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Challenges of Teaching Software Engineering in the Age of AI
A Case Study from Birzeit University

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***Abstract*— The integration of generative AI tools in higher education presents both opportunities and risks, especially in software engineering education. This study investigates the influence of these tools on teaching and learning practices at Birzeit University, using survey data from 70 students and 12 faculty members. The results reveal a rising dependency on AI for programming tasks, challenges in maintaining academic integrity, and shifting dynamics in student engagement and assessment. While faculty members express concern over the erosion of foundational skills, both students and instructors recognize the educational value of AI when guided by ethical and pedagogical frameworks. Correlation analysis shows that students who frequently use AI tools are more likely to report perceived benefits in learning efficiency and concept understanding. The paper concludes with recommendations for assessment redesign, AI literacy, and institutional policy. The relatively small sample size, particularly for faculty, is acknowledged as a limitation, and the findings should be interpreted with this context in mind.**

I. INTRODUCTION

The rapid evolution of artificial intelligence (AI), particularly in the form of generative tools like ChatGPT, GitHub Copilot, and others, is transforming higher education at an unprecedented pace. These tools can generate code, summarize technical concepts, write essays, and even assist in solving engineering problems all within seconds[1]. While such capabilities offer immense potential for enhancing learning, they also introduce significant challenges for academic integrity, skill acquisition, and the traditional model of instruction, especially in technical disciplines like software engineering[2].

Software engineering education depends on students mastering fundamental concepts such as algorithms, data structures, low-level programming, and system design. These competencies require deep understanding, critical thinking, and the ability to independently solve complex problems. The increasing availability and use of AI tools, however, raises critical concerns: Are students relying too heavily on these tools? Are foundational skills being compromised? How can instructors assess authentic learning in an environment where AI assistance is readily accessible?[3]

At Birzeit University, these changes are becoming increasingly evident. Students now have easy access to AI tools that can assist with or even complete programming assignments and projects. While some educators view this as an opportunity to enhance learning efficiency and personalize education, others raise concerns about declining student engagement, reduced problem-solving effort, and the erosion of academic integrity. The balance between leveraging AI for educational enhancement and maintaining rigorous standards for skill development is becoming a central challenge for faculty.

To better understand this evolving landscape, this study investigates the perceptions and experiences of both students and faculty members in the computer engineering and computer science programs at Birzeit University. Through a structured survey distributed in Spring 2025, we collected responses from 70 students and 12 faculty members. These responses shed light on how AI tools are currently used, the perceived benefits and drawbacks, and the ethical and educational concerns that have emerged.

Preliminary findings suggest that a majority of students (over 75%) frequently use AI tools for programming tasks, particularly for debugging, generating code, and understanding algorithms. While students reported increased efficiency and learning support, many also admitted to over-reliance on these tools, sometimes without fully understanding the underlying logic. Faculty members, meanwhile, expressed growing concerns about detecting AI-assisted work, increased difficulty in assessing authentic understanding, and a noticeable decline in students' independent problem-solving efforts. Despite these concerns, both groups recognized the educational potential of AI when used ethically and under proper guidance.

The remainder of this paper is organized as follows: Section II reviews the relevant literature on the rise of generative AI in higher education, with a focus on its impact on skill development, assessment, and policy. Section III outlines the methodology used in designing and distributing the student and faculty surveys. Section IV presents the results of the survey, highlighting patterns of AI use, perceptions, and concerns. Section V offers a detailed discussion of the findings from both student and faculty perspectives. Section VI provides practical recommendations for faculty, students, and university administrators. Finally, Section VII concludes the paper and suggests directions for future research.

II. LITERATURE REVIEW

A. The Rise of Generative AI in Higher Education

Generative AI technologies, particularly large language models (LLMs) like ChatGPT, are increasingly integrated into educational settings. These tools are capable of producing essays, solving programming problems, summarizing lectures, and generating code snippets with minimal input[4]. Their accessibility and efficiency have led to widespread use

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among students across disciplines. In technical education, the impact is especially significant due to AI's ability to assist with tasks that traditionally required deep cognitive engagement, such as writing algorithms or debugging code[5].

Scholars such as Prather et al. argue that AI tools can serve as cognitive amplifiers, enhancing the learning experience when used properly. However, the pedagogical implications of these tools remain underexplored, particularly in developing countries and in technical fields where mastery of concepts is crucial[6]. Current research indicates that students are increasingly familiar with generative AI tools, with many reporting regular use in their academic work [7]. Research also indicates that students perceive these tools as having a positive impact on their learning efficiency, initiative, and creativity [8].

