]. Thus, instructors can use ChatGPT in various ways to push students to learn and hone their critical thinking abilities.

First, questions like "How could you tackle this new challenge using your prior knowledge and skills?" are a good starting point, and questions like "What tactics would you employ to overcome any obstacles?" challenge pupils to apply critical thinking and problem-solving skills. Second, instructors can periodically evaluate their students' abilities and pinpoint areas for development by using ChatGPT to design quizzes and assessments that gauge students' comprehension of the subject matter. Third, ChatGPT may create unique lessons based on each student's needs and skill level, giving them progressively more challenging assignments to push themselves. Furthermore, ChatGPT can produce excellent solutions to tasks and assignments, giving students access to high-quality models [5].

Thus, AI-powered grading solutions have improved assessment objectivity, speed, and scalability, especially in big classrooms. However, relying too much on AI for assessment could reduce the individualised input important for students' development. This raises questions about accuracy and fairness, particularly regarding subjective tasks like essays. By asking difficult questions, designing customised tests, and offering excellent examples, lecturers can use ChatGPT to promote critical thinking in their students. This will enhance their learning experiences and help them build their skills.

III. Research Methodology

This qualitative study aims to support project-based assessment by assisting lecturers in pushing students to learn and build critical thinking abilities through various ChatGPT applications.

The constructivist paradigm was used in this exploratory case study research, which was judged pertinent to the study since it helped the researcher assess how well-prepared lecturers were to carry out project-based assessment. Mertens [43] points out that the constructivist paradigm, which aims to comprehend the complex domain of the research participants, is consistent with qualitative data-collection

techniques like observations, interviews, document reviews, and open-ended questionnaires. The researcher sought to interpret, characterise and report on the lived experiences and perspectives of the lecturers who participated in the study by conducting an interpretative inquiry [44].

The research was conducted over three months. This study occurred within the largest ODeL institution in South Africa, which plays a crucial role in training most of the country's teachers. The ODeL model provided a flexible and accessible environment for the research, allowing for an in-depth exploration of educational practices and teacher development within the unique context of distance learning. This exploratory inquiry aims to gather and analyse feedback from lecturers' thoughts on using ChatGPT in ODeL environments to enhance students' critical thinking abilities through project-based assessment methods.

A purposeful selection process was used to choose 20 participants who were knowledgeable about the topic. They needed to have taught in an ODeL setting for at least five years to meet the requirements. Following this institution's distant learning delivery model, data was gathered by e-mailing open-ended questionnaires to the participants. The questionnaire with 15 questions (see Appendix), sent to 20 lecturers involved in ODeL, featured three headings: online assessment, project-based assessment, and how lecturers can develop critical thinking skills using ChatGPT. Twelve questionnaires were returned. Given space limitations, the researcher focused on the second theme only, namely project-based assessment.

Inductive analysis, a qualitative researcher synthesising and making sense of the data, was used to evaluate the questionnaire-transcribed data [45]. After carefully reviewing the data, the researcher looked for trends and classifications. The latter helped define the overarching themes from the gathered information. The researcher who performed the coding is experienced in qualitative research, with a solid background in qualitative methodologies, data analysis, and interpretation. This expertise ensures that the coding process is conducted with a high level of rigour and attention to detail, adhering to best practices in qualitative research.

The reliability of the qualitative data analysis was necessary for the researcher. The credibility, transferability, dependability, and confirmability of qualitative content analysis are the standards Collins and Hussey [46] suggest using to assess its reliability.

Credibility is the degree to which the research findings are believable; it guarantees that the questions are relevant and consistent with the study's goals [47]. Member checking is used as a qualitative strategy to increase trustworthiness [48].

Validating and confirming the accuracy of the data entails providing participants with preliminary findings [49]. The degree to which study findings can be used in different contexts or with different populations is known as transferability. Although the researcher acknowledged the possibility of transferability, she also acknowledged the contextual and subjective quality of reality; therefore, she refrained from claiming that the same results would hold in all circumstances.

