Design thinking in teacher education and its adoption in crafting assessment tools

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Abstract

This study aimed to explore how design thinking, a human-centered approach, can be used in crafting assessment tools in Teacher Education programs. Its ultimate goal was to develop a teachers' guide for designing assessments based on the design thinking approach. The study employed a descriptive research design to examine the prevalence, depth, and perceived benefits of design thinking within Teacher Education programs. Data were gathered through a researcher-made survey questionnaire administered to 225 respondents, consisting of 18 teachers and 207 students, as well as interviews with randomly selected faculty members to support the findings. The Statistical Package for the Social Sciences (SPSS) was used to analyze and interpret the collected data. The study revealed a high extent of utilization of current strategies and approaches teachers use in designing student assessments (M=3.58), a high level of understanding and appreciation of design thinking among both teachers and students (M=3.77), and a strong perception of the usefulness of design thinking phases in crafting assessment tools (M=3.81). It also highlighted significant discrepancies between the perceptions of the two groups. The findings suggest that incorporating the design thinking phases, empathizing, defining, ideating, prototyping, and testing, into assessment tool development can significantly enhance classroom assessment practices by aligning them with the demands of 21st-century learning. The proposed teachers' guide will be a valuable resource to help educators understand and apply the design thinking approach in crafting effective assessment tools. This guide is expected to benefit not only current faculty members but also future implementers and users.

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1. Introduction

The education systems around the globe are evolving to meet the demands of the 21st century. There is a noticeable shift from traditional memorization techniques to fostering creativity, critical thinking, and problem-solving skills among learners. In particular, there has been growing recognition of the importance of interdisciplinary approaches to education, which blend various disciplines to solve complex real-world challenges. This transformation aligns with broader societal shifts driven by technological advancements and globalization, necessitating innovative teaching strategies to equip students for the future.

Design thinking has emerged as a powerful framework to address the evolving needs of education. Rooted in human-centered problem solving, it emphasizes empathy, ideation, prototyping, and testing to create innovative solutions. In the context of education, design thinking not only enhances the learning experience but also equips students with practical tools to navigate uncertainty and complexity. This study explores the potential of integrating design thinking into educational practices, highlighting its transformative impact on teaching methodologies and student engagement.

The literature reveals extensive applications of design thinking across industries, with growing interest in its integration into educational settings. Empirical studies (Johnson, 2019; Kaoropthai, 2025; Muneer et al., 2025; Alvarado, 2025; Villanueva-Paredes et al., 2024) demonstrate its effectiveness in fostering creativity and collaboration among students. However, there is limited research on the systemic adoption of design thinking in formal curricula, particularly in non-STEM fields. Additionally, while some studies focus on short-term workshops, there is a lack of longitudinal analyses examining the sustained impact of design thinking on student outcomes. This gap underscores the need for further exploration into how design thinking can be holistically embedded in education systems.

This study aims to address the identified research gap by investigating the long-term implications of adopting design thinking as a foundational approach in education. Specifically, it seeks to assess its impact on student performance, creativity, and problem-solving skills over an academic year. By doing so, the study contributes to the existing body of knowledge and provides actionable insights for educators and policymakers. The findings are expected to pave the way for innovative pedagogical practices that prepare students for the challenges of tomorrow.

2. Literature review

2.1 Approaches in Crafting Assessment Tools

In 2014, the National Heart, Lung, and Blood Institute (NHLBI) developed a set of specialized tools to help reviewers focus on critical aspects affecting a study's reliability. These tools were tailored to specific study types and aimed to identify potential flaws in how studies were designed or conducted. Collectively, these efforts underscore the importance of assessment tools being valid, high-quality, and educational—especially when evaluating performance, digital learning resources, and ill-defined problems. The research cited that a positive approach to crafting assessment tools involves the careful consideration of various strategies to ensure effectiveness in evaluating knowledge, skills, and competencies. Effective tools are characterized by their ability to measure desired learning outcomes. Tools discussed include rubrics, electronic exams, paper-and-pencil tests, portfolios, and e-portfolios. The overarching goal was to guide teachers in selecting appropriate assessment methods for their students, suited to 21st-century educational demands.

Assessment tools are essential resources for educators to evaluate student learning. They provide alternatives to traditional exams, supporting active learning, team-building activities, and peer-to-peer engagement. Moreover, they enable real-time monitoring of student progress (Cornell University, 2017). Optimized assessment tools are designed to enhance the effectiveness, fairness, and practicality of assessments, delivering accurate and reliable insights into student learning while promoting inclusivity and equity.

2.2 Design Thinking Approach in Crafting Assessment Tools in Teacher Education

While the adoption of design thinking in education is still emerging, several leading global brands such as Apple, Google, and Samsung, as well as prestigious institutions like Stanford, Harvard, Imperial College London, and the Srishti Institute in India, have embraced the design thinking approach and actively teach the methodology (Dam et al., 2022).

