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Redesigning Assessment in Technical Education Amid Generative AI Disruption: A Call for Policy and Pedagogical Reform

Amitabh Verma
Faculty of Business, Sohar University, Sohar, Oman
vermainfo123@gmail.com

Abstract **- The rapid rise of generative artificial intelligence (AI) tools such as ChatGPT and Gemini has introduced new complexities to academic assessment, particularly in technical education where skill-based evaluations are central. This study investigates how generative AI is impacting assessment practices in technical education institutions across the Gulf Cooperation Council (GCC) region. Employing a convergent mixed-methods approach, the research draws on survey responses from 120 students and faculty members, as well as in-depth interviews with academic staff from three GCC countries. Quantitative findings reveal a significant disparity in AI tool usage between students and faculty, with students more frequently relying on AI for academic tasks. A chi-square test confirmed that this difference is statistically significant (χ^2 (3, N = 120) = 11.73, p = .008). Qualitative analysis identified four key themes: rising concerns over AI-enabled academic dishonesty, perceived threats to fairness and learning outcomes, institutional policy gaps, and emerging assessment adaptations such as oral exams and reflective evaluations. This study underscores an urgent need for institutional reforms, including AI-specific academic integrity policies, faculty training, and assessment redesign. By aligning pedagogy and policy with the realities of AI-integrated learning environments, technical education institutions in the GCC can uphold academic standards while fostering ethical, future-ready learning ecosystems.**

Keywords **- Generative artificial intelligence, technical education, AI in education, ChatGPT, Gemini, Educational policy.**

I. INTRODUCTION

THE rapid advancement of generative artificial intelligence (AI) technologies—such as ChatGPT, Google Gemini, and GitHub Copilot—has begun to transform the landscape of education globally. In particular, the ability of these tools to generate human-like text, solve complex problems, write code, and produce design content poses both opportunities and threats to traditional models of teaching and assessment (Wong, 2024). Nowhere is this disruption more pronounced than in technical education, where skill-based evaluation, problem-solving tasks, and project submissions (Koh & and Doroudi, 2023; Kolade et al., 2024) are central to learning outcomes and competency development.

The Gulf Cooperation Council (GCC) countries—comprising Oman, the United Arab Emirates, Saudi Arabia, Bahrain, Kuwait, and Qatar—have invested significantly in digital transformation and higher education modernization. However, the integration of AI tools into students' academic behavior has raised concerns among educators and policymakers, particularly regarding plagiarism, authenticity, and the reliability of assessments (Xia et al., 2024; Corbin et al., 2025). Traditional assessment formats such as written assignments, code-based evaluations, and even online quizzes are increasingly vulnerable to manipulation through AI-generated responses (Luo (Jess), 2024). This calls into question the validity and fairness of current assessment practices in technical institutions.

At the same time, generative AI offers a unique opportunity to rethink assessment not just as a means of grading, but as a process of meaningful engagement and learning reinforcement (Yusuf et al., 2024; Lye & Lim, 2024). Emerging pedagogical models suggest that AI can be used to augment formative learning, develop critical thinking, and simulate real-world problem-solving—if embedded carefully within an ethical and well-designed framework (Kanbach et al., 2024). However, achieving this balance requires a strategic re-evaluation of institutional policies, assessment design, faculty training, and curriculum integration.

Despite growing discourse on AI's impact on education, understanding of how technical institutions in the GCC are responding to this disruption remains limited. This study addresses this gap by exploring the current perceptions, institutional practices, and policy

responses related to generative AI in technical education across the region (van den Berg & and Papadopoulos, 2024; Swiecki et al., 2022). It aims to provide evidence-based recommendations for building resilient, equitable, and future-ready assessment systems that align with both pedagogical integrity and technological advancement.

While much of the literature highlights the risks associated with generative AI in education, emerging studies also emphasize its transformative opportunities. When used responsibly, generative AI can support personalized learning, formative feedback, problem-solving practice, and critical thinking development (Chan, 2023; Lye & Lim, 2024). In technical education, AI tools can help students debug code, generate alternative design solutions, and simulate real-world problem-solving scenarios. Rather than positioning AI solely as a threat, institutions can strategically leverage these tools to enhance student engagement, strengthen learning outcomes, and prepare graduates for increasingly AI-integrated workplaces.

This study's novelty lies not only in its focus on technical education institutions across the GCC region—an area that remains significantly underexplored in generative AI assessment research—but also in integrating pedagogical, institutional, and policy dimensions within a single analytical framework. Unlike prior studies that primarily examine academic dishonesty or student perceptions in isolation, this study adopts a convergent mixed-methods approach to capture both stakeholder behavior and institutional readiness. By linking generative AI adoption patterns with assessment vulnerability, faculty perceptions, institutional preparedness, and policy reform strategies, the study moves beyond descriptive analysis and contributes a context-specific framework for developing AI-resilient assessment systems in technical education.

The remainder of this paper is organized as follows: Section 1.1 and 1.2 present the research objectives and guiding questions. Section 2 reviews relevant literature on generative AI, assessment practices, and policy developments in technical education. Section 4 describes the research methodology, including data collection and analysis procedures. Section 5 presents the study's key findings, followed by a discussion in Section 6. Section 7 offers recommendations for pedagogical and policy reform. Finally, Section 8 concludes the study and outlines directions for future research.

A. Research Objectives

The rapid emergence of generative artificial intelligence (GenAI) tools has introduced significant challenges to conventional assessment models in technical education (Bower et al., 2024). As institutions in the Gulf Cooperation Council (GCC) countries grapple with the dual need to preserve academic integrity and embrace technological innovation, research is urgently needed to examine how assessments are being re-evaluated and redesigned. This study aims to fill this gap by identifying institutional responses, educator perspectives, and policy directions regarding GenAI's influence on assessment practices.

This study aims to:

Investigate the awareness and usage patterns of generative AI tools (e.g., ChatGPT, Gemini) among students and educators in technical education institutions across the GCC.

Assess the perceived impact of AI-generated content on the validity and fairness of current assessment methods.

Identify the challenges educators face in maintaining academic integrity and learning outcomes amid GenAI adoption.

Explore institutional responses and policy adaptations regarding assessment design in the age of AI.

Recommend pedagogical and policy reforms to enhance the credibility, inclusivity, and effectiveness of assessments in technical education.