Dependability relates to the stability of data over time. However, since the study acknowledges the subjective and contextual nature of reality, the researcher did not aim to achieve identical findings but instead focused on the stability and consistency of the data within the specific research context.

Confirmability refers to the objectivity of the data, where multiple independent individuals should agree on the accuracy, relevance, and meaning. The researcher ensured confirmability by maintaining transparency and providing clear justifications and evidence for interpretations and conclusions. In this regard, ethical clearance was obtained beforehand from the institution where the research occurred (Table 1).

Table 1. Biographical data of the participants (*n*=12)

Participant	Male/ Female	AGE	Lecturing subject	Highest qualification	e-learning experience	ChatGPT experience
P1	M	50	Hospitality management	PhD (Curriculum Studies)	Moderate	Extensively for teaching and learning
P2	F	48	Curriculum Studies	MEd (Curriculum Studies)	Good, teach fully online	Attended workshops. Using it for clarifying concepts
P3	M	32	General Education	MEd (Curriculum Studies)	Online facilitator	Using it for assessment purposes
P4	M	49	Teaching Methods of Biology	PhD (Curriculum Studies)	Online lecturer and marker	Using ChatGPT to promote and encourage teaching and learning
P5	M	53	Curriculum Studies	DEd (Curriculum Studies)	Good, teach fully online	Using ChatGPT for research and how one can utilise it in the academic environment
P6	F	36	Teaching Methods of Economic and Management Sciences	MEd (Curriculum Studies)	Teach fully online	Using ChatGPT to assist with ideas for setting assessments in an online module
P7	F	62	Open distance learning	DEd (Curriculum Studies)	Experienced, use it daily to teach	Experienced. Conducted research and using it for teaching, learning, and research
P8	F	45	Teaching Practice and Life Orientation	MEd (Curriculum Studies)	Experienced, lecture online module	Experienced. Using it for brainstorming, presentations, and questionnaires
P9	M	39	Computer Applications Technology	PhD (Curriculum Studies)	Online lecturer and marker	Using ChatGPT for one year for research and assessment

P10	M	36	Social Sciences	MEd (Curriculum Studies)	Good, teach and mark fully online	Using ChatGPT for assessment purposes
P11	M	69	Psychology of Education	DEd (Educational Psychology)	Experienced, teaching fully online	Using ChatGPT for research and how one can utilise it in the academic environment
P12	F	48	Curriculum Studies and English	MEd (Curriculum Studies)	Good, teach and mark fully online	Using ChatGPT for research and questionnaires

IV. Findings and Discussion

Twelve questionnaires were returned. Six males and six females took part in this research. Most of the participants were in the age group of 35–55 years. The participants were lecturers experienced in e-learning, specifically within ODeL environments. All participants had significant experience teaching fully online courses and were well-versed in various digital tools and platforms facilitating remote education. The participants in this study are experienced users of ChatGPT who have used the tool for teaching and learning in an online environment. They have attended workshops to enhance their understanding of ChatGPT and have utilised it in various capacities, including clarifying concepts, brainstorming, setting assessments, and conducting research. Their experience spans using ChatGPT for developing presentations, creating questionnaires, and generating ideas for online modules, demonstrating a comprehensive integration of the tool into their teaching, learning, and research practices.

Inductive analysis was used to examine the transcribed questionnaire data. After examining the data, the researcher looked for trends and classifications. The research aims are aligned with the research findings presented here. The empirical data led to the emergence of categories categorised under the paper's theme, project-based assessment. The findings are categorised according to the determined topics; participant expressions are represented through verbatim quotations, and the data are then analysed and connected to the literature and theoretical framework.

The following categories emerged from an analysis of the data: (1) Students' ability to apply acquired knowledge through project-based assessment and think critically and creatively; (2) students' problem-solving skills; (3) thinking critically about the subject matter; (4) and strategies or approaches educators can use to design project-based assessments. Each of these categories is discussed below.

