Leveraging AI Tools to Improve Student Performance in Engineering Technology Courses

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Abstract

At XXXXXX University, two Engineering Technology courses are integrating artificial intelligence (AI) tools to support student monitoring and advisement. Using Microsoft Copilot with enterprise data protection, the approach tracks student progress and provides timely, personalized feedback to instructors. The two courses, from freshman to junior levels, apply the AI-based approach to identify students at risk during key points in the semester and help them stay aware of their academic standing.

The initiative aims to improve student success and retention through early and responsive support. Faculty use AI-generated data to monitor course performance and adjust teaching strategies to strengthen engagement. This paper presents the implementation process, describes the methods used to identify at-risk students, and reports preliminary outcomes on student performance and persistence.

Keywords: Artificial intelligence, student retention, at-risk students, course performance monitoring

Introduction

As artificial intelligence technologies continue to develop, colleges and universities are increasingly using them to support teaching and learning [1]. The growth of online and blended instruction has made tools that can assist with instruction, assessment, and student engagement especially valuable. At the same time, many of these AI tools are still unfamiliar to educators, and their effective use depends largely on teachers' knowledge and digital skills [2]. To take full advantage of AI-enabled approaches such as adaptive learning and intelligent tutoring systems, instructors need appropriate competencies to integrate these technologies into their everyday teaching [2]. Strengthening teachers' AI-related competencies is therefore an important step toward improving learning outcomes and preparing students for an increasingly technology driven world [1,3].

Two faculty members in the engineering technology program in XXXXXX University adapted an AI-based software, Microsoft Copilot, to their courses during the Fall 2025 semester to examine its practicality in supporting college teaching. The tool was used to monitor weekly changes in student grades, identify at-risk trends, and trigger early intervention through student success systems and advisors. This approach aligns with Bowen and Watson [4], who mentioned using AI to support learning and instructional decision-making while keeping instructors accountable for outcomes.

This paper describes how the AI software enabled these two instructors to save time for mentoring students, providing targeted interventions, and refining instructional practices by automating weekly grade processing, comparisons, summaries, and report generation. These findings support prior research showing that AI-based tools can reduce administrative workload and allow educators to focus more on instruction and student engagement [5]. The paper also discusses future applications and related concerns.

This project does not seek to modify instructional methods to directly improve student learning outcomes. Instead, it focuses on enhancing student advisement by providing timely feedback on academic performance, particularly for students at risk of failure due to low engagement or poor laboratory performance. While formal assessment of student learning outcomes is not the primary objective of this study, the proposed approach supports ABET-aligned practices by improving student awareness, engagement, and responsiveness to performance feedback, which are critical factors influencing outcome attainment.

Background

The two instructors are from the Electrical Engineering Technology (EET) and Mechanical Engineering Technology (MET) programs. Each selected one course from the Fall 2025 semester to pilot the use of the AI software.

The EET course chosen for this project is a required undergraduate course in EET program, typically taken between the fourth and sixth semesters. It is a 3-credit course with two-hour lecture and a two-hour hands-on laboratory each week. Enrollment trends are approximately 100 students in the spring semester and 60 students in the fall semester. The course focuses applied embedded digital systems, including analog and digital interfaces, interrupts, serial communication, and hardware/software integration. Student performance is assessed through weekly quizzes, in-class activities, laboratory work, post-lab assignments, and exams, generating substantial assessment data. Because course content builds progressively, students who fall behind early are at increased risk of withdrawal or failure. While several instructional strategies were implemented to improve learning and retention, the time required to analyze performance data limited the instructor's ability to provide timely and individualized feedback, motivating the adoption of AI-supported analytics.

In contrast, the MET course selected for this study is a freshman-level gateway course in the School of Engineering Technology. The course introduces the fundamentals of metals and ceramics and is delivered as a 3-credit class with a two-hour lecture and a two-hour laboratory each week, enrolling approximately 150 students per semester. As an introductory course, students who attend regularly and complete weekly labs and assignments are unlikely to fail. Approximately 20 in-class quizzes are given each semester and are used both for assessment and attendance tracking. Students with consistently low quiz and lab performance are more likely to exhibit poor attendance and earn grades below a C. Because first-year retention is a key priority, the AI-based tool was used to assist performance monitoring and support early identification of at-risk students while reducing instructor workload.