B. Research Questions

To achieve the above objectives, the study is guided by the following key research questions:

RQ1: To what extent are generative AI tools being used by students and faculty in technical education institutions in GCC countries?

RQ2: How do educators perceive the influence of GenAI on assessment reliability, academic integrity, and student learning?

RQ3: What types of assessments are most vulnerable to AI-enabled misuse or dependence?

RQ4: How are institutions responding—pedagogically and policy-wise—to the challenges posed by GenAI?

RQ5: What assessment redesign strategies can ensure authenticity and learning value in the presence of generative AI?

II. LITERATURE REVIEW

The emergence of generative artificial intelligence (GenAI) tools—such as ChatGPT, Google Gemini, and Copilot—has introduced a significant inflection point in higher and technical education, particularly in the domain of assessment (Memarian & Doleck, 2024). While these tools offer vast potential for learner support and productivity, their unchecked use has raised serious concerns about academic integrity, the authenticity of learning, and the long-term validity of traditional assessment methods.

Recent studies emphasize that generative AI technologies are not merely tools for information retrieval but active content creators that challenge the foundations of conventional education (Kasneci et al., 2023 ; Camilleri, 2024). In technical education—where evaluation of coding skills, design thinking, and report writing is central—AI-generated outputs can easily bypass traditional take-home assignments, code submissions, and even project reports. As Sok & Heng (2024) argue, the increasing accessibility of AI tools is reshaping what educators assess and how students engage with tasks.

To strengthen this study's theoretical grounding, the Technology Acceptance Model (TAM) provides a useful lens for understanding the adoption of generative AI tools in technical education. TAM explains that perceived usefulness and perceived ease of use significantly influence users' intention to adopt technology (Davis, 1989). In the context of generative AI, students often see tools such as ChatGPT and Gemini as highly useful for improving productivity, solving technical problems, and completing assignments, while faculty may evaluate these tools more cautiously because of concerns about academic integrity and assessment validity. Integrating TAM helps explain the disparity in AI adoption between students and educators and supports the need to redesign assessments to align technological acceptance with pedagogical integrity.

More troubling is the "invisible assistance" AI provides, blurring the line between collaboration and misconduct (Cotton et al., 2024). Unlike plagiarism, where copying is traceable, GenAI responses are often original in phrasing, making them harder to detect through conventional plagiarism tools. This demands a shift from detection-based integrity systems toward assessment designs that promote process-oriented and authentic demonstrations of competence (Smutný & Schreiberova, 2020).

Technical education, particularly in polytechnic and applied science institutions, relies heavily on skills-based assessment, practical assignments, and applied problem-solving. However, these formats are increasingly susceptible to AI intervention. For instance, programming tasks—once reliable indicators of student understanding—can now be automated with near-perfect results using AI coding assistants (Finnie-Ansley et al., 2022). A recent cross-institutional study in Europe found that nearly 60% of technical students had used generative AI tools in at least one graded task within the past semester(Zawacki-Richter et al., 2024).

This reality undermines the reliability of assessments that focus on products rather than processes. As Doyle et al.(2024) suggest, educators must shift toward multi-phase assessment designs, oral validations, live demonstrations, or reflective components that demonstrate learning beyond output alone.

While much of the literature highlights the risks of generative AI in education, emerging studies also emphasize its transformative opportunities. When used responsibly, generative AI can support personalized learning, formative feedback, problem-solving practice, and critical-thinking development (Chan, 2023; Lye & Lim, 2024). In technical education, AI tools can help students debug code, generate alternative design solutions, and simulate real-world problem-solving scenarios. Rather than treating AI solely as a threat, institutions can use these tools to boost student engagement and prepare learners for AI-integrated workplaces.

Despite the rapid digitalization of higher education in GCC countries—especially post-COVID—institutional preparedness for AI-driven disruptions remains limited. A study by Al-Mamary et al. (2024) examining Saudi Arabian universities highlighted that most academic integrity policies do not yet explicitly address AI-generated content. Similarly, in Oman and

the UAE, emerging research (Al-Busaidi et al., 2024) suggests that faculty awareness is high, but institutional policies and training resources are lagging.

This disconnect creates a vacuum in which students adopt AI tools without clear guidance, and educators struggle to balance fairness with innovation. Technical colleges, in particular, lack the autonomy or agility to redesign assessment systems quickly, as rigid examination boards and accreditation standards constrain them. Consequently, GCC needs frameworks that integrate AI literacy, redefine academic misconduct, and provide clear assessment alternatives.

The literature also highlights several promising directions. Studies by Searson et al., (2024) and Chan (2023) advocate for "AI-aware pedagogy," in which, instead of banning tools like ChatGPT, educators teach students to use them ethically as co-creators or thought partners. In technical education, this might involve task redesign in which AI use is allowed, but students are assessed on how they adapt, critique, or validate AI-generated content.

Others suggest the integration of oral assessments, iterative feedback loops, and reflective learning journals as more AI-resilient formats (Lancaster & Cotarlan, 2021). While resource-intensive, such approaches may be necessary to preserve assessment credibility in technical disciplines that are inherently applied and practice-oriented.

Although previous studies acknowledge the disruptive influence of generative AI on higher education assessment, most existing research is concentrated in Western university settings and primarily focuses on academic misconduct risks. Limited attention has been given to technical education institutions in the GCC region, where assessment systems are highly skills-based and institutional policy responses remain underdeveloped. Furthermore, existing studies often lack strong theoretical grounding to explain stakeholder behavior and institutional adaptation. Research on how assessment redesign can preserve academic integrity while leveraging the pedagogical benefits of AI remains insufficient. This study addresses this gap by providing empirical evidence from GCC technical institutions and proposing practical policy and pedagogical reforms for AI-resilient assessment systems.