Students' ability to apply acquired knowledge through project-based assessment and think critically and creatively

A 50-year-old male participant stated the following:

Project-based assessment plays vital in enhancing students' capacity to apply acquired knowledge while fostering critical and creative thinking. It requires students to synthesise information from various sources and disciplines, encouraging them to apply what they have learned in a real-world context. The need to design, plan, and execute a project necessitates students' critical thinking as they must make decisions, solve problems, and evaluate their choices throughout the project process.

A 48-year-old female participant explained:

It helps students to apply their knowledge to the real-life context, thus assisting the[ir] understanding of how academic concepts relate to the world around them.

A 53-year-old male participant stated:

This instructional approach, which encourages students to become independent workers, critical thinkers, and problem solvers, may enhance their critical thinking skills in various ways.

A 36-year-old participant noted:

Projects allow students to meet the outcomes and solve problems in a manner that best suits their personal learning methods and needs. They can find a variety of ways to do the project, and this promotes their problem-solving and creative thinking abilities.

A 62-year-old female noted:

Experience in project-based assessment will enable them to apply the skills gained in the workplace.

Another participant, aged 45, explained:

Students have a longer timeframe to work with project-based assessment rather than online assessment. This will encourage their involvement and engagement in the project. If the project-based assessment also has a groupwork component, then the students will have the opportunity to learn from each other through collaboration and the sharing of ideas.

According to a 39-year-old male participant,

it encourages students to work independently, think critically and be problem-solvers and urges them to form questions of their own.

A male participant, 69 years of age, noted:

Project-based assessments focus on practical, real-life problems and apply them in everyday life.

The participants emphasised the value of project-based assessment in fostering critical thinking, problem-solving, and the real-world application of knowledge, highlighting its role in promoting independence and collaboration among students of various ages and backgrounds. They emphasised its ability to facilitate a deeper understanding of academic concepts and students' acquisition of workplace skills, advocating for its longer timeframe and group work components to enhance student engagement and learning. This aligns with Viljoen's [5] advocacy of student-centred and experimental learning methods and Dewey's [25] argument that students develop a vested interest in learning when they tackle real, meaningful tasks and problems that mirror the work of experts in actual or reality-based scenarios.

Thus, it was highlighted that project-based assessments enhance students' application of knowledge in real-world contexts, fostering critical thinking, creativity, problem-solving, and independence. The benefits of longer timeframes and group work for deeper understanding and workplace skills were noted, aligning with student-centred

and experiential learning theories.

Students' problem-solving skills

A 50-year-old male participant wrote the following:

Project-based assessments are powerful catalysts for nurturing students' problem-solving skills and fostering innovation. They immerse students in real-world scenarios, presenting them with complex challenges that demand thoughtful solutions. This hands-on approach requires students to analyse problems critically and strategise effectively. When students work on projects, it often necessitates [them] to collaborate, exposing them to diverse perspectives and ideas, which can stimulate innovative thinking. The iterative nature of project-based assessments encourages students to learn from their mistakes, adapt their strategies and refine their problem-solving skills, instilling a growth mindset vital for innovation.

A female participant, aged 48, stated:

Active involvement fosters a deeper level of understanding and retention of knowledge.

A male participant, aged 49, noted:

Since the assessment is a project-based [one], the students must think [about] how to solve the problem while each of them must come up [with] solutions, they will discuss them and adopt the most appropriate one.

A male, aged 53, responded in telegram style:

Practical activities and engagement may lead to hands-on experiences. Development of higher-order thinking skills, such as problem-solving, creativity, and interpretation. [The] timeframes allowed ensure prolonged involvement upon completion. It is a learning approach that sometimes involves other subjects and disciplines, which provide a holistic learning experience. Working together on a project may lead to teamwork, [and the] improvement of communication and social skills. It requires (normally) feedback and thus presentation and communication skills [and] provides opportunities for self-reflection and self-assessment.

