Leveraging Peer Learning Assistants and AI to Enhance Student Engagement in Statistics and Data Science

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Enhancing Student Engagement through AI and Peer Support

AI Chatbot for STAT 4/6800 and the **Peer Learning Assistant (PLA) initiative in STAT 2360** represent two complementary strategies for enhancing student success in statistics courses.

STAT 4/6800 is a graduate-level course focused on foundational tools for statistical theory, including vector spaces, matrix algebra, eigenvalues, projections, and advanced topics such as generalized inverses and quadratic forms. In Fall 2024, an AI-powered chatbot—*Learn Helper*—was launched to provide real-time, course-specific academic support. Built on ChatGPT and trained on STAT 4/6800 materials (lecture slides, syllabus, grading policies), the tool offers students just-in-time assistance outside class hours.

In STAT 2360, student engagement is supported through the Peer Learning Assistant (PLA) Program. This initiative enlists high-performing undergraduates from past semesters to guide current students using active learning strategies and collaborative problem-solving. PLAs lead peer discussions, clarify challenging concepts, and help create an inclusive learning environment.

Together, these innovations highlight a multi-modal approach to learning—combining AI technology with peer support to promote understanding, reduce anxiety, and create a more interactive classroom experience.

This document presents two complementary strategies—Peer Learning Assistants and an AI-powered ChatGPT tutorbot—used in statistics courses to improve student learning.

Objectives

- Encourage collaborative problem-solving and active in-class participation.
  By fostering group-based engagement and discussion, students are more likely to articulate their reasoning and learn from peers.
- Bridge gaps in student confidence and performance.
  Targeted peer support helps students build confidence, especially those hesitant to participate or ask questions.
- Reinforce core statistical thinking and data analysis through peer-led examples.
  Peer Learning Assistants use relatable, student-driven examples to deepen conceptual understanding of statistical methods.
- Provide immediate, personalized feedback and self-paced guidance.
  Real-time peer feedback enables timely correction of misconceptions and supports students progressing at different speeds.
- Support diverse learning styles through adaptive, peer-based interaction.
  Peer interactions allow for flexible teaching approaches that resonate with visual, verbal, and experiential learners alike.

Peer Learning Assistant (PLA) Program in STAT 2360

The PLA Program uses trained undergraduate peers who excelled in STAT 2360 to support current students through active learning strategies, fostering collaboration and engagement.

Student Engagement through Peer Support

In STAT 2360, Peer Learning Assistants (PLAs) play a key role in fostering active learning inside and outside the classroom. The integration of PLAs aims to:

- **Facilitate Active Engagement:** PLAs guide students through activities that promote collaboration, discussion, and critical thinking. These not only reinforce statistical concepts but also build communication and teamwork skills essential for data science.
- **Support Peer-Led Problem Solving:** Students work on course problems together under PLA guidance, who break down complex ideas into manageable parts. This peer-led approach helps students explain their reasoning and strengthen understanding through articulation.
- **Encourage Student Participation:** PLAs help create a low-stress, inclusive environment. Students are more likely to engage when peers take on supportive roles, building community and increasing participation.
- **Promote Reflective Learning:** PLAs model reflection by asking guiding questions that help students assess their understanding. This encourages metacognition and supports the development of self-directed study habits.

Evidence of Impact (PLAs)

- **Course Performance:** Higher exam scores and grades.
- **Engagement:** Increased attendance and participation.

Positive Student Feedback (PLAs)

"My PLA helped me see material differently—I felt comfortable asking questions."

"PLAs made the class less intimidating and more interactive."

Active Learning Integration with AI Chatbot

- **Engagement:** Real-time Q&A for abstract topics .
- **Self-Paced Learning:** Customized explanations .
- **Problem-Solving:** Guiding questions .

Student Feedback (AI Chatbot)

"It explained worksheet problems clearly—I finally understood."

"Helped with orthogonal complements and diagonalization."

Evidence of Impact (AI Chatbot)

- **Performance:** Higher homework and midterm scores.
- **Clarity:** Fewer struggles with topics like Gram-Sch chmidt.
- **Usage:** Used for academic and administrative queries.
- **Administrative Help:** Access to grading policies, office hours.

Assessment Comparison

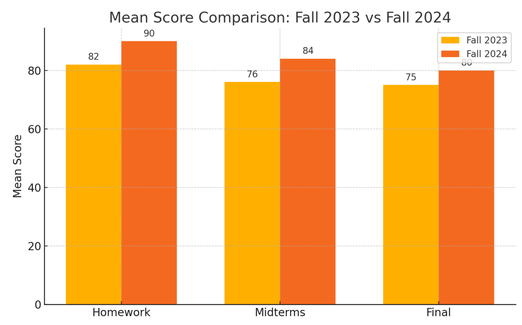

Figure: Fall 2023 vs Fall 2024 Assessment Averages

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