III. CONCEPTUAL FRAMEWORK

The conceptual framework (Figure 1) used in this study is an adapted framework rather than a direct adoption of a single prior model. While Lee et al. (2024) provided an important foundation for understanding educators' perspectives on generative AI in higher education, the present study extends and contextualizes these insights for technical education institutions in the GCC region. Given the distinct characteristics of technical education—particularly its emphasis on competency-based assessment, applied learning, and accreditation-driven evaluation—the framework was expanded to include additional dimensions, including Assessment Vulnerability, Institutional Readiness and Response, and Assessment Reform Strategies. These constructs (Table 1) were synthesized from multiple studies rather than derived from a single source, ensuring contextual relevance and stronger conceptual alignment with the GCC technical education environment**.**

Although the original studies were conducted in Western higher education settings, the underlying concerns regarding assessment integrity, institutional readiness, and pedagogical adaptation are highly relevant to GCC technical education, particularly given the region's rapid digital transformation and strong emphasis on employability and accreditation standards

TABLE I

SOURCE AND DEVELOPMENT OF CONCEPTUAL FRAMEWORK CONSTRUCTS

Construct	**Primary Source(s)**	**Adaptation for Current Study**
Generative AI Usage	Lee et al. (2024); Chan & Hu (2023)	Extended to include student and faculty usage patterns in GCC technical institutions
Assessment Vulnerability	Swiecki et al. (2022); Qadir (2023)	Focused on technical assessments such as coding, projects, and practical evaluations
Perceptions of Integrity and Fairness	Cotton et al. (2024); Yusuf et al. (2024)	Expanded to include faculty concerns regarding fairness and grading reliability

Institutional Readiness and Response	Lee et al. (2024); Chan (2023)	Adapted to GCC institutional policy and governance structures
Assessment Reform Strategies	Lye & Lim (2024); Lancaster & Cotarlan (2021)	Focused on oral exams, reflective assessments, and process-based evaluation
Pedagogical and Policy Implications	Sun & Pratt (2024); Wood & Moss (2024)	Extended to GCC policy reform and accreditation implications

The framework developed for this study synthesizes the key factors influencing assessment practices in technical education amid the rise of generative AI technologies. Drawing upon insights from the literature and preliminary stakeholder reflections, the framework maps the interrelationships among six core constructs: Generative AI Usage, Assessment Vulnerability, Perceptions of Integrity and Fairness, Institutional Readiness and Response, Assessment Reform Strategies, and Pedagogical and Policy Implications (Lee et al., 2024).

At the core of the framework is the increased use of generative AI tools such as ChatGPT, Gemini, and Copilot by students (Giannakos et al., 2024.) and, to some extent, educators. This usage directly contributes to assessment vulnerability, particularly in traditional formats like take-home assignments, coding exercises, and report-based evaluations (Chan & Hu, 2023). As AI use grows, concerns about academic dishonesty, authenticity of student work, and grade inflation become more prominent.

These developments shape perceptions of integrity and fairness among both faculty and students, influencing trust in the assessment system (Mulyani et al., 2025;Yusuf et al., 2024). Simultaneously, institutions vary in their readiness and responsiveness, with some lacking clear policies or support mechanisms to address AI-related disruptions. This institutional (un)preparedness interacts with both assessment vulnerabilities and stakeholder perceptions to shape how colleges and faculties respond (Stolpe & Hallström, 2024).

The framework proposes that these dynamics collectively necessitate the formulation and adoption of assessment reform strategies (Qadir, 2023). These reforms, in turn, are closely interlinked with pedagogical and policy implications for technical education in the GCC. While specific reform measures can inform institutional and national policy shifts, evolving educational policies and accreditation standards may also shape how reforms are conceived (Wood & Moss, 2024;Sun & Pratt, 2024) and implemented at the institutional level. This mutual relationship highlights the need to align practice and policy to ensure sustainable and credible assessment systems in the age of generative AI.

The framework thus serves as a foundation for guiding this study's methodological design and provides a lens through which the data will be interpreted. It offers a holistic view of the challenges and opportunities facing technical education systems (Su & Yang , 2023) as they confront the evolving realities of artificial intelligence in academic assessment. Figure 1 illustrates the conceptual framework and the directional relationships among the key constructs.

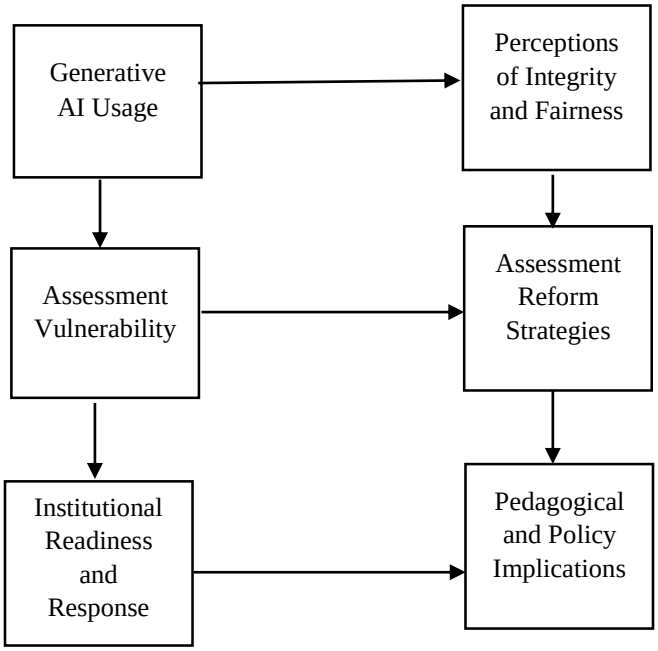

Fig.1. Conceptual framework

IV. RESEARCH METHODOLOGY

This study adopts a mixed-methods research design to explore the impact of generative AI tools on assessment practices in technical education institutions across the Gulf Cooperation Council (GCC) countries (Akbar et al., 2025). The study used quantitative surveys and qualitative interviews to capture both the breadth of institutional experiences and the depth of pedagogical responses to using generative AI in academic settings.

A. Research design

This study adopts a convergent mixed-methods research design to investigate the impact of generative artificial intelligence (GenAI) on assessment practices within technical education institutions across GCC countries (Lakshmi et al., 2023). This design aims to capture broad stakeholder perspectives through quantitative survey data while exploring the depth of institutional and pedagogical responses through qualitative interviews.

The mixed-methods approach is especially well suited to this research due to the issue's emerging and multidimensional nature. While quantitative data offer insight into the extent and patterns of GenAI usage, qualitative data provide contextual understanding of how educators and administrators perceive and respond to the challenges posed by AI tools like ChatGPT, Gemini, and Copilot (Shwedeh et al., 2024). The design is guided by the following considerations:

The topic is exploratory, requiring an open inquiry into institutional behavior and user perceptions.

The research seeks to generate practical and policy-relevant insights, not merely measure phenomena.

A convergent design allows integration of findings from both datasets at the interpretation stage, supporting more robust and well-informed conclusions.