B. Impacts on Student Learning and Skill Development

Computer engineering education emphasizes structured problem-solving, critical thinking, and mastery of complex technical content. Generative AI tools, while helpful, may short-circuit the learning process by offering ready-made solutions without requiring deep understanding. Zviel note that over-reliance on AI code assistants can impair students' debugging skills and reduce their capacity to internalize algorithmic logic [3].

Moreover, as students increasingly consult AI systems to complete their programming assignments or lab reports, educators express concern about the erosion of independent thinking. There is also evidence suggesting that some students fail to verify or fully understand the outputs generated by AI, which may lead to conceptual misunderstandings and superficial knowledge[9].

C. Challenges to Academic Integrity and Assessment

Generative AI presents a new dimension of academic dishonesty. Traditional plagiarism detection tools are often ineffective against AI-generated text and code, making it difficult for instructors to determine the authenticity of student submissions [10].Cotton et al. describe this as a "*crisis of assessment validity*", a condition in which educators can no longer confidently evaluate what a student truly knows or has learned[11].

In the context of engineering education, where assignments and projects often require analytical thinking and design-based solutions, the use of AI tools complicates the task of ensuring fairness and originality. This has led to calls for a reimagining of assessments to emphasize in-person evaluations, oral exams, and collaborative projects that reduce the opportunity for unmonitored AI use[12].

D. Institutional Responses and Ethical Use

Some institutions have responded to the AI revolution by outright banning the use of these tools, while others are experimenting with ways to integrate them ethically into the learning process. Mollick and Mollick advocate for a more balanced approach, suggesting that students should be taught AI literacy, including when and how to use such tools responsibly[13]. This approach could help students develop skills in critical evaluation, tool selection, and ethical decision-making; competencies that are becoming increasingly relevant in engineering professions.

However, the capacity to adopt such strategies varies significantly by institution, especially in regions facing infrastructural and political challenges. In Palestine, where universities often operate under constraints of limited resources and political instability, the adoption of coherent AI policies in education remains a work in progress.

E. Gaps in the Literature and the Need for Localized Studies

While global discourse on AI in education is expanding, most of the existing literature focuses on universities in North America, Europe, and parts of Asia. There is a noticeable gap in empirical studies from Arab institutions, and even fewer that examine the localized effects of AI on technical education.

This study contributes to bridging this gap by providing a focused analysis of how generative AI tools are affecting teaching and learning in the computer engineering program at Birzeit University. Through this case study, we aim to understand student and faculty perspectives, identify the challenges they face, and offer context-sensitive recommendations that resonate with the realities of higher education in Palestine.

F. Relevant Prior Work by the Author

This study builds upon a growing body of research conducted by the author and collaborators on the intersection of artificial intelligence, educational technologies, and computer science education, particularly in the context of Arab and Palestinian learners. These prior works provide empirical and theoretical foundations that inform the current investigation.

Recent contributions include several studies presented at the 2025 IEEE International Conference on Smart Learning Courses (SCME). One study examined the effectiveness of voice and text based chatbots on students' programming skills[14], while another explored the impact of emotion-aware AI chatbots on engagement and learning outcomes in coding education[15]. Both highlighted the promise of AI-driven dialogue systems in supporting personalized learning experiences. Another SCME paper evaluated the accuracy and effectiveness of AI-based grading systems in computer science, concluding that AI grading can be both time-efficient and pedagogically sound when aligned with human-centric evaluation frameworks[16].

At the AIET2025 conference, the author presented a framework for designing emotionally aware chatbots tailored to Arabic-speaking students, underscoring the importance of cultural and linguistic alignment in AI-assisted education[17].

In parallel, several studies published in the INTED2025 proceedings explored related dimensions of educational AI. These include: Active learning strategies in HCI courses in Palestinian universities[18]; Guidelines for emotion recognition and personalization in educational chatbots[19]; Best practices for building voice-based AI learning assistants[20].

Together, these prior works underscore the author's continued interest in the ethical, technical, and pedagogical implications of AI in education. The present study builds on this foundation by shifting focus from chatbot systems to the broader use of generative AI tools in programming education, with an emphasis on academic integrity, learning behavior, and institutional response.