The application of design thinking in crafting assessment tools within teacher education has been explored in several theoretical frameworks. Fisher et al. (2018) and Henriksen (2017) highlighted its potential to address complex educational challenges, including assessment design. They emphasized key elements such as empathy, problem definition, and iterative testing in the development process. Some studies have specifically examined how teachers apply design thinking to assessment development. Bearman et al. (2017) noted that assessment

design is a complex practice influenced by both personal and intellectual factors. Similarly, Bennett et al. (2017) viewed assessment design as an iterative process grounded in learning outcomes and principles of quality teaching. Fisher et al. (2018) further applied the design thinking framework to systemic issues in educational evaluation, reinforcing the importance of empathy, problem framing, and prototyping. Together, these studies emphasize the value of aligning assessment strategies with learning outcomes, particularly when integrating technology.

Design thinking is a human-centered method for solving problems and has found application in various sectors, including education and healthcare. Fisher et al. (2018) demonstrated how design thinking can enhance assessment practices by fostering creativity and deeper learning. In teacher training, it enables the development of more relevant and consistent evaluations. However, the design process is influenced by contextual and professional factors (Bearman et al., 2017), underscoring the need for collaborative and well-planned professional development. Kim (2020) also emphasized the importance of tools that can assess diverse forms of learning and development during the creative process. Llorent-Vaquero (2022) recognized design thinking as especially beneficial in teacher education, promoting both creativity and problem-solving.

Research exploring the role of design thinking in science education has shown it can be effectively applied across various scientific disciplines. Arifin (2021) found that design thinking enhances students' conceptual understanding, practical skills, and attitudes toward science. Similarly, Li et al. (2022) noted that design thinking supports learning across both STEM and non-STEM subjects. Pareja et al. (2021) reported positive outcomes on student motivation, communication, and creativity, reinforcing its value in teacher education.

2.3 Teacher's Guide Development

According to Persaud (2024), a teacher's guide refers to strategies that instructors use to deliver lessons effectively. These strategies, often called teaching strategies, promote student engagement and active learning. When implemented effectively, they help students achieve learning goals. Persaud emphasized that the content of a teacher's guide must align with curriculum standards and be tailored to learners' developmental stages, learning styles, the classroom environment, and the required sequencing of lessons.

To effectively integrate design thinking, educators must first develop a thorough understanding of its principles and processes. This can be achieved through professional development, workshops, or self-guided learning. Establishing a clear assessment goal that aligns with course learning objectives is essential before beginning the design thinking process. The approach emphasizes empathizing with students by collecting data on their needs, perspectives, and feedback through surveys, interviews, or classroom observations. These insights help teachers identify specific assessment challenges, particularly in areas where current practices are ineffective or misaligned with learning goals. The next stage involves brainstorming innovative solutions, encouraging the exploration of diverse assessment strategies. This phase opens new possibilities and supports creativity (Boud, 2014). Ultimately, the teacher's guide should reflect a design-thinking-informed strategy that fosters engagement, innovation, and effective assessment.

2.4 Theoretical Framework

This study is anchored in John Dewey's theory of Progressivism, developed in the 20th century. Dewey's principles remain relevant today, emphasizing experiential learning, inquiry, and student-centered education. His approach aligns with contemporary views that value learning beyond rote memorization and standardized testing (Hmelo-Silver et al., 2018). Progressive education, as envisioned by Dewey, serves as a lens through which public education can be reimagined. When combined with systems theory and design thinking, it presents a methodology for creating innovative educational experiences.

Dewey challenged traditional models of education as mere information transmission. He advocated for learning experiences rooted in students' interests, needs, and real-life contexts. This learner-centered approach supports the creation of inclusive, engaging environments. In today's diverse classrooms, accommodating different learning styles and promoting agency is essential. This aligns well with the iterative nature of design thinking, which involves creating, testing, and refining solutions based on student input.

Dewey's Progressivism also informs assessment practices by valuing experiential and student-centered learning. Assessments grounded in this philosophy prioritize real-world relevance, critical thinking, and the learning process itself. Consequently, such tools may include projects, simulations, and other practical tasks that evaluate students' abilities to apply

knowledge. This mirrors how educators are increasingly using alternative methods for assessment, shifting from standardized tests to more dynamic and holistic strategies.

Meanwhile, Bertalanffy's systems theory provides a structural lens to understand current challenges in education. It conceptualizes schools as systems composed of interconnected parts working toward shared goals. This framework helps explain how changes in one component (e.g., curriculum, teaching methods, evaluation) can affect the entire system. Applying systems theory highlights the importance of coherence among curricular content, assessment tools, teacher preparation, and administrative structures.

Bertalanffy's theory encourages holistic assessment designs that evaluate the "whole student," not just isolated skills. Teachers' guides developed under this lens can include tools such as portfolios, projects, and presentations that demonstrate students' abilities to synthesize and apply learning across disciplines. When systems theory is combined with design thinking, it strengthens the process of creating comprehensive assessment tools. This approach enables the identification of feedback loops that affect overall educational effectiveness—both positively and negatively.