Methodology

Case 1-EET course

For the EET course, the instructor exported assessment data from the Brightspace learning management system (LMS) and used Microsoft Copilot to conduct week-to-week learning analytics on student performance. The grade data from previous weeks and this week were saved in an Excel file and uploaded to Copilot using structured prompts defined by the instructor. Copilot then generated an Excel report with five tabs tailored to instructional needs, each providing weekly student performance summaries.

These week-to-week comparisons were used to identify students whose overall or lab grades declined by at least one letter grade, flagging them as academically at risk. These indicators triggered early interventions, including direct communication with students and referrals through the university's student success and advising systems.

The weekly prompt for this EET course is as below. (Replace all {Curly Braces} with the appropriate file names or week numbers):

Create a week {{WEEK_NUMBER}} review using the files I'll provide:
Tasks:
1. Week {{WEEK_NUMBER}} Summary (ID, name, email, final %, letter grade)
2. Update Week-by-Week Performance with this week's average
3. Dropped Grades: compare Week {{WEEK_NUMBER-1}} -> Week {{WEEK_NUMBER}}
4. D & F Grades (this week)
5. Grade Level Changes with correct direction logic (A>B>C>D>F)

The weekly report generated included five tabs:

- Week summary: a complete listing of each student's name, email, final percentage, and calculated letter grade.
- Week-by-Week class performance: a cumulative tab where each new week added the new class average; a multi-week view tab.
- Dropped grades: a list of students whose performance declined from Week $x-1$ to Week x, allowing early detection of emerging difficulties.
- D and F grades: a targeted report of all students currently below the 60% threshold.
- Grade level changes: documentation of students whose grade category shifted (e.g., B to C, C to D), showing the need for timely outreach.

The excel file generated includes the following tabs as below:

Email	Calculated Final Grade Numerator	Calculated Final Grade Denominator	Final %	Grade
	73.29	80.00	91.61	A
	67.37	80.00	84.21	B
	73.90	80.00	92.38	A
	53.41	80.00	66.77	D
	73.66	80.00	92.08	A
	32.45	80.00	40.57	F
	69.76	80.00	87.20	B
	59.85	80.00	74.81	C
	68.34	80.00	85.42	B
	62.14	80.00	77.68	C
	76.95	80.00	96.19	A
	77.67	80.00	97.09	A
	74.69	80.00	93.36	A
	73.26	80.00	91.58	A
	52.31	80.00	65.38	D

Figure 1: Week 7 Summary generated by Copilot (Tab 1)

Week	Average Final %
Week 3	85.58
Week 4	80.44
Week 5	81.45
Week 6	81.42
Week 7	81.27

Figure 2: Week-by-Week Performance (Tab 2)

Email	Final %_Week6	Final %_Week7
	94.93	87.17
	95.41	93.71
	65.96	60.53
	78.05	76.51
	96.22	95.97
	93.08	92.87
	40.06	39.61
	83.91	77.68
	63.18	60.82
	68.41	65.38
	55.87	53.56
	92.19	91.95
	43.70	40.57
	91.57	89.54
	96.24	96.19
	64.51	62.10
	97.38	96.01
	25.14	22.92

Figure 3: Dropped Grades in Week 7 (Tab 3)

Email	Calculated Final Grade Numerator	Calculated Final Grade Denominator	Final %	Grade
	53.41	80	66.77	D
	32.45	80	40.57	F
	52.31	80	65.38	D
	48.66	80	60.82	D
	49.68	80	62.10	D
	48.42	80	60.53	D
	45.33	80	56.66	F
	44.01	80	55.02	F
	42.85	80	53.56	F
	18.33	80	22.92	F
	51.21	80	64.01	D
	31.69	80	39.61	F

Figure 4: D and F Grades in Week 7 (Tab 4)