III. Methodology

This study employed a descriptive, survey-based research design to explore the impact of generative AI tools on software engineering education at Birzeit University. Two structured online surveys, one for students and one for faculty, were developed to gather quantitative and qualitative data regarding the use of AI tools, perceived benefits and challenges, ethical concerns, and their influence on learning and teaching practices.

A. Survey Instruments

The student survey[1] consisted of 20 items, including multiple-choice questions, Likert scale statements, and open-ended responses. The questions focused on students' frequency of AI tool usage, types of tasks performed with AI assistance, perceived learning benefits, and their attitudes toward academic integrity.

The faculty survey[2] contained 18 items and aimed to capture instructors' observations of student behavior, assessment challenges, and their personal stance on integrating AI into their teaching. Both surveys were reviewed by peers for clarity and alignment with the research objectives and were piloted with a small group before distribution.

B. Sample Characteristics

Students: A total of 70 undergraduate students from the Computer Science and Computer Engineering programs at Birzeit University completed the student survey. The sample included a balanced representation across academic years and genders.

Faculty: 12 instructors from the Department of Computer Science and the Department of Computer Systems Engineering participated. The majority had over five years of teaching experience and were actively involved in teaching programming, algorithms, or systems-related courses.

C. Data Collection Process

The surveys were administered via Google Forms in May and early June 2025. Invitations were sent through institutional email and department communication channels. Participation was voluntary and anonymous, and students and faculty were informed that the data would be used solely for academic research. Responses were collected over a two-week period.

[1]https://forms.gle/rBizRVSsNtoL56Ys5
[2]https://forms.gle/yAcMsLz92YMucLef6

D. Ethical Considerations

The research design adhered to ethical principles of voluntary participation, anonymity, and data confidentiality. No personally identifying information was collected, and the participants were informed about the study's objectives and use of data. All responses were stored securely and analyzed in aggregate form only.

E. Data Analysis

Quantitative data were analyzed using descriptive statistics to identify usage trends and perceptions. Frequencies and percentages were calculated for categorical variables. For Likert-scale items, average ratings and distribution patterns were examined. Open-ended responses were qualitatively reviewed and categorized into key themes to enrich the findings.

F. Limitations

This study is subject to several limitations. First, the data is based on self-reported behavior, which may be influenced by social desirability or recall bias. Second, the sample size, particularly for faculty, is relatively small and limited to a single institution, which may affect the generalizability of the findings. Finally, the study provides a snapshot of perceptions during a specific timeframe and may not capture evolving attitudes or practices related to AI in education.

IV. Results

A. Student Survey Results

Usage Patterns: A large majority of students (77%) reported using generative AI tools such as ChatGPT, GitHub Copilot, or similar platforms regularly in their coursework. Among these, 52% use them at least once a week, and 25% use them almost daily. The most common use cases were:

- Debugging code (68%)
- Generating new code (61%)
- Understanding complex programming concepts (55%)
- Completing assignments (43%)

Perceived Benefits: Students highlighted several advantages of AI tool usage:

- 74% stated that AI tools help them complete tasks faster
- 66% agreed that these tools improve their understanding of programming topics
- 59% believed AI support enhances their self-learning abilities

Concerns and Risks: However, the data also reveal concerning trends:

- 42% admitted they sometimes rely on AI without trying to solve problems themselves
- 38% reported submitting AI-generated solutions without fully understanding them
- 29% were unsure about the ethical boundaries of AI use in assignments

Attitudes Toward Academic Integrity: While most students (63%) believed that using AI as a helper (e.g., for hints or debugging) is acceptable, only 22% viewed direct

submission of AI-generated answers as ethical. Many students expressed uncertainty, suggesting a need for clearer institutional guidelines.

Open-ended Responses: Themes emerging from student comments include:

- "*AI saves time but makes me lazy.*"
- "*I learn from it, but sometimes I just copy and don't try myself.*"
- "*I wish teachers would explain when it's okay to use AI.*"

B. Faculty Survey Results

Observations of Student Behavior: Faculty members largely agreed that AI is influencing how students complete their coursework:

- 83% believed students use AI tools frequently
- 75% observed a decrease in original student work or problem-solving effort
- 67% faced difficulty detecting AI-generated content in assignments

Perceptions of AI's Impact: While concerned, some faculty acknowledged the educational potential of AI:

- 50% agreed that AI could be useful for student learning when used ethically
- 42% had tried integrating AI tools into class discussions or assignments
- 25% viewed AI as a threat to educational quality if left unmanaged

Assessment Challenges: A majority of instructors (9 out of 12) reported increased difficulty in assessing authentic understanding. Several expressed concern about how to fairly grade work that may be partially or entirely AI-assisted.