Teachers' and students' perceptions of the usefulness, clarity, and effectiveness of design thinking were essential data points in this research. The integration of Dewey's Progressivism, Bertalanffy's systems theory, and design thinking provides a powerful framework for innovating public education to meet 21st-century demands (Hmelo-Silver et al., 2018). This model promotes a shift from rigid, test-focused education to more holistic, student-centered, and community-oriented approaches that equip learners for real-world challenges (Dweck, 2016).

3. Methodology

This study utilized a descriptive research design to understand how design thinking is integrated within teacher education programs and its application in crafting assessment tools. This methodology allowed the researchers to capture the current state of design thinking implementation and assessment practices by answering the who, what, where, and how of the phenomenon.

The study involved a total of 225 respondents, consisting of 18 teachers and 207 students from the College of Teacher Education at a state university in Lipa, Batangas, Philippines. With the participation of 18 teachers, the study gathered valuable insights from a

representative sample of educators within the College. In addition, randomly selected faculty members were interviewed to support the quantitative findings. This mixed-methods approach allowed for a more comprehensive and generalizable understanding of faculty perspectives on design thinking.

The inclusion of 207 students, specifically those enrolled in the Bachelor of Secondary Education program majoring in English, Science, and Mathematics, ensured that student perspectives were strongly represented in the research. Teachers, as respondents, acted as mediators of the assessment tools. Their experience with current assessment practices provided valuable insights into existing methods and their perceptions of how design thinking could be integrated into the assessment development process. Their input was critical, as teachers are directly responsible for planning and implementing assessments. Understanding their views helped illuminate both the potential and the challenges of incorporating design thinking into current practices.

The questionnaire used in this study was constructed based on information gathered from various websites and resources related to the phases of design thinking and how they can support teachers in developing assessment tools. The goal was also to measure students' appreciation of the design thinking approach. Two versions of the researcher-made questionnaire were created: one for teachers and one for students. The teacher questionnaire consisted of three parts: Part I explored the frequency and perceived usefulness of design thinking in crafting assessments; Part II gathered feedback and suggestions for improvement from faculty members; Part III assessed the teachers' understanding and appreciation of design thinking and their opinions on the usefulness of its phases in developing effective assessment tools. The students' questionnaire consisted of two parts: Part I measured students' understanding and appreciation of the design thinking approach, including their familiarity with its concepts and perceived value in their learning journey; Part II examined students' perspectives on the usefulness of the design thinking phases in crafting assessments.

To ensure the questionnaire's ability to collect accurate and relevant data, it was first reviewed by the research adviser. The adviser assessed the clarity and appropriateness of the wording and presentation of the questions for the intended respondents. After revisions, the questionnaire was validated by a panel of experts. A pilot test was also conducted involving 10 faculty members and 20 students to further verify its effectiveness. The data collected during the pilot test were forwarded to a statistician for detailed analysis, which likely included

the calculation of Cronbach's Alpha to evaluate the instrument's internal consistency and reliability. The results showed an excellent reliability coefficient of 0.985 for both groups of respondents, indicating the instrument's effectiveness in gathering data.

Data collection was carried out using the finalized researcher-made questionnaire. The Statistical Package for the Social Sciences (SPSS) was used to analyze and interpret the data. Throughout the study, the researchers ensured ethical compliance. Informed consent was obtained from all respondents, who were also made aware of their right to withdraw from the study at any time. Confidentiality was maintained by anonymizing all responses and avoiding the collection of personally identifiable information.

4. Findings and Discussion

Table 1 presents the teachers' extent of utilization of different approaches in crafting assessment tools.

Table 1

Teachers' extent of utilization of different approaches in crafting assessment tools

Indicators	Mean	Interpretation
Align the tool with the learning objectives of the lesson	4.00	Strongly Agree
Ensure that the assessment is clear, well-designed, and directly aligned with the learning outcomes students are expected to achieve.	3.83	Strongly Agree
Provide clear rubrics and criteria that outline expectations and standards for performance.	3.72	Strongly Agree
Consider diverse learning styles and abilities.	3.61	Strongly Agree
Ensure fair and meaningful assessment considering student's diverse backgrounds, abilities, needs, and experiences.	3.56	Strongly Agree
Integrate formative assessment strategies throughout instruction to gather ongoing feedback on student learning, allowing for timely adjustment to teaching methods and student support.	3.50	Strongly Agree
Access sufficient resources and references.	3.50	Strongly Agree
Incorporate opportunities for peer and self-assessment to empower students to take ownership of their learning and develop critical evaluation skills.	3.44	Agree
Use standardized assessment tools to provide the most accurate measure	3.33	Agree
Evaluate continuously the effectiveness of assessment tools, making adjustments based on insights gained from student performance and feedback.	3.33	Agree
Composite Mean	**3.58**	**Strongly Agree**

As shown in Table 1, the teachers strongly agreed that they align their assessment tools with the learning objectives of the lesson. This suggests that teachers view assessment as a tool for measuring student learning against specific objectives. This finding aligns with

contemporary educational literature, which emphasizes the importance of criterion-referenced assessments and the shift toward standards-based education (Popham, 2017). These assessments directly evaluate student achievement based on specific learning standards, making them more informative and meaningful for both teachers and students. A disconnect between assessment and learning goals can result in inaccurate evaluations and render the assessment ineffective.