Email	Final %_Week6	Grade_Week6	Final %_Week7	Grade_Week7	Direction
	94.93	A	87.17	B	Decrease
	78.21	C	82.71	B	Increase
	83.91	B	77.68	C	Decrease
	69.92	D	76.64	C	Increase
	91.57	A	89.54	B	Decrease
	57.79	F	70.99	C	Increase
	77.62	C	80.36	B	Increase
	69.28	D	73.57	C	Increase
	95.33	A	87.20	B	Decrease
	69.75	D	74.81	C	Increase

Figure 5: Grade Level Changes in Week 7 (Tab 5)

These reports allowed the EET instructor to quickly track individual student performance over time. Students whose grades improved received confirmation emails acknowledging their progress, while students whose performance declined were contacted with reminders and offers of support. Students earning a C or below received messages showing instructor concern and available academic resources.

Case 2 – MET course

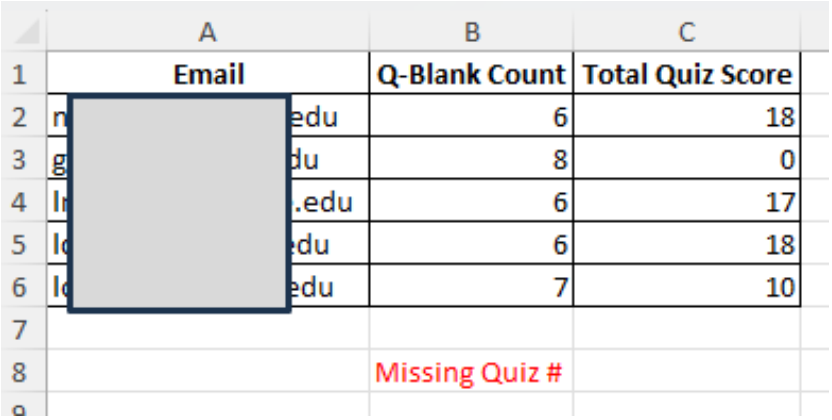
On the other side, the MET instructor used Microsoft Copilot to support instruction in a first-year gateway course. Rather than conducting weekly analyses, student quiz and lab data were exported from the LMS on a monthly basis. Structured prompts directed Copilot to identify students with low numbers of completed quizzes and labs.

Participation frequency rather than grade values, was served as the primary indicator of attendance and course engagement.

By the end of the second month of the Fall 2025 semester, approximately 10 in-class quizzes and 6 labs had been processed. Copilot generated lists of students who had completed only 5 to 6 quizzes, those only with four or fewer quiz records, and those missing two or more labs. These indicators were used to identify students with low course involvement. Based on these reports, the instructor sent targeted alert emails reminding students of attendance expectations and grading policies, while offering academic support as needed. The automated reports, which included student contact information (see Figure 6), simplified communication and enabled timely intervention to support first-year student retention.

The sample prompt for generating a list of students missing six or more quizzes is shown below:

"Use this excel sheet. Only concern the columns start with the letter Q, give me an excel sheet with students' email, the number of blanks with 6 or more, and the total of the Q columns." (Q means Quiz here)



	A	B	C
1	Email	Q-Blank Count	Total Quiz Score
2	n[redacted]edu	6	18
3	g[redacted]du	8	0
4	l[redacted].edu	6	17
5	l[redacted]du	6	18
6	l[redacted]edu	7	10
7			
8		Missing Quiz #	

Figure 6: Students Missing 6 or More Quizzes List (2nd Month, Fall 25) in a MET Class

After one semester of implementation, several practical tips for managing the course workflow were identified:

- Maintaining a master Excel file that is updated and uploaded each week or biweekly.
- Downloading and saving the updated Excel report after each review.

- During the next review cycle, uploading the previously saved file along with the new grade sheet.
- Allowing the software to merge the files and update the reports automatically.