A female, aged 62, stated:

Problem-based assessment is part of the skills students will need in the workplace. If they are exposed to such skills, it will enable them to work with others to solve problems in the workplace.

A 45-year-old female stated the following:

If the project-based assessment is based on real-life problems, then it will encourage students to think innovatively to solve these problems by reflecting on their own life experiences.

According to a 36-year-old female participant,

Students are given actual problems or real-world difficulties to tackle as part of project-based assessments. For them to come up with workable ideas, this calls for critical and creative thinking. Open-ended requirements are common in project-based assessments, allowing students to experiment with different strategies and approaches. As a result, students are encouraged to consider unconventional ideas critically and creatively. To achieve the project's requirements, students must conduct research, assess data, and consider a variety of [various] perspectives. This procedure enhances their capacity to solve difficulties and make wise decisions. Projects frequently require teamwork, which promotes collaboration and communication of ideas. Students who brainstorm together and build on each other's ideas come up with [develop] innovative solutions. Project-based learning gives students the freedom to try out novel ideas and take calculated chances. In addition to inspiring original thought, this helps pupils get over [overcome] their fear of failing. Student teachers are free to experiment with new ideas because they oversee the project. This sense of ownership motivates them to use their imaginations and take care of their own education.

In the words of a 69-year-old male participant,

It requires new ideas and out-of-the-box thinking.

Project-based assessments immerse students in true-to-life scenarios, fostering critical thinking, collaboration, and problem-solving skills, which are essential for innovation and workplace success. This hands-on approach encourages students to think creatively, experiment with new concepts, and overcome their fear of failure, leading to deeper understanding and a sense of ownership in their learning process. This is consistent with the literature that indicates that a collaborative learning environment is fostered when students work in teams or pairs under the guidance of an educator, facilitator or mentor [36, 37]. Additionally, in PjBL, students investigate significant questions, gather information, and engage in critical thinking [42].

Consequently, project-based assessments immerse students in real-world scenarios, enhancing their problem-solving skills through critical thinking, collaboration, and innovative approaches.

Think critically about the subject matter

As a 50-year-old male participant stated:

For project-based exams, students must conduct extensive research using material from academic journals, textbooks, websites, and real-world experiences. To develop a comprehensive grasp of the topic at hand, this technique necessitates the synthesis of multiple bits of information. Students are required to critically analyse, evaluate, and interpret the information obtained while they work on their chosen projects. This includes determining the reliability of sources, identifying biases, and reaching sound conclusions. Also, the nature of project-based assessments necessitates students' creative thinking to solve complex problems. The requirement to design and execute a project often pushes students to devise innovative solutions and original approaches.

According to a 48-year-old female participant,

students are encouraged to go out [and] seek information through interviewing people [about] the specific phenomenon […] Students can search the internet to get information regarding the phenomenon.

A 32-year-old male participant indicated that

The collective contributions of different members and the synthesis of gathered information have the potential to inspire students to delve deeper into their existing knowledge and encourage them to contribute even more than they already have.

As noted by a 53-year-old male participant:

Research and investigations remain an excellent manner to explore multiple sources such as books, articles, websites and interviews. Students need to be encouraged to be inquisitive and deepen their understanding of and foster creativity. This

can be done through brainstorming and keeping an idea journal of [on] the specific subject. They may also use mind mapping or concept mapping that forms part of the data-collection process for such [a] journal.

According to a 45-year-old female participant:

Here again, I think it is the actual question or task that will encourage students to integrate information from various sources, think critically about the subject matter, and develop original ideas.

A 39-year-old male participant stated that

students can develop their critical thinking skills in their respective subjects by solving real-life problems in their respective societies. They need to be taught that knowledge is about accessing various sources and coming [up] with [an] informed decision [o]n any problem they are trying to solve.