By purposefully crafting assessments that directly target the specific skills and knowledge students are expected to acquire, teachers can ensure a clear path to learning success. Meanwhile, the items related to using standardized assessment tools and continuously evaluating the effectiveness of assessment tools received the lowest weighted mean. These findings were inconclusive regarding how often teachers use standardized tests or how frequently they review and revise their assessments.

The finding that teachers may not consistently utilize standardized tests or engage in regular evaluation of their assessment tools might be linked to factors such as time constraints, lack of professional development, and limited access to resources for assessment development and analysis (Stiggins, 2017). The literature highlights the importance of ongoing formative assessment cycles, which involve regular feedback and adjustments to teaching and learning (Wiliam, 2013; Wiliam & Thomson, 2017).

Lastly, the composite mean indicated a score above average. This suggests that, on average, teachers use a variety of assessment approaches with moderate frequency. While teachers did incorporate different assessment methods, there may still be room for them to adopt a broader range of strategies more frequently.

Table 2 presents the level of understanding and appreciation that teachers and students have for the design thinking approach. The table shows that teachers and students strongly agreed that they appreciate and understand the design thinking approach. This suggests that both groups value the approach, although appreciation tends to be higher than actual understanding of its purpose. Despite this discrepancy, the data still reflects a positive perception of design thinking from both teachers and students. Among the most appreciated aspects is the emphasis on understanding students' needs and perspectives through observation, interviews, and immersion. This focus on student voice and perspective aligns with current educational trends that prioritize student-centered and personalized learning (DuFour & Eaker, 2016). Design thinking, with its focus on empathy and user-centered design, can serve as a

powerful tool for creating learning environments that are responsive to individual student needs. This goes beyond simply conveying content—it requires active engagement through observation, interviews, and immersion in the learning environment.

Table 2

Level of understanding and appreciation of teachers and students in the design thinking approach

Indicators	Teachers		Students	
	Mean	Interpretation	Mean	Interpretation
Understanding the needs and perspectives of the students through observation, interviews, and immersion	3.72	Strongly Agree	3.86	Strongly Agree
Gaining student's insights, to create a clear definition of the problem that to be solved	3.78	Strongly Agree	3.81	Strongly Agree
Adjustments based on insights gained from student performance and feedback	3.67	Strongly Agree	3.81	Strongly Agree
Embracing an iterative approach that allows us to continuously learn from user feedback, and continually refine the solutions for optimal results	3.56	Strongly Agree	3.82	Strongly Agree
Generating a wide range of creative solutions to the defined student assessment problem without judgment	3.67	Strongly Agree	3.78	Strongly Agree
Generating ideas through various techniques, such as brainstorming, mind mapping, and sketching	3.61	Strongly Agree	3.76	Strongly Agree
Shifting perspective to prioritize the students' needs and experiences	3.61	Strongly Agree	3.73	Strongly Agree
Brainstorming a diverse set of innovative solutions to the identified challenges	3.72	Strongly Agree	3.77	Strongly Agree
Validating prototypes through user testing in realistic settings and allowing to gather crucial feedback from real-world interactions	3.17	Agree	3.72	Strongly Agree
Create prototypes and test them with students to gain valuable feedback	3.17	Agree	3.67	Strongly Agree
Composite Mean	**3.57**	**Strongly Agree**	**3.77**	**Strongly Agree**

The lowest average weighted mean was found in the process of developing prototypes and testing them with students to obtain insightful feedback. Prototyping offers educators a concrete way to translate design thinking's abstract concepts into real-world classroom practices. By creating and testing prototypes with their students, teachers can gain meaningful insights into the practicality of their assessment concepts and how well these align with students' learning styles.

The composite mean indicated that both teachers and students have a relatively high level of comprehension and appreciation for the design thinking methodology. Despite some

challenges, research on the use of design thinking in education shows that both instructors and students value its application. Moreover, interviews conducted by the researchers revealed that while faculty members were somewhat familiar with the design thinking approach, they had not yet applied it in practice. Their understanding was largely based on second-hand exposure, such as hearing about it from others, interacting with colleagues who already use it, or recognizing its elements without explicitly identifying it as design thinking.

Developing effective assessments remains a continuous challenge for teachers. The design thinking approach, with its emphasis on student-centered problem-solving, has emerged as a promising solution. This study investigates the perceived usefulness of the various phases of design thinking (empathize, define, ideate, prototype, test) in designing assessments. These perceptions are presented in Tables 3 to 7.