By using a mixed-methods design, this study not only documents the current state of AI influence on assessments but also identifies emerging practices, policy gaps, and strategic opportunities for assessment reform in GCC technical education.

B. Sampling and Participants

The study focused on participants from technical education institutions across the six Gulf Cooperation Council (GCC) countries: Oman, the United Arab Emirates, Saudi Arabia, Kuwait, Qatar, and Bahrain. A purposive sampling technique was employed to ensure the inclusion of respondents who are directly engaged with academic assessment processes in technical education (El Naggar et al., 2024)—specifically students enrolled in diploma or undergraduate-level technical programs and faculty members involved in teaching, assessment design, or academic coordination. This sampling approach was selected to ensure diversity in perspectives across institutional roles, disciplines, and national contexts.

The quantitative phase included approximately 120 participants, including 70 students and 50 faculty members from public and private technical institutions. Respondents completed an online survey distributed through institutional mailing lists, academic forums, and professional educator networks within the GCC. For the qualitative phase, the researchers conducted semi-structured interviews with 10 participants, including experienced faculty members and academic leaders from three GCC countries—Oman, the UAE, and Saudi Arabia. These individuals were selected for their active involvement in assessment design and curriculum development, ensuring rich, contextually grounded insights into the institutional and pedagogical challenges of integrating generative AI tools into assessment.

C. Data Collection Methods

Data for this study were collected using a combination of quantitative and qualitative methods to ensure a comprehensive understanding of the impact of generative AI on assessment practices in technical education (Klingebiel et al., 2024). The quantitative component involved administering a structured online questionnaire designed to gather data from both students and faculty members across technical education institutions in the GCC region. The survey included a mix of Likert-scale and multiple-choice questions, focusing on awareness and use of generative AI tools (e.g., ChatGPT, Gemini), perceived risks to academic integrity, the vulnerability of specific assessment formats, and the presence or absence of institutional policy responses.

The questionnaire was distributed electronically via institutional mailing lists, academic networks, and educator forums to facilitate broad participation. Respondents were assured anonymity and confidentiality to encourage honest, unbiased responses.

The survey instrument was developed by adapting items from prior validated studies on generative AI adoption, academic integrity, and assessment redesign in higher education. Because no single validated instrument fully captured the technical education context of GCC institutions, the questionnaire synthesized relevant items from Lee et al. (2024), Chan (2023), Swiecki et al. (2022), Cotton et al. (2024), and Lye and Lim (2024). This study used additional context-specific items that were developed to reflect practical assessment challenges in technical

education, particularly coding tasks, project-based learning, oral validation, and institutional policy awareness. The instrument included both Likert-scale items and multiple-choice questions aligned with the six constructs of the conceptual framework. Before full deployment, three academic experts in higher education and educational technology reviewed the questionnaire, and the researcher pilot-tested it with 10 participants to ensure clarity, relevance, and contextual appropriateness. The final instrument design incorporated feedback from the pilot phase.

Table II presents the measurement constructs, representative survey items, and the primary literature sources used to develop the questionnaire. This study designed the instrument by adapting validated items from previous studies on generative AI adoption, academic integrity, assessment vulnerability, and assessment redesign in higher education. Because no single existing scale fully captured the technical education context of GCC institutions, we incorporated additional context-specific items to reflect practical assessment challenges such as coding tasks, project-based learning, oral validation, and institutional policy readiness. The table shows how each construct was operationalized and ensures transparency about the survey instrument's theoretical and empirical foundations.

TABLE II

SURVEY CONSTRUCTS AND SAMPLE ITEMS

Construct	**Survey items**	**Source**
Generative AI Usage (GAI)	GAI1: I frequently use AI tools such as ChatGPT for academic tasks.	Lee et al. (2024); Chan & Hu (2023)
	GAI2: Generative AI helps me complete assignments more efficiently.	
	GAI3: I rely on AI tools for problem-solving in technical subjects.	
Assessment Vulnerability (AV)	AV1: Traditional assignments are increasingly vulnerable to AI misuse.	Swiecki et al. (2022); Qadir (2023)
	AV2: AI tools make it difficult to verify original student work.	
	AV3: Coding and project-based assessments are highly exposed to AI assistance	
Integrity and Fairness (IF)	IF1: AI-generated work creates fairness concerns in grading.	Cotton et al. (2024);
	IF2: Students using AI may gain unfair academic advantages.	Yusuf et al. (2024)
	IF3: Generative AI threatens academic integrity in assessment.	
Institutional Readiness (IR)	IR1: My institution has clear policies regarding AI use in assessments.	Lee et al. (2024); Chan (2023)
	IR2: Faculty receive sufficient guidance on managing AI-related challenges.	
	IR3: Institutional support for AI governance is adequate.	
Assessment Reform Strategies (ARS)	ARS1: Oral assessments improve verification of student understanding.	Lye & Lim (2024); Lancaster & Cotarlan (2021)
	ARS2: Reflective journals reduce dependence on AI-generated outputs.	
	ARS3: Process-based assessments are more reliable than product-only evaluations.	
Pedagogical and Policy Implications (PPI)	PPI1: AI-specific academic integrity policies are urgently needed.	Sun & Pratt (2024); Wood & Moss (2024)
	PPI2: Curriculum redesign is necessary to address AI integration.	
	PPI3: AI literacy should be included in technical education programs.	

C. Validity and Reliability

To ensure the study's methodological soundness, several measures were taken to establish the validity and reliability of both the quantitative and qualitative components of this research (Roberts & Priest, 2006). Given the mixed-methods approach, the credibility of the findings was strengthened by integrating data sources and applying consistent verification techniques.

For the quantitative phase, the survey instrument was developed from relevant literature and existing frameworks on AI use in education and assessment design. Prior to full deployment, the questionnaire underwent pilot testing with 10 participants representing both faculty and students from technical institutions. This study used pilot feedback to refine question clarity, scale consistency, and the survey's overall structure. We assessed the internal consistency of multi-item scales—such as those measuring perceptions of AI-enabled assessment challenges, academic integrity concerns, and institutional preparedness—using Cronbach's alpha. The reliability coefficients exceeded the commonly

accepted threshold of 0.70, indicating satisfactory internal reliability of the survey constructs.