Faculty Comments (Themes):

- "*Students can produce polished code, but they fail to explain it during exams.*"
- "*I support AI if it's used to assist thinking, not replace it.*"
- "*We need urgent policies to define acceptable AI use.*"

C. Correlations Analysis

In addition to descriptive statistics, we explored correlations between AI usage frequency and student reported learning outcomes. The data revealed a moderate positive relationship between frequent use of AI tools (e.g., daily or weekly use) and students' perception that these tools enhance their understanding of course concepts. Students who reported using AI tools regularly were significantly more likely to agree that these tools helped them understand programming logic, complete assignments faster, and build confidence in coding-related tasks.

Interestingly, students who frequently used AI tools were also more likely to report increased engagement with course material when AI was used as a supplement rather than a substitute for traditional study. However, among a small subset of students who reported high dependency on AI tools, there was a noticeable decline in self-reported effort on foundational tasks such as debugging or low-level design. This suggests a nuanced relationship: moderate use of AI tools may enhance learning efficiency, while excessive reliance may reduce engagement with critical engineering thinking processes. These correlations do not imply causation, but they indicate that the frequency and context of AI use can influence how students perceive its role in their learning.

V. Discussion

A. Student Perspective: Benefits, Dependencies, and Ethical Dilemmas

Student responses show an enthusiastic adoption of AI tools, with over 75% of students using them regularly. Many emphasized that tools like ChatGPT help them learn faster and understand material better: "*Sometimes I ask ChatGPT to explain the code line by line, it's really helpful when I'm stuck.*"

This indicates that AI is not only viewed as a shortcut but also as a personalized tutor. In the context of learning outcomes, this aligns with improved access to explanations and problem-solving aids, especially for students struggling with language or foundational skills.

However, concerns emerge regarding engagement and independent thinking. Students admitted skipping the learning process: "*I rely on ChatGPT even before I try to think about the problem.*" "*I get the answer fast, but I don't learn deeply.*"

These behaviors suggest that although AI can facilitate learning, it may also reduce cognitive engagement and inhibit the development of essential software engineering competencies such as algorithmic thinking and debugging under pressure.

The ethical confusion was also significant. While 63% believed using AI as a helper is acceptable, many students were unsure where the line is drawn: "*If I use ChatGPT and modify the answer, is that still considered cheating?*"

This uncertainty risks normalizing academic dishonesty unintentionally and highlights the lack of formal guidance.

B. Faculty Perspective: Observations, Pedagogical Shifts, and Assessment Challenges

Faculty shared concerns that AI is altering how students engage with coursework. Many observed improved code quality but reduced understanding: "*Students submit code that works perfectly, but they can't explain what it does.*"

From a learning outcome perspective, faculty noted a misalignment between students' ability to generate correct output and their grasp of underlying logic critical in software engineering.

Engagement was also a common theme: "*They skip the problem-solving step and just rely on the tool.*"

Faculty voiced a strong need to revise assessment methods. Assignments alone were no longer reliable for measuring learning: *"I've had to move to in-person exams and interviews just to be sure they understand."*

Despite this, several faculty members expressed interest in constructive integration of AI: *"I encourage students*

to compare their solutions with AI. It helps them think critically."

This shows an emerging willingness to incorporate AI in pedagogy, provided it promotes deeper learning.

C. Alignment and Mismatch: Student vs. Faculty Perspectives

There is a notable mismatch in how students and faculty perceive AI's role:

- Students largely view AI as a legitimate tool to enhance productivity and understanding.
- Faculty are more cautious, emphasizing the erosion of core skills and academic integrity.

Both groups agree on AI's usefulness when used ethically and reflect a shared need for clarity. However, students often lack guidance, while faculty feel unprepared to manage this shift.

This mismatch can lead to inconsistent expectations, classroom friction, and mixed messages about what is acceptable.

D. Implications for Curriculum, Instruction, and Policy

The results point to several implications for Birzeit University's software engineering programs:

- Curriculum Design: Integrate discussions about ethical AI use and responsible tool adoption into early courses (e.g., Introduction to Programming).
- Assessment Reform: Shift from static take-home assignments toward more interactive assessments-oral explanations, live coding, or reflective reports-designed to evaluate conceptual understanding, not just output.
- Faculty Development: Provide training on AI literacy and how to use AI as a pedagogical aid, not just as a threat.
- Policy Development: Establish department-wide or university-level guidelines on acceptable AI use. e.g., what constitutes plagiarism, permitted tools in coursework, etc.
- Student Orientation: Offer student workshops on how to learn with AI, not from it, emphasizing critical engagement, verification of outputs, and the importance of self-reliance in building engineering competence.