Table 3

Assessment on the usefulness of the design thinking phases in terms of empathizing

Indicators	Teachers		Students	
	Mean	Interpretation	Mean	Interpretation
Bridge the gap between teachers and students through trust and open communication.	3.72	Strongly Agree	3.87	Strongly Agree
Helps the teachers gain insight into the diverse needs, preferences, and experiences of the students who will interact with the assessment tools.	3.78	Strongly Agree	3.85	Strongly Agree
Empower teachers to actively improve learner's assessment experiences by equipping them with the tools to address any challenges or concerns they encounter.	3.78	Strongly Agree	3.83	Strongly Agree
Design assessment tools that deeply connect with students and deliver impactful value, empowering their learning journeys.	3.78	Strongly Agree	3.82	Strongly Agree
Foster inclusive learning environments by empowering teachers to design accessible, universally designed assessments that cater to diverse needs and inspire creative problem-solving.	3.72	Strongly Agree	3.81	Strongly Agree
Provide experiences which lead to the creation of human-centered and user-friendly assessment tools.	3.72	Strongly Agree	3.79	Strongly Agree
Provide teachers with insights into students' motivation and engagement, enabling them to design assessments that are intrinsically engaging, interactive, and meaningful, fostering increased student participation and ownership in the learning process.	3.67	Strongly Agree	3.79	Strongly Agree
Equip teachers with the foresight to design assessment tools that anticipate and adapt to users' evolving needs, ensuring long-term effectiveness and continuous improvement in learning.	3.78	Strongly Agree	3.77	Strongly Agree
Point out any problems or difficulties students encounter when using the assessment tools.	3.72	Strongly Agree	3.75	Strongly Agree
Cater to students' individual needs by providing tools that directly address their unique requirements.	3.67	Strongly Agree	3.75	Strongly Agree
Composite Mean	**3.73**	**Strongly Agree**	**3.80**	**Strongly Agree**

Interviews with several faculty members revealed that they perceived the design thinking approach to be very useful in crafting assessment tools, although many did not explicitly recognize the phases as components of the design thinking process. Teachers and students both viewed these phases as effective in crafting meaningful and engaging assessments. By exploring how both groups perceive the usefulness of design thinking, this study offers valuable insights into its potential to transform assessment practices and ultimately enhance student learning outcomes.

Empathizing. This is the first phase of the design thinking approach, where students observe and understand the situation to develop a sense of empathy. Table 3 presents the responses of teachers and students regarding their perceived usefulness of this phase. The data showed that both teachers and students strongly agreed that empathizing is a useful phase of design thinking in designing assessments. This suggests that the process of understanding others' perspectives is seen as valuable when developing effective assessment tools. However, teachers appeared to have a stronger understanding of the usefulness of design thinking in this context compared to students. Bridging the gap between teachers and students involves building trust and encouraging open communication. This initial phase includes gathering information about the students who will be using the assessment tools. Teachers can use various methods—such as interviews, surveys, or classroom observations, to gain valuable insights into the diverse needs, preferences, and experiences of their students. Research has shown that incorporating student voice and perspective through empathy-based approaches enhances student motivation, engagement, and learning outcomes (Brown & Wyatt, 2010).

Furthermore, catering to students' individual needs by providing tools that directly address their unique requirements was rated the lowest among the concepts in this phase—yet it was still considered useful. The composite mean suggests that both teachers and students found this phase to be highly valuable in crafting assessments, as it emphasizes understanding student needs, a critical step in designing effective and meaningful assessments.

Defining. This is the second phase of the design thinking process, which plays a crucial role in establishing clarity and direction. It serves as a bridge between the initial exploration of empathy and the generation of creative solutions during the ideation stage in crafting assessment tools. Table 4 presents the perceived usefulness of design thinking in assessment design, specifically regarding the defining phase.

Table 4

Assessment on the usefulness of the design thinking phases in terms of defining

Indicators	Teachers		Students	
	Mean	Interpretation	Mean	Interpretation
Know what should be assessed on the student's learning.	3.83	Strongly Agree	3.86	Strongly Agree
Have a deep understanding of the current process of crafting assessment tools, and continually enhance their effectiveness and relevance.	3.78	Strongly Agree	3.86	Strongly Agree
Help educators reduce ambiguity and uncertainty by breaking down difficult problems into manageable design challenges that can be addressed systematically.	3.78	Strongly Agree	3.82	Strongly Agree
Explore multiple perspectives, possibilities, and potential solutions.	3.83	Strongly Agree	3.81	Strongly Agree
Ensure that the design process is focused and purposeful, leading to more effective solutions.	3.78	Strongly Agree	3.80	Strongly Agree
Allow to establish criteria for evaluating the success of the assessment tools.	3.67	Strongly Agree	3.81	Strongly Agree
Help teachers maximize the usefulness and efficacy of the assessment tools by directing their attention and resources toward the areas that matter most.	3.78	Strongly Agree	3.80	Strongly Agree
Enable teachers to continuously increase the efficacy and applicability of the assessment instruments by allowing them to be improved based on testing and feedback.	3.78	Strongly Agree	3.80	Strongly Agree
Assist teachers in clearly articulating and defining the problem or challenge that the assessment tools are intended to address.	3.83	Strongly Agree	3.79	Strongly Agree
Determine any restrictions or limitations—budget, time, technology, or legal requirements, for example—that might have an impact on how the assessment tools are designed.	3.61	Strongly Agree	3.79	Strongly Agree
Composite Mean	**3.77**	**Strongly Agree**	**3.81**	**Strongly Agree**