In the qualitative phase, the study addressed credibility and trustworthiness through thematic analysis supported by peer debriefing and member checking. After transcription, the research team independently reviewed all interview responses and developed and refined a coding scheme through iterative discussions. To enhance validity, selected participants reviewed summaries of the preliminary findings (member checking) to confirm that their perspectives were accurately interpreted. This not only improved theme accuracy but also reinforced the authenticity of the interpretations.

Finally, converging quantitative and qualitative findings during the interpretation stage contributed to the study's overall validity. Triangulating data sources provided a more comprehensive and nuanced understanding of how generative AI is reshaping assessment practices in technical education across the GCC region. By combining statistical patterns with contextual insights, the study ensured that its conclusions were both data-driven and contextually grounded

Table III presents the reliability and validity assessment of the measurement constructs used in this study. Cronbach's Alpha values for all constructs range from 0.81 to 0.86, exceeding the recommended threshold of 0.70, indicating satisfactory internal consistency reliability. Similarly, Composite Reliability (CR) values range from 0.87 to 0.90, confirming strong construct reliability. The Average Variance Extracted (AVE) values for all constructs are above 0.50, demonstrating adequate convergent validity and indicating that the items sufficiently explain the variance of their respective constructs. These results confirm that the measurement model is both reliable and valid for examining the impact of generative AI on assessment practices in technical education institutions across the GCC region.

TABLE III

RELIABILITY AND VALIDITY OF THE MEASUREMENT CONSTRUCTS

Construct	**No. of Items**	**Cronbach's Alpha**	**Composite Reliability (CR)**	**Average Variance Extracted (AVE)**
Generative AI Usage (GAI)	3	0.84	0.89	0.73
Assessment Vulnerability (AV)	3	0.82	0.88	0.7
Integrity and Fairness (IF)	3	0.86	0.9	0.75
Institutional Readiness (IR)	3	0.81	0.87	0.69
Assessment Reform Strategies (ARS)	3	0.85	0.89	0.72
Pedagogical and Policy Implications (PPI)	3	0.83	0.88	0.71

Since the survey instrument was adapted from multiple prior studies and applied in a new regional context, an Exploratory Factor Analysis (EFA) was conducted to examine the underlying factor structure and confirm construct validity within the GCC technical education setting. Principal Component Analysis with Varimax rotation was employed using SPSS. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.842, exceeding the recommended threshold of 0.60, while Bartlett's Test of Sphericity was significant ($p < 0.001$), confirming the suitability of the data for factor analysis (Table 4). The analysis extracted six factors with eigenvalues greater than 1, consistent with the proposed conceptual framework. All item loadings exceeded 0.70 on their respective constructs, with minimal cross-loadings, supporting the measurement model's stability and validity.

TABLE IV

EXPLORATORY FACTOR ANALYSIS

Construct	**Item Code**	**Factor Loading**	**Eigenvalue**
Generative AI Usage	GAI1	0.81	3.42
	GAI2	0.84	
	GAI3	0.79	
Assessment Vulnerability	AV1	0.78	2.95
	AV2	0.82	
	AV3	0.76	
Integrity and Fairness	IF1	0.85	2.87
	IF2	0.83	
	IF3	0.8	

Institutional Readiness	IR1	0.77	2.64
	IR2	0.81	
	IR3	0.75	
Assessment Reform Strategies	ARS1	0.84	2.78
	ARS2	0.79	
	ARS3	0.82	
Pedagogical and Policy Implications	PPI1	0.8	2.69
	PPI2	0.83	
	PPI3	0.78	

The EFA results confirm that the adapted instrument retains a stable six-factor structure within the GCC technical education context. All factor loadings exceeded the recommended threshold of 0.60, indicating strong item-construct relationships. The extracted factors align with the proposed conceptual framework, suggesting that the constructs are conceptually sound and transferable across educational and regional contexts.

In parallel, the study collected qualitative data through semi-structured interviews with selected faculty members and academic leaders. These interviews aimed to capture more nuanced perspectives on the challenges, adaptations, and institutional reforms associated with integrating generative AI into assessment. The study identified interview participants through purposive sampling based on their involvement in assessment design, curriculum planning, or academic quality assurance. The interviews were conducted in person or via video conferencing, depending on participant availability and geographic location. All interviews were audio-recorded with the participants' consent and subsequently transcribed for analysis. This dual-method approach allowed for both a broad overview and in-depth understanding of how technical education institutions are navigating the disruptions caused by generative AI in academic evaluation.

The data analysis followed a mixed-methods strategy, with quantitative and qualitative components analyzed in parallel before being integrated during interpretation. The aim was to provide both a broad overview of trends and stakeholder perceptions regarding generative AI in technical education assessments and a deeper understanding of the underlying challenges and institutional responses in the GCC context.

This study analyzed quantitative data collected through the online survey using SPSS. Descriptive statistics, including frequencies, percentages, means, and standard deviations, summarized participant demographics and key survey variables. These variables included awareness and use of generative AI tools such as ChatGPT and Gemini, the types of assessments perceived to be most affected, concerns about academic integrity, and the presence or absence of institutional policies addressing AI use. Where applicable, we used cross-tabulations to compare responses across groups, particularly students and faculty members. This helped identify patterns and discrepancies in perceptions and experiences. To assess whether differences between groups were statistically significant, we conducted chi-square tests on selected categorical variables, such as institutional policy awareness across countries or educational roles.

When survey items were grouped into multi-item scales—such as attitudes toward AI-enabled cheating or perceived institutional readiness—reliability analysis used Cronbach's alpha to assess internal consistency. The quantitative analysis aimed not to generalize to the entire population of technical education stakeholders in the GCC, but to identify meaningful patterns, trends, and areas of concern that warrant further qualitative exploration and policy attention.

The qualitative data derived from the semi-structured interviews were analyzed using thematic analysis, following the six-phase framework proposed by Braun and Clarke (2006). After transcribing the interviews verbatim, the researcher immersed themselves in the data through repeated readings to become familiar with it. The researcher then generated initial codes inductively from the data, capturing significant statements and experiences related to assessment challenges, perceived misuse of AI tools, institutional policy gaps, and reform efforts. The researcher then examined these codes to identify recurring themes, which were refined and organized into higher-level categories reflecting key issues emerging from the interview narratives. Themes such as "AI-enabled academic dishonesty," "adaptive assessment strategies," "faculty concerns over fairness," and "institutional ambiguity" were central to the analysis. To ensure analytical rigor, peer debriefing validated the coding process and thematic interpretation, and selected quotations were retained to support the findings and enhance the analysis's authenticity.