As noted by a 36-year-old female participant:

The task of combining data from several sources and critically evaluating the accuracy and reliability of each source is put before the students. This blending of knowledge aids their development of a thorough comprehension of the subject. Complex issues or challenges that call for critical thought frequently arise during projects. Before coming up with their ideas, students must conduct a critical analysis of the problem, pinpoint the main problems and consider many viewpoints. Students are encouraged to use their imagination and come up with unique solutions to the projects' problems, as they are assessed through projects. It encourages a sense of ownership and pride in their work because they are allowed to [can] experiment and invent. The knowledge and abilities that students have learned are to be applied to real-world situations.

Students engage in project-based assessments that necessitate thorough research involving diverse sources, promote critical analysis and creative problem-solving, and foster deeper understanding and originality. By encouraging students to integrate information, think critically, and develop original ideas, educators emphasise the importance of accessing various sources and applying knowledge to real-life problems, fostering a sense of ownership and pride in their work while promoting the application of learned skills in practical scenarios. This is consistent with the body of research indicating that PjBL is a dynamic classroom approach-focused, student-centred teaching. It is thought that when students actively investigate real-world issues and obstacles, they learn more deeply. With PjBL, students gain knowledge of a subject by devoting significant time to researching and solving a challenging question, challenge, or issue. It represents an inquiry-based, dynamic learning approach. Project-based assessments require students to conduct extensive research, critically analyse information from diverse sources, and develop original ideas, promoting a deeper understanding of the subject matter.

Strategies or approaches educators can use to design project-based assessments

As explained by a 50-year-old male participant:

The project can be designed by the lecturer or tutor around challenging, real-world problems or scenarios requiring students to critically evaluate and synthesise information gathered from various sources, to formulate solutions. Moreover, it is important to incorporate opportunities for student choice and autonomy within the project, allowing them to exercise creativity in selecting project topics and approaches. This will allow students to feel that they are part of the design of the project and may ensure that [they] are more invested in the project. Lecturers and/or tutors should provide clear assessment criteria and rubrics that emphasise critical thinking skills such as analysis, evaluation, and problem-solving, as well as [and] creativity in problem-solving and innovation, ensuring that these abilities are evaluated explicitly. Encouraging collaboration and peer feedback during project work not only promotes critical discussion but also exposes students to diverse perspectives, fostering creativity.

As a 32-year-old male participant noted,

reflective writing can be used as a strategy for developing critical thinking and creative skills.

A 49-year-old male participant stated that

the questions should be open-ended, the students should be encouraged [to] apply the knowledge and skills they derived or acquired in their classroom, and […] allowed to have their own methods to provide solutions.

According to a 53-year-old male participant,

assessments that are authentic and stimulating [are needed]. Assessments that allow students to express their ideas, thoughts and emotions can be fulfilling. Activities that promote social interaction, such as collaboration and group work [are vital]. Ample opportunities for collaboration [will] allow for interaction, communication and peer/group learning.

A 36-year-old female participant pointed out

the need to make topics relevant and valid, interesting and subject-specific.

A 45-year-old female participant indicated that

educators could design their project-based assessments to be conducted in a group. The strategies or approaches used must include research, gathering data from various sources, analysing this data and presenting it in innovative ways, such as through rap, poetry, drama, etcetera.

A 39-year-old male participant believed that

educators should keep their lessons and assessments real and authentic. They must insist on skills development and encourage their students to be independent and collaborate to share their knowledge and skills.

A 36-year-old female participant stated that

projects could be organised around open-ended issues or difficulties that have a variety of potential answers. As students weigh [up] the advantages and disadvantages of each solution, this would enable them to consider other viewpoints, analyse various approaches and develop critical thinking abilities. Projects could be situations or problems from the real world that call for creative solutions. This places the task in context and encourages students to think creatively while considering the real-world applications of their ideas. Educators could create projects that lead students through a defined method for solving problems. This procedure could include phases like defining the issue, doing research, generating ideas, creating prototypes, conducting tests and improving solutions. Critical thought and innovative input would be needed at every stage. Educators could also develop clear and comprehensive rubrics that

explicitly outline the criteria for assessing critical thinking and creative abilities.