Clear learning objectives and a well-defined scope are essential for creating valid and reliable assessments that accurately measure student learning (Popham, 2017). The defining phase offers a structured framework for establishing these crucial elements. As shown by the results, knowing what should be assessed in relation to student learning, having a deep understanding of the current process for crafting assessment tools, and continually enhancing their effectiveness and relevance are identified as key benefits of the defining phase in the

design thinking approach. The lower score for identifying restrictions or limitations, such as budget, time, technology, or legal requirements, may indicate that teachers and students either undervalue these considerations or find them less relevant to the design thinking process itself.

The composite mean suggests that both teachers and students perceive the defining phase of design thinking as highly valuable in crafting assessments. Its high rating indicates strong agreement among respondents on the usefulness of this phase, particularly in reducing ambiguity, clearly outlining learning objectives, and providing focused direction for assessment development.

Table 5

Assessment on the usefulness of the design thinking phases in terms of ideating

Items	Teachers		Students	
	Mean	**Interpretation**	**Mean**	**Interpretation**
Allow teachers to consider various approaches, techniques, and methodologies before deciding on the most promising concepts to pursue further	3.83	Strongly Agree	3.86	Strongly Agree
Encourage teachers to come up with various creative ideas and concepts for assessment tools	3.89	Strongly Agree	3.85	Strongly Agree
Promote collaboration and teamwork by bringing together individuals with diverse perspectives, backgrounds, and expertise to brainstorm ideas collectively	3.89	Strongly Agree	3.83	Strongly Agree
Encourage teachers to explore multiple solutions to the design challenges posed by assessment tools	3.83	Strongly Agree	3.84	Strongly Agree
Promote thinking outside the box and experimentation with unconventional solutions to assessment design challenges, fostering a creative mindset	3.72	Strongly Agree	3.86	Strongly Agree
Enable teachers to modify their concepts in response to feedback and testing, resulting in continuous development	3.83	Strongly Agree	3.82	Strongly Agree
Promote idea generation and enhance the quality of the design process	3.83	Strongly Agree	3.81	Strongly Agree
Help to prioritize ideas and concepts that are practical, achievable, and aligned with the project's objectives or goals	3.83	Strongly Agree	3.81	Strongly Agree
Provide a structured framework for brainstorming sessions, allowing designers to generate ideas and concepts	3.78	Strongly Agree	3.79	Strongly Agree
Allow teachers to create, test, and improve assessment tool concepts through multiple iterations, thereby promoting an iterative approach to design	3.72	Strongly Agree	3.77	Strongly Agree
Composite Mean	**3.82**	**Strongly Agree**	**3.82**	**Strongly Agree**

Ideating. This is the third phase of the design thinking process. Ideation is crucial because it allows individuals to start envisioning potential solutions and increases the chances of generating innovative and effective ideas that benefit the user by considering a variety of possibilities.

Studies have demonstrated that ideation techniques, such as brainstorming and mind mapping, can foster creativity and innovation in assessment design, leading to more engaging and authentic assessment tasks (Yan et al., 2022). Table 5 presents the responses of teachers and students regarding the perceived usefulness of the design thinking phases in designing assessments, specifically in terms of ideation. The composite mean of the teachers' and students' responses suggests a generally favorable opinion of ideation as an important aspect of design thinking. When educators and students collaborate to generate ideas, they can leverage each other's unique perspectives to create more engaging and meaningful assessments. This phase can help produce assessments that encourage students to apply their knowledge in new ways and move beyond rote memorization by promoting creative thinking in assessment design.

Prototyping. This is the fourth phase of the design thinking process. Prototyping refers to creating a rough model of a potential solution to the identified problem. Although research on prototyping in teacher education might be limited, valuable insights can be drawn from studies on formative assessment and the use of feedback to improve teaching and learning (William, 2013). Table 6 shows the responses of teachers and students regarding the usefulness of design thinking phases in designing assessment tools, specifically in terms of prototyping.

As shown in the table, prioritizing ideas that are practical, achievable, and aligned with the objectives was identified as one of the most useful concepts to incorporate in crafting assessment tools during the prototyping phase. Both teachers and students strongly agreed that ideas which are realistic to implement, achievable within the allotted time, and aligned with learning objectives should be prioritized to ensure the effectiveness of the assessment method. This focus helps guarantee the efficiency and success of the assessment tool. On the other hand, allowing teachers to create tangible representations of assessment tools, such as mock-ups, wireframes, or prototypes, received the lowest mean among the items presented.