VI. Recommendations

In light of the challenges and insights revealed through this study, we propose a set of targeted recommendations for faculty, students, and university administrators to ensure the responsible and effective integration of AI tools in software engineering education at Birzeit University.

A. For Faculty: Rethinking Assessment and Policy

- Redesign Assessments for Authentic Understanding: Instructors should shift away from static take-home assignments and adopt formats that are less susceptible to AI misuse. These may include:
  - Oral defenses of code.
  - In-class practicals or live coding sessions.
  - Reflective writing explaining solution logic.
  - Version-controlled project submissions to track progress.
- Develop Course-Level AI Policies: Faculty should explicitly state what forms of AI use are acceptable or not in each course syllabus. This includes:
  - When and how tools like ChatGPT or Copilot may be used.
  - What constitutes plagiarism or unacceptable reliance.
- Raise Awareness Through Class Discussions: Instructors should lead open discussions on the ethical use of AI and its impact on learning. This helps foster a shared understanding and clarifies expectations.

B. For Students: Promoting Ethical and Independent Learning

- Encourage Self-Reliant Learning First, AI Second: Students should be guided to attempt solving problems independently before consulting AI tools. A suggested workflow might be: Try independently $\rightarrow$ use AI for feedback or hints $\rightarrow$ reflect on differences
- Clarify Ethical Boundaries of AI Use: Students must be made aware that:
  - Copying code blindly, even from AI, is academically dishonest.
  - AI can assist learning but not replace it.
  - Changing a few lines does not make the solution "original".
- Foster Digital Literacy and Critical Thinking: Workshops or tutorials can be developed to teach students how to verify, critique, and responsibly adapt AI outputs instead of accepting them at face value.

C. For University Administration: Institutional Support and Regulation

- Provide Training and Capacity-Building for Faculty: Birzeit University should organize workshops for faculty on:
  - The capabilities and limitations of generative AI.
  - AI-integrated pedagogy and assessment design.
  - Case studies of effective classroom practices.
- Develop a Clear University-Wide AI Policy: A standardized, yet flexible, policy should be created that:
  - Defines acceptable AI use across disciplines.
  - Protects academic integrity without banning innovation.
  - Supports both faculty enforcement and student understanding.
- Support Research and Innovation in AI-Education Integration: The administration can encourage pilot projects or funded research to explore creative ways to use AI tools responsibly within engineering education.

VII. Conclusion and Future Work

The growing use of generative AI tools in higher education is transforming how students learn and how instructors teach,

especially in fields like software engineering that demand problem-solving and technical depth. This study, focused on Birzeit University, highlights both the benefits and the risks of this shift. Students find AI tools useful for coding and learning support, but many also show signs of over-reliance, with some using them without fully understanding the content. Faculty members are struggling to assess genuine learning and are calling for clearer policies and more support. The findings suggest that banning AI or ignoring its presence is not the answer. Instead, institutions should respond with thoughtful strategies, redesigning assessments, guiding ethical AI use, and equipping faculty to adapt. The challenge is not to resist AI, but to ensure it enhances, rather than undermines, the integrity and effectiveness of education. Addressing these challenges requires collaboration between educators, students, and administrators. Clear communication, shared expectations, and continuous evaluation will be key. As AI continues to evolve, so too must our approaches to teaching and learning. This is an opportunity not just to respond to change, but to lead it responsibly.

While this study provides useful insight into how AI tools are impacting software engineering education at Birzeit University, further research is needed to deepen and broaden the findings. Future studies could include:

- Longitudinal research to track how AI use shapes student learning and behavior over time.
- Experimental designs comparing classrooms with different levels of AI integration.
- Cross-institutional studies to identify shared challenges and best practices in diverse academic contexts.
- AI-aware assessment models that focus on understanding, reflection, and originality rather than just outputs.

In addition to research, this work supports practical efforts such as developing AI literacy workshops, revising departmental policies, and updating curricula. As AI continues to reshape education, it's essential to respond not just with new tools, but with thoughtful pedagogy and clear ethical guidance.

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