Educators should design projects around actual pertinent problems, incorporating student choice and autonomy to foster their creativity and investment or engagement. Clear assessment criteria, collaboration and peer feedback are essential for promoting critical thinking, innovation and diverse perspectives in PjBL. These findings are consistent with a statement by Kokotsaki et al. [39], who emphasise assessment through reflection, as well as self- and peer evaluation. It is imperative to regularly monitor and record evidence of progress. Viljoen [5] argues that ChatGPT can generate differentiated assignments tailored to each student's needs and abilities, offering increasingly complex tasks to challenge individual students. Furthermore, ChatGPT can provide examples of high-quality responses to assignments and tasks to furnish students with exemplary models.

Examples of project-based assessments and recommendations

Considering the participants' contributions, this research provides examples and recommends project-based assessments that challenge students to demonstrate their critical thinking and creativity in different subjects.

Within hospitality education, for example, students must demonstrate critical thinking and creativity to develop the essential skills needed for success in the industry. Professionals in this dynamic business must be able to quickly adjust to shifting global trends, technological advancements, and guest preferences. Students who use critical thinking skills are better equipped to assess complicated situations, decide wisely, and solve problems that can come up in the quick-paced hospitality industry. Creativity is crucial in the hospitality industry since it enables students to design distinctive guest experiences that set their businesses apart from competitors. Creative thinkers can also better come up with original answers to common industry issues, including eco-friendly procedures, improvements in customer support, and efficient operations.

For instance, in language classes, students can demonstrate their critical thinking abilities by gathering materials to create an evidence portfolio. This can include reading activities (e.g., exciting reading materials) or a collection of their writing activities (e.g., stories, poems, or essays). They may compare different reading texts and, by doing so, enhance their ability to analyse texts critically.

Students may be given case studies specific to the module outcomes and a South African context, for example, in an Economics and Management Sciences classroom in an under-resourced school (where there is a problem with overcrowding). They may be required to explain how they would teach a lesson (design a lesson plan) about Supply and Demand or asked to design relevant assessments for those learners. Lecturers might assign students a project to address or alleviate challenges (in the hypothetical scenario depicted above), compel them to think critically about the challenges encountered in many local classrooms and apply creative thinking in solving related problems.

In a school subject such as Life Orientation, teachers might challenge learners to look at their environment and identify a problem that needs fixing or correcting. Then, they might devise a plan to solve that problem by involving their peers, the school community and their parents.

ICT and innovation projects may allow students to express their creativity and collaborate on their work.

Students may be assigned a project in the Social Sciences to write a historical documentary about a particular period or event. They could conduct thorough research, carefully evaluate historical views, and look through primary sources. Through their documentary, students must show they can study historical events and use multimedia elements to express their conclusions creatively.

They might also be assigned a project involving a conversation on a worldwide issue, such as human rights, poverty, or climate change. They would have to assess the evidence, create compelling arguments, and conduct in-depth investigations into both sides of a disagreement. Students must critically analyse complex global concerns and present persuasive arguments for this project.

A project involving commercial issues could serve as another illustration. Teams of students might be formed, and each team would be given a budget to launch a fictitious company. They would be required to create a business plan, study the competitors, gather market data and develop an original value proposition. This endeavour would require creativity in creating novel products or services and critical thinking in strategic business decisions.

Usually, research that effectively challenges students is needed to complement project-based assessments that cover many facets of the course material.

V. Conclusion

Academic institutions and individual scholars must investigate generative AI technology, ascertain its constraints, contemplate its possible applications to their fields of study or instruction, and engage in dialogue with their students.