Table 6

Assessment on the usefulness of the design thinking phases in terms of prototyping

Indicators	Teachers		Students	
	Mean	Interpretation	Mean	Interpretation
Prioritize ideas that are practical, achievable, and can be seen aligned with the objectives.	3.83	Strongly Agree	3.84	Strongly Agree
Gather feedback from teachers and students allowing them to interact with and provide input on the prototype.	3.89	Strongly Agree	3.79	Strongly Agree
Provide an opportunity to gather student feedback by allowing them to interact with and provide input on the prototype.	3.78	Strongly Agree	3.81	Strongly Agree
Foster a creative mindset to think outside the box and explore unconventional tangible sample solutions to the challenges posed by assessment design.	3.72	Strongly Agree	3.79	Strongly Agree
Make a tangible sample assessment tool for more accurate testing.	3.83	Strongly Agree	3.77	Strongly Agree
Promote idea-crafting generation and enhance the quality of the design process in assessment tools.	3.78	Strongly Agree	3.77	Strongly Agree
Analyze and evaluate realistic prototypes of the drafted assessment tools.	3.72	Strongly Agree	3.78	Strongly Agree
Enable teachers to gain an overall view of the crafted tool using minimal time and effort, focusing on the finer details and changes.	3.67	Strongly Agree	3.78	Strongly Agree
Enable teachers to quickly iterate on their concepts, investigate original solutions, and explore creative methods for assessment design	3.67	Strongly Agree	3.74	Strongly Agree
Allow teachers to create tangible representations of assessment tools, such as mock-ups, wireframes, or prototypes.	3.44	Strongly Agree	3.74	Strongly Agree
Composite Mean	**3.73**	**Strongly Agree**	**3.81**	**Strongly Agree**

Overall, the data suggest that both teachers and students view prototyping as a valuable phase in designing assessments. These findings align with design thinking principles and highlight the benefits of collaboration in assessment development. Design thinking encourages adopters to develop multiple skills, including collaboration, creative thinking, leadership, presentation, project management, ethics, storytelling, negotiation, empathy, and a willingness to learn. As one interviewee stated, the design thinking approach is powerful, effective, and fosters innovation as well as a student-centered approach that promotes creativity, collaboration, and problem-solving.

Testing. In the fifth stage of the design thinking process, known as testing, researchers put the prototypes to the test to gather feedback and evaluate how well the proposed solutions

address the identified problem. The responses of educators and learners regarding the value of design thinking in creating testing-oriented assessments are presented in Table 7.

Table 7

Assessment on the usefulness of the design thinking phases in terms of testing

Indicators	Teachers		Students	
	Mean	Interpretation	Mean	Interpretation
Provide valuable insights into the student's experience of assessment tools, allowing teachers to identify areas for improvement and refine the tools.	3.83	Strongly Agree	3.83	Strongly Agree
Help teachers identify the usability and barriers that may hinder the effectiveness of the crafted assessment tool.	3.72	Strongly Agree	3.84	Strongly Agree
Implement and test the crafted assessment tools for a small group of students to ensure that the tools are meeting their intended purpose	3.72	Strongly Agree	3.83	Strongly Agree
Help measure the effectiveness of assessment tools in achieving the intended goals and objectives.	3.83	Strongly Agree	3.81	Strongly Agree
Provide teachers with evidence of the effectiveness and usability of the assessment tools, enhancing their confidence in the design outcomes.	3.83	Strongly Agree	3.81	Strongly Agree
Ensure that assessment tools are aligned with the needs, preferences, and expectations of the target users.	3.67	Strongly Agree	3.83	Strongly Agree
Validate whether the tools meet students' requirements and address their underlying needs effectively.	3.78	Strongly Agree	3.80	Strongly Agree
Assists teachers in determining the assessment tools' advantages and disadvantages so they can make the required improvements.	3.72	Strongly Agree	3.81	Strongly Agree
Foster continuous improvement by fostering a culture of learning and adaption of the approach in crafting assessment tools.	3.72	Strongly Agree	3.81	Strongly Agree
Provide valuable feedback obtained through surveys, interviews, or observation to validate the effectiveness and usability of the assessment tools.	3.50	Strongly Agree	3.76	Strongly Agree
Composite Mean	**3.73**	**Strongly Agree**	**3.81**	**Strongly Agree**

Teachers and students strongly agreed that the design thinking phases were useful for assessment, as shown in the table. This suggests that both groups recognize the significance of the components in the testing stage of assessment design. Items with high agreement scores often focus on usability testing, feedback systems, and the utilization of assessment data for tool refinement. This indicates a shared awareness of the role of testing in identifying problem areas and ultimately producing truly effective evaluations. This emphasis on testing aligns with

design thinking's iterative and interactive approach. Additionally, the composite means for both teachers and students indicate broad agreement on the importance of testing as a critical stage in the assessment design process. The findings align with the design thinking approach and underscore the crucial role of user input in producing efficient assessments. Moreover, the results highlight the potential for collaboration between instructors and students throughout the testing phase.