After independently analyzing both datasets, the findings were integrated in the final interpretation phase. This convergence of quantitative trends and qualitative insights enabled a more comprehensive understanding of how generative AI is reshaping assessment practices in technical education across the GCC. For example, quantitative data might indicate that most students have used AI tools in academic tasks, while qualitative narratives from faculty reveal a lack of institutional readiness to address this behavior. This integration not only strengthens the reliability of the findings but also enables more grounded and actionable recommendations.

V. RESULTS

The results are organized in two parts to reflect the convergent mixed-methods design. The first part reports descriptive and comparative insights from student and faculty survey responses on awareness, usage patterns, and perceptions of generative AI tools in academic assessment. The second part presents key themes emerging from in-depth interviews with faculty members and academic leaders, providing deeper context and interpretation of institutional practices, challenges, and policy responses related to AI integration in technical education.

By combining these data sources, the study aims to offer a comprehensive and grounded understanding of how generative AI is reshaping assessment practices in technical education institutions across the GCC region.

A. Quantitative Findings

Quantitative analysis of survey responses collected from students and faculty members in technical education institutions across the GCC region. It includes respondent demographics (Table V), descriptive statistics of the key constructs (Table VI), patterns of generative AI usage (Table VII), and statistical analysis using chi-square tests (Table 8) to examine differences between students and faculty. These findings provide an overview of how generative AI is influencing assessment practices and institutional responses

TABLE V

DEMOGRAPHIC PROFILE OF RESPONDENTS

Respondent Type	Count	Percentage
Students	70	58.3
Faculty	50	41.7

Table VI presents the descriptive statistics for the six measurement constructs examined in this study. The mean scores indicate that respondents generally perceive generative AI usage, assessment vulnerability, integrity concerns, and the need for pedagogical and policy reforms at relatively high levels. The highest mean score was observed for Pedagogical and Policy Implications (M = 4.22), suggesting strong agreement regarding the urgent need for institutional policy reform and curriculum redesign. Institutional Readiness recorded the lowest mean score (M = 3.41), indicating that many respondents perceive insufficient institutional preparedness to manage generative AI-related challenges. The relatively low standard deviations suggest consistent responses across constructs.

TABLE VI

DESCRIPTIVE STATISTICS OF MEASUREMENT CONSTRUCTS

Construct	Mean	Standard Deviation
Generative AI Usage (GAI)	4.12	0.74
Assessment Vulnerability (AV)	4.05	0.69
Integrity and Fairness (IF)	4.18	0.72
Institutional Readiness (IR)	3.41	0.81
Assessment Reform Strategies (ARS)	4.09	0.66
Pedagogical and Policy Implications (PPI)	4.22	0.7

TABLE VII

FREQUENCY OF GENERATIVE AI USE

AI Use Frequency	Students (%)	Faculty (%)
Never	10	25
Occasionally	35	45
Often	40	25
Always	15	5

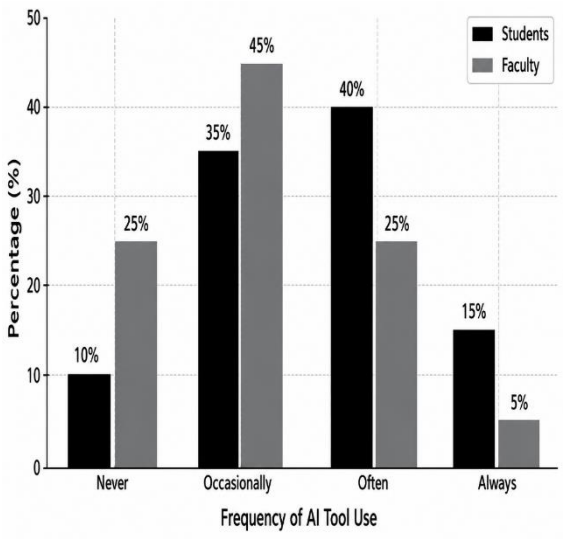

Fig. 2: Use of Generative AI Tools by Frequency

Table V shows the demographic distribution of respondents: 58.3% were students and 41.7% were faculty, enabling a comparative view of their perspectives on AI use in assessments.

Table VII and Figure 2 illustrate differences in generative AI usage. Most students reported frequent use, with 40% using AI tools often and 15% always. In contrast, only 25% of faculty used them often, and just 5% always. Faculty were more likely to report never using AI (25%) compared to students (10%).

These findings indicate that students are more engaged with AI tools than faculty, pointing to a growing usage gap. This suggests the need for clearer institutional policies and training to bridge understanding and ensure fair assessment practices.

To statistically validate this difference (Table 8), we conducted a chi-square test of independence. The results revealed a significant association between respondent type and AI usage frequency, $\chi^2(3, N = 120) = 11.73, p = .008$. This confirms that differences in AI usage patterns between students and faculty are not due to chance, reinforcing the need for role-specific strategies in policy design and training initiatives.

TABLE VII

OBSERVED FREQUENCY OF GENERATIVE AI TOOL USE BY RESPONDENTS

	Never	Occasionally	Often	Always
Students (n=70)	7	25	28	10
Faculty (n=50)	13	23	13	1

Table IX presents the correlation analysis among the study's six constructs. The results indicate a significant positive relationship between Generative AI Usage and Assessment Vulnerability ($r = 0.62$, $p < 0.01$), suggesting that increased AI usage is associated with greater concerns about assessment reliability. Integrity and Fairness also showed strong positive relationships with Assessment Reform Strategies ($r = 0.68$, $p < 0.01$), indicating that fairness concerns drive the need for redesigned assessment approaches. Institutional Readiness showed weaker and partially negative relationships with some constructs, reflecting institutions' perceived lack of preparedness to address AI-related challenges.