Results and Discussion

At the end of the semester, overall student data was generated, and students' weekly median score was calculated based on due date of the all the course activities. The EET instructor compared it with previous two fall semester scores to provide insight into the effect of early intervention. As seen in figure 7, it shows that Fall 25 weekly median score has consistently higher than the weekly median score of previous two years from Week 3. Table 1 shows students who failed or dropped the class in the final month of the semester due to very low attendance only in the sample MET course. After the monthly alert emails were sent to students with low attendance, almost no students dropped or failed the course due to attendance issues. The only student who failed the course in the list had no record of attending any classes throughout the entire Fall 2025 semester. It seems the objection for student retention has been reached.

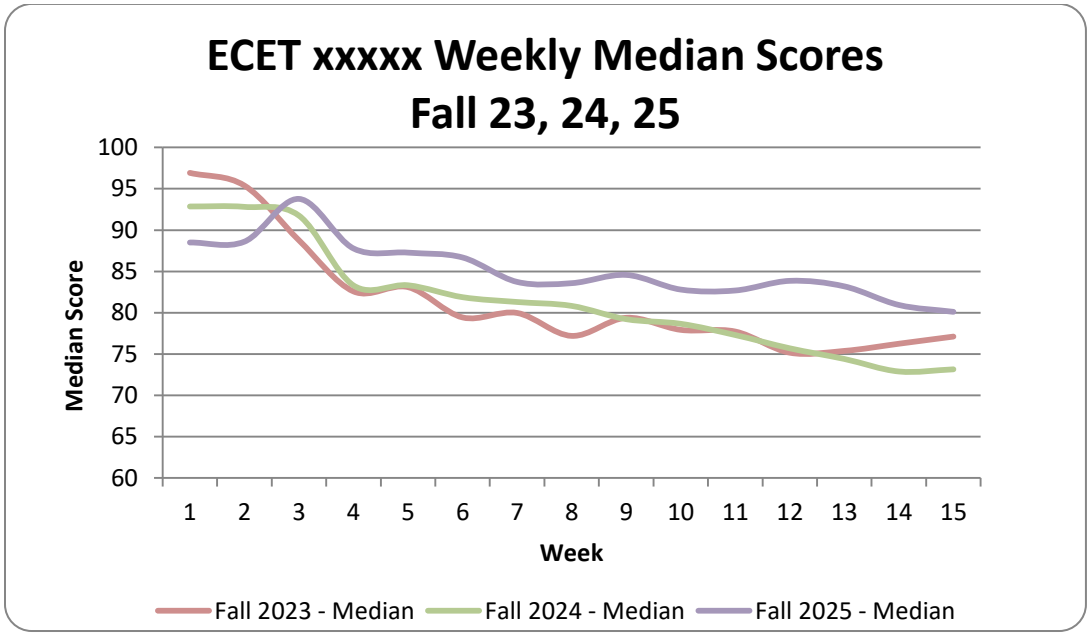


Figure 7: Weekly Median Scores Comparison (EET XXX00 course)

Table 1: MET XXX00 STUDENTS WITH MORE THAN 8 MISSING QUIZZES or 3 MISSING LABS

Semester	Total Students	Drop/Fail
Fall 2024	143	6
Spring 2025	147	4
Fall 2025	136	1

By utilizing AI-based tool, a structured and repeatable workflow for analyzing weekly student performance was developed. The interaction with Copilot focused on loading grade exports, building week-to-week comparisons, identifying drops and raises in performance, and generating detailed summaries that highlight students at risk academically. Through this process, Copilot helped automate complex calculations and create organized reports that would otherwise be time-consuming to assemble manually. This system became a reliable partner in transforming raw grade data from Brightspace into meaningful insights.

Summary

This trial marked the first experience for both authors using AI software to support coursework. The results showed that AI was effective in reducing course administration time in both courses. Although overall faculty workload did not decrease, time was shifted from routine administrative tasks to student communication and targeted support, contributing to lower withdrawal rates and improved student performance. While similar analyses could be completed using complex Excel workflows, AI made the process easier to adapt across courses with different grading structures and enrollments. However, instructors must carefully review AI-generated results to ensure accuracy, particularly when grading policies vary across courses. In future semesters, we plan to explore additional AI tools across courses with different grading structures.

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