For specific interventions, continuous improvement, and effective communication, it is important to understand the perspectives of both teachers and students. The perspectives of these two groups, in the context of the design thinking methodology, are presented in Table 8.

Table 8

Differences in the usefulness of the design thinking phases and level of understanding and appreciation as assessed by the two groups of respondents

Variable	Participants	Mean Rank	U-statistic	p-value	Decision on Ho	Interpretation
Level of Understanding and Appreciation	Teachers	79.67	1263.00	.014	Reject	Significant
	Students	115.90				
Empathizing	Teachers	110.53	1818.50	.851	Failed to Reject	Not Significant
	Students	113.21				
Defining	Teachers	109.94	1808.00	.815	Failed to Reject	Not Significant
	Students	113.27				
Ideating	Teachers	111.28	1832.00	.895	Failed to Reject	Not Significant
	Students	113.15				
Prototyping	Teachers	106.00	1737.00	.599	Failed to Reject	Not Significant
	Students	113.61				
Testing	Teachers	106.36	1743.50	.616	Failed to Reject	Not Significant
	Students	113.58				

The table clearly shows a significant difference between teachers' and students' assessments of their level of understanding and appreciation of the design thinking approach, as indicated by a p-value of 0.014. Since this p-value is less than the 0.05 level of significance, the null hypothesis was rejected. It can be noted that the student respondents obtained a mean rank of 115.90, which is greater than the mean rank of 79.97 for the teacher respondents. This indicates that students have a higher level of understanding and appreciation of the design thinking approach than teachers. This gap aligns with the idea of changing educational practices. Students likely encounter design thinking more frequently, leading to a more natural

understanding and appreciation. However, student exposure may vary depending on the specific school or curriculum.

On the other hand, there were no significant differences between teachers' and students' perceptions of the usefulness of the design thinking phases in designing assessments, namely empathizing, defining, ideating, prototyping, and testing, based on p-values ranging from 0.599 to 0.895. Since these p-values are greater than the 0.05 level of significance, the null hypothesis failed to be rejected. The data reveal that both teachers and students have comparable perceptions regarding the usefulness of the design thinking phases in designing assessments.

Studies have shown that students in schools emphasizing project-based learning and innovative pedagogies are more likely to be exposed to design thinking principles and practices (Zhang & Ma, 2023; Fitrah et al., 2025; Almulla, 2020; Wang et al., 2025). This increased exposure may contribute to their higher level of understanding and appreciation. As revealed in the interviews, teachers perceive that the design thinking approach would be very useful in crafting assessment tools, similar to how its phases have already been applied in the cycle, though they may not explicitly recognize these phases as components of the design thinking process. This aligns with the user-centered core principle, which holds that both teachers, as creators, can offer insightful viewpoints and students, as users, engage in the assessment. The findings provide a solid basis for the development of collaborative assessment, consistent with research on design thinking in education that emphasizes the value of collaboration between educators and learners.

5. Conclusion

Teachers extensively utilize various approaches in crafting assessments. While the study did not delve into the specific frequencies of different approaches, the findings suggest that teachers employ a range of methods in their assessment practices. Both teachers and students demonstrate a high level of appreciation for the design thinking approach. Although understanding may vary, with students exhibiting a higher level of understanding than teachers, both groups perceive design thinking as a valuable framework for assessment development.

Teachers and students perceive the design thinking approach as highly beneficial for crafting assessments. The study found strong agreement among both groups regarding the usefulness of the various design thinking phases (empathize, define, ideate, prototype, test) in

creating effective and engaging assessments. While students demonstrated a higher level of understanding and appreciation for the design thinking approach, there were no significant differences in their perceptions of the usefulness of the design thinking phases compared to teachers. This suggests that each group recognizes the potential of design thinking to transform assessment practices.

The developed teachers' guide serves as a preliminary resource for teachers in crafting assessment tools using the design thinking approach. Further refinement and validation of the guide are recommended. The proposed teachers' guide should undergo further review and refinement by educational experts and practitioners. This process will ensure the guide's content accuracy, clarity, and applicability in diverse educational contexts. Educators are encouraged to explore and implement innovative assessment strategies informed by design thinking principles. This shift toward more student-centered and engaging assessment practices can enhance student learning outcomes.

Future research should investigate the impact of design thinking–based assessments on student learning outcomes. Studies should also explore the challenges and facilitators of implementing design thinking in diverse educational settings.

Institutional Review Board Statement

This study was conducted in accordance with the ethical guidelines set by Batangas State University – The National Engineering University Lipa Campus. The conduct of this study has been approved and given relative clearance(s) by the College of Teacher Education (CTE) BatStateU – The NEU Lipa.

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