TABLE IX

CORRELATION MATRIX OF CONSTRUCTS

Construct	GAI	AV	IF	IR	ARS	PPI
Generative AI Usage (GAI)	1.000					
Assessment Vulnerability (AV)	0.62**	1.000				
Integrity and Fairness (IF)	0.58**	0.71**	1.000			
Institutional Readiness (IR)	-0.31*	-0.28*	-0.35*	1.000		
Assessment Reform Strategies (ARS)	0.55**	0.63**	0.68**	0.42**	1.000	
Pedagogical & Policy Implications (PPI)	0.49**	0.57**	0.61**	0.46**	0.72**	1.000

Note: $p < 0.05$, ** $p < 0.01$

The independent sample t-test results (Table 10) indicate significant differences between students and faculty in Generative AI Usage ($p < 0.01$), confirming that students rely more heavily on AI tools for academic tasks. Significant differences also emerged in Institutional Readiness ($p < 0.05$), with faculty perceiving slightly stronger institutional preparedness than students. These findings highlight differing stakeholder experiences and reinforce the need for role-specific institutional strategies and assessment reforms.

TABLE X

INDEPENDENT SAMPLE T-TEST (STUDENTS VS FACULTY)

Construct	Students Mean	Faculty Mean	t-value	p-value
Generative AI Usage	4.35	3.62	4.28	0.001
Assessment Vulnerability	4.12	3.94	2.11	0.036
Integrity and Fairness	4.08	4.29	-2.34	0.021
Institutional Readiness	3.28	3.59	-2.76	0.007
Assessment Reform Strategies	4.02	4.18	-1.89	0.061
Policy Implications	4.15	4.31	-1.67	0.097

B. Qualitative Findings

The qualitative findings are based on semi-structured interviews conducted with 10 faculty members and academic leaders from technical education institutions across three GCC countries. The interviews were analyzed using thematic analysis, which identified recurring patterns and narratives related to the challenges, perceptions, and institutional responses to generative AI in academic assessment. Four key themes emerged from the analysis, each supported by anonymized participant quotes to provide contextual depth.

Theme 1: AI-Enabled Academic Dishonesty

Several participants expressed concern about students increasingly using generative AI tools to complete assignments without engaging in actual learning. Faculty reported difficulty in detecting AI-generated content, especially when it is original in phrasing and structurally coherent.

"*I had a case where a student submitted an assignment that was too polished to be their work. It wasn't plagiarized, but I later realized ChatGPT generated it. Our usual plagiarism software didn't catch it."*

(Faculty Member, Oman)

This theme highlights the need for institutions to move beyond traditional plagiarism detection systems and adopt strategies that address the subtler forms of AI-facilitated academic misconduct.

Theme 2: Faculty Concerns About Fairness and Learning Value

Many faculty members shared that they are struggling to maintain the fairness and educational value of assessments amid AI assistance. Growing anxiety centers on students bypassing critical thinking and problem-solving tasks by relying heavily on AI.

"I worry that students are learning to prompt AI better instead of understanding the actual content. This affects not just their learning but also the integrity of our grading system."

(Lecturer, UAE)

These concerns reflect a broader pedagogical dilemma — balancing innovation with academic rigor — especially in skill-based technical programs.

Theme 3: Institutional Policy Gaps

A recurring issue in the interviews was the lack of clear, institution-wide policies or guidelines on using generative AI in academic work. Faculty felt unsupported and unsure about how to address suspected misuse.

"We don't yet have an official stance on AI use. Some instructors allow it, others ban it completely. This inconsistency is confusing for students and staff alike."

(Program Coordinator, Saudi Arabia)

This theme emphasizes the urgent need for coherent institutional frameworks that define acceptable use, support educators, and establish enforcement mechanisms.

Theme 4: Emerging Assessment Adaptations

Despite these challenges, several faculty members reported making informal adjustments to their assessments to reduce AI misuse. These included integrating oral components, requiring process logs, or shifting to in-class evaluations.

"I started asking students to explain their submitted work in a short viva session. It helps me verify whether they actually understand what they submitted."

(Senior Faculty, UAE)

These grassroots adaptations indicate early movement toward more AI-resilient assessment

strategies, though most remain ad hoc and unstandardized.

C. Triangulation of Findings

The convergence of quantitative and qualitative data reveals consistent themes regarding the influence of generative AI on assessment practices in technical education. Survey findings showed that students use AI tools more frequently than faculty, with 55% of students using them often or always, compared with 30% of faculty. This usage gap was echoed in the interviews, where faculty expressed concern about students relying on AI to bypass actual learning and highlighted difficulties detecting AI-generated content with traditional plagiarism systems.

Both data sources revealed strong concerns about academic integrity, though from different angles. Quantitatively, over 60% of respondents viewed AI as a threat to fairness in assessment. Qualitatively, this concern was elaborated through first-hand faculty experiences with questionable submissions and uncertainty about grading standards.

Institutional policy gaps also emerged across both strands. Survey data showed that a significant portion of students and faculty were unaware of any institutional policy on AI use. Interviews reinforced this, with educators citing a lack of clear guidance or coordinated responses from academic leadership. This disconnect leaves educators to manage AI-related challenges independently, resulting in inconsistent practices across departments.

Finally, both data sets pointed toward emerging adaptation strategies. Survey results indicated growing interest in AI-resilient assessment formats, while interviews revealed that faculty are already experimenting with oral assessments and process-based evaluations to verify student understanding.

Together, these findings underscore the need for structured, system-wide reforms to ensure fair, effective, and future-ready assessment practices in technical education across the GCC.

VI. DISCUSSION

The findings provide important insights into how generative AI tools are reshaping the assessment landscape in technical education institutions across the GCC. Through a mixed-methods approach, the study explored patterns of AI usage, stakeholder perceptions, institutional preparedness, and emerging adaptation strategies in response to the growing integration of AI in academic environments.

The quantitative data confirmed a clear gap between students and faculty in terms of generative AI usage. While students are adopting tools like ChatGPT and Gemini at a high rate, faculty engagement remains limited. This aligns with existing research by Kasneci et al.(2023) and Zawacki-Richter et al. (2024), which also found a generational and pedagogical divide in AI adoption. The gap is further exacerbated by limited institutional support, as many educators reported the absence of clear policies or training mechanisms to address AI use in assessments.

The qualitative themes deepened these insights, particularly regarding the erosion of academic integrity and the uncertainty educators face when assessing AI-assisted student submissions. The theme of AI-enabled academic dishonesty echoes concerns raised by (Cotton et al.(2024), who highlighted the difficulty of identifying AI-generated work due to its originality and non-plagiarized structure. Faculty concerns about fairness and learning loss align with Doyle et al. (2023), who argue that the overuse of AI may undermine essential skills such as critical thinking and independent problem-solving.