Project-based assessments often foster creative thinking in pupils by providing novel methods for problem-solving and designing solutions. Students working on practical projects are more open to trying out new ideas and concepts, which helps them develop their creative thinking. Additionally, cooperation is typically required for project-based evaluations, which fosters collaboration and communication skills—two things that are essential for critical and creative thinking. Finally, project-based learning offers a dynamic platform for students to acquire the cognitive and practical skills necessary to thrive in today's rapidly evolving workplace. According to the researcher, many students lack project-based abilities and find it challenging to apply the knowledge they learn from online resources like research papers and even books. They also struggle to use this knowledge to build or enhance their ideas and ways of thinking.

Project-based examinations usually present students with challenging, open-ended scenarios that require critical thinking. They must evaluate available options, perform informational analysis, and draw well-informed judgements. This enhances their ability to think critically, balance advantages and disadvantages and arrive at reasonable conclusions.

Problem-solving is a fundamental component of project-based assessment. Students will face difficulties and setbacks during a project, forcing them to formulate solutions.

The collaborative nature of many projects encourages effective teamwork and communication. Students learn to collaborate, share ideas, delegate tasks, and manage conflicts. They must put their newly acquired information to work in meaningful and applicable ways to pass project-based assessments. In this way, they are forced to apply theoretical ideas to existing situations by working on projects that mimic real-world scenarios, thus deepening their grasp of the material.

Iterative project development processes, where students receive feedback and revise their work, can enhance critical thinking and creativity as they reflect on and refine their ideas.

Overall, this study explores how ChatGPT can be integrated into teaching and learning processes. It focuses on the lecturers' perceptions of its effectiveness, potential benefits, and challenges when used in project-based learning and to foster critical thinking skills in an ODeL setting.

By extending these principles beyond the ODeL context at a specific institution, other academic institutions and learning environments can benefit from integrating generative AI technology and project-based learning methodologies. This holistic approach enhances students' creative and critical thinking skills and better prepares them for the challenges of the modern workforce. Engaging in continuous dialogue, promoting collaboration, and emphasising the practical application of knowledge are vital strategies for achieving these goals.

The study's limitations include the small number of participants, and the researcher does not claim that the findings can be generalised. Additionally, the researcher acknowledges that capturing the experiences and perceptions of students engaging in project-based assessments is valuable and could provide further insights. Another limitation of the study is that participants were not required to input prompts directly, which could have provided a deeper understanding of the tool's potential to enhance learning outcomes. Therefore, additional research in this area is suggested.

Appendix

Questionnaire:

Online assessment

In what ways can the integration of ChatGPT into online assessments enhance the assessment of teacher education and training programs?

What are the potential benefits and drawbacks of using ChatGPT for online assessment in teacher education?

How can ChatGPT effectively assess and evaluate the critical thinking skills of teacher education students in online settings?

What ethical considerations should educators consider when utilising ChatGPT for online assessment in teacher training programs?

How can the use of ChatGPT in online assessment contribute to the professional development of aspiring teachers and improve the quality of their training?

Project-based assessment

How does project-based assessment promote students' ability to apply their acquired knowledge and think critically and creatively?

In what ways do project-based assessments foster students' problem-solving skills and encourage them to think innovatively?

Can you provide examples of project-based assessments that effectively challenge students to demonstrate their critical thinking and creativity?

How does project-based assessment encourage students to integrate information from various sources, think critically about the subject matter, and develop original ideas?

What strategies or approaches can educators use to design project-based assessments that specifically target and assess students' critical thinking and creative abilities?

How can lecturers develop critical thinking skills using ChatGPT?

How can lecturers effectively incorporate ChatGPT into teacher training programs to encourage students' critical thinking skills?

How can lecturers use ChatGPT to stimulate students' curiosity and promote deep thinking in teacher training?

How can lecturers design engaging activities or projects that require teachers to train students to apply critical thinking skills while interacting with ChatGPT?

How can lecturers create a supportive and collaborative learning environment that encourages teacher training students to question, debate, and challenge the responses generated by ChatGPT?

How can lecturers help teacher-training students to transfer the critical thinking skills they develop through interacting with ChatGPT into their future teaching practices?

Conflict of Interest

The author declares no conflict of interest.

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