Institutional policy gaps were a recurring theme in both data sets. This supports Alghamdi & Alashban, (2023)findings on the lack of AI-specific guidelines in Gulf universities, which creates a fragmented response across departments and institutions. Without formal frameworks, educators must interpret and enforce standards individually, resulting in inconsistency and confusion among students.

Encouragingly, the study also revealed signs of emerging pedagogical reform, with faculty beginning to adapt assessment formats to counteract or integrate AI use. This reflects Swiecki et al.(2022) call for "AI-aware pedagogy," which does not seek to eliminate AI but instead incorporates it ethically and meaningfully into learning and evaluation. These efforts, however, remain largely experimental and unstandardized, highlighting the need for institutional leadership and systemic support.

Viewed through the study's conceptual framework, AI use, assessment vulnerability, and perceptions of integrity are interlinked and shaped by the institution's readiness and policy environment. Without strategic policy, faculty responses remain localized and reactive. A more sustainable model requires

institutional policies to align with evolving pedagogical practices and assessment designs, ensuring fairness, transparency, and academic rigor in the age of generative AI.

Overall, the discussion underscores the need for technical education institutions in the GCC to not only recognize the disruptive potential of generative AI but also seize the opportunity to modernize their assessment strategies. Doing so will require a coordinated effort involving faculty development, curriculum redesign, and the establishment of robust policy frameworks that reflect the realities of an AI-integrated academic ecosystem.

VII. RECOMMENDATIONS

The findings highlight a critical need for technical education institutions in the GCC to take proactive, structured steps to address generative AI's influence on academic assessment. A foremost priority is developing and disseminating clear institutional policies that define the acceptable use of AI tools in academic contexts. These policies should be accessible, clearly communicated to all stakeholders, and embedded in existing academic integrity frameworks, course syllabi, and assessment guidelines.

Alongside policy formulation, we urgently need to rethink assessment design to minimize opportunities for AI misuse. This study argues that formats that focus solely on final outputs should be reconsidered in favor of more authentic, process-driven methods. Oral assessments, in-class demonstrations, iterative project submissions, and reflective learning journals are examples of formats that can verify student understanding and reduce dependence on AI-generated content. These approaches not only safeguard academic integrity but also promote deeper learning and skill development.

Faculty members play a central role in this transformation and need support through ongoing professional development. Institutions should invest in training programs and workshops that increase faculty awareness of AI capabilities and limitations, while also equipping them with practical strategies to design assessments resilient to technological disruption. Faculty should also be encouraged to explore the responsible integration of AI tools into teaching and learning, turning potential threats into opportunities for innovation.

Rather than adopting restrictive or punitive approaches, institutions should foster a culture of transparency around AI use. Students can be guided to use AI tools ethically through clearly framed assignments that allow or limit their use. Encouraging students to disclose how AI contributed to their work and to reflect on their learning process can help normalize responsible use and reduce ambiguity around academic expectations.

From the students' perspective, the proposed assessment redesign aims to encourage responsible, transparent use of generative AI as a learning aid rather than a substitute for independent thinking. Students should be permitted to use AI tools for activities such as brainstorming ideas, explaining difficult concepts, debugging code, obtaining formative feedback, and exploring alternative solutions. However, they should be required to disclose how they used AI, critically evaluate AI-generated outputs, justify their modifications, and demonstrate their own understanding through reflective reports, oral presentations, viva examinations, or practical demonstrations. Maintaining AI-assisted learning portfolios that document prompts, outputs, revisions, and personal reflections can further support authentic learning while enabling educators to assess the student's actual knowledge and competencies. This approach not only preserves academic integrity but also develops AI literacy, critical thinking, problem-solving, and ethical decision-making skills that are increasingly essential in modern technical professions.

More broadly, collaboration among institutions across the GCC is essential. Sharing best practices, policy templates, and reform strategies can accelerate progress and foster consistency in how technical education systems respond to AI-related challenges. Regional forums or working groups can support this collaboration and ensure AI governance in education is both contextually relevant and future-oriented.

Finally, curriculum frameworks and accreditation standards must evolve to keep pace with technological advancements. Integrating AI ethics, digital literacy, and responsible tool use into technical education programs can prepare students not only to navigate but also to lead in AI-augmented professional environments. These steps are essential to ensuring that adopting generative AI in education strengthens, rather than undermines, the core values of learning, integrity, and student development.

CONCLUSION

This study explored the rapidly evolving landscape of assessment in technical education amid the disruptive emergence of generative AI tools. Using a mixed-methods approach with quantitative surveys and qualitative interviews, the research examined how students and faculty in the GCC region perceive, use, and respond to AI technologies such as ChatGPT and Gemini in academic contexts. The findings revealed a widening gap between student adoption of AI and faculty preparedness, highlighting pressing concerns about academic integrity, fairness, and the relevance of current assessment practices.

The study found that while students increasingly incorporate generative AI into their academic workflows, faculty remain cautious, often lacking clear institutional policies or guidance to address this shift. This disparity is further compounded by the vulnerability of traditional assessment formats and the limited availability of standardized, AI-resilient evaluation methods. At the same time, early signs of adaptation were observed, as some educators have begun experimenting with alternative approaches such as oral assessments and reflective tasks to maintain the authenticity of student work.

These insights underscore the urgent need for technical education institutions across the GCC to modernize their assessment systems. Moving forward, a comprehensive response must include institutional policy development, faculty training, curriculum reform, and regional collaboration. Rather than viewing generative AI as a threat, educators and policymakers should seize this moment to design more meaningful, ethical, and future-ready learning environments.

By acknowledging the multifaceted challenges and embracing innovation, technical education systems in the GCC can turn this disruption into a catalyst for lasting transformation. The study's findings and recommendations offer a practical roadmap for institutions seeking to uphold academic integrity while preparing students for a rapidly evolving technological landscape.

LIMITATIONS AND FUTURE RESEARCH

This study is not without limitations. First, the research was limited to a purposive sample from selected technical education institutions in three GCC countries. While the sample offers valuable insights, the findings may not fully capture the diversity of experiences across all institutions in the region. Future research should aim for broader representation across the entire GCC to enhance the generalizability of results.

Second, the fast-paced evolution of generative AI technologies makes it challenging to capture their long-term impact on education. As tools like ChatGPT and Gemini continue to develop, ongoing research is needed to examine how institutional responses, assessment strategies, and student behaviors adapt over time.

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