

# JeepyTA: A GenAI-powered forum teaching assistant

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# What is an AI Teaching Assistant?

- AI Teaching Assistants use computational methods to support TAs and instructors, performing the types of tasks traditionally done by human TAs
- Human TAs play a vital role in higher education – but face real limitations
  - Balancing teaching with their own coursework and research
  - Limited availability outside office hours
  - Uneven pedagogical training and feedback quality
  - Scalability constraints in large courses
- AI TAs are not replacements – they are augmentation
  - Providing support that is immediate, personalised, detailed, and available 24/7
  - Freeing human TAs and instructors for higher-level support and teaching

# Some Potential Areas for AI TA Support

- Administrative and logistical support
  - Answering questions about the syllabus, deadlines, grading policies, and course logistics
  - Monitoring student participation and alerting instructors to engagement issues
- Instructional support
  - Responding to student reflections and questions on readings and lectures
  - Supporting brainstorming and idea generation
  - Debugging support for programming assignments
- Formative assessment and feedback
  - Rubric-aligned feedback on essays, drafts, and projects – in seconds rather than days
  - Summarising discussion forums to surface key themes and student participation

# Recent Emergence of AI Teaching Assistants based on LLMs

- IIT Kanpur – AI-augmented TAs for CS programming (Ahmed, 2025)
  - GPT-4 Turbo generated targeted feedback on student code, linked to specific error lines
  - Human TAs reviewed AI drafts before sending – but some forwarded responses without checking for hallucinations
  - Manual TA feedback often led to faster problem resolution despite being shorter and less detailed
- Czechia – “Alex” chatbot for university English conversation practice (Polakova & Klimova, 2024)
  - GPT-3 + grammar correction models; students practised weekly dialogue sessions with real-time feedback
  - Measurable grammar/vocabulary gains, less impact on motivation

# Providing Feedback to Learners

- One of the key potentials of Generative AI for teaching and learning

# Providing Feedback to Learners

- LLMs are really good at generating responses
- Can this ability produce feedback that is
  - More detailed
  - More tailored
  - More rapid
  - More constructive
- And can we leverage this ability in a way that
  - Deepens learning rather than just improving performance
  - Doesn't teach students to avoid hard work
  - Helps students learn how to work effectively with LLMs to achieve their tasks, along the way

# Pre-LLM automated feedback: effective but shallow

- First-generation Automated Writing Evaluation (AWE) tools (Criterion, My Access!, Grammarly) focused almost entirely on surface-level errors: grammar, spelling, punctuation, word choice
- They provided little guidance on higher-order concerns: idea development, argument structure, coherence, or audience awareness (Grimes & Warschauer, 2008; Li et al., 2015)
- Students learned to “fix what the system flags” — revisions aimed at raising scores rather than improving meaning (Grimes & Warschauer, 2010) or content (Chen & Cheng, 2008)

# LLMs: richer, more targeted feedback

- LLMs enable feedback that goes beyond surface errors — addressing organisation, coherence, argumentation, and task alignment
- Retrieval-augmented generation (RAG) allows systems to ground feedback in course syllabi, rubrics, and assignment descriptions, making it assignment-specific rather than generic
- Early evidence is promising: LLM feedback tends to be rubric-aligned and descriptive (Banihashem et al., 2024), leading to appropriate revisions (Meyer et al., 2024)
- JeepyTA, our AI Teaching Assistant, is built on this approach: GPT + RAG, integrated into course discussion forums, providing feedback within 1–2 minutes of submission

# Giving the right feedback

- LLM feedback can be descriptive and summary-like rather than directly identifying what needs to change and why (Steiss et al., 2024; Bergström & Yvdal, 2024)
- Without instructor scaffolding, students tend to use LLM feedback for surface corrections rather than discourse-level revision (Mahapatra, 2024)
- Can we give feedback toward higher-order concerns, not just surface issues?

# Feedback for *learning*



- Risk of AI Dependency where students perform but do not learn (Darvishi et al., 2024)
- Visible improvement in writing quality seen in many studies (Chan et al., 2024; Meyer et al., 2024) may reflect temporary performance gains rather than durable learning
- Students remember only ~25% of (non-LLM) written feedback within a week (Winstone et al., 2024) — retention is the real challenge

# JeepyTA: 5 universities, 16 courses, 20 sections (Shah et al., 2024; Liu et al., 2024, in press; Baker et al., 2026)





▲ Not secure | educ.jeepytee.net/d/11-assignment/3

UPenn EDUC 6191 Search Forum

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 **rachel**  5 days ago  
What is the Creative Assignment 1 due date?

---

 **jeepytee**  5 days ago  
 [unknown]  @[deleted] -> 1159pm, September 25, USA Eastern time.

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JeepyTA: 5 universities, 16 courses, 20 sections  
(Shah et al., 2024; Liu et al., 2024, in press; Baker et al., 2026)

- Used in several ways across courses
  - Uses designed in partnership with instructors
  - Core Methods in Educational Data Mining
  - Big Data, Education, and Society
  - Adaptive Learning Systems
  - Video Games and Virtual Worlds
  - Foundations of Educational Thought
  - Cultural Foundations of Learning and Development

# Answering questions (current version, much iterated)

- Embeddings used to add course info to GPT
  - Syllabus
  - Weekly slides
  - Assignment descriptions
  - Transcripts of videos for each week of class
  - Video scripts for video discussion assignments (our equivalent of breakout rooms)
  - Course readings
- Previously: past semester instructor responses to questions (Q&A pairs)
  - Turns out to be less useful with versions after GPT-3.5

# Current Prompt

- You are JeepyTA, a virtual teaching assistant for the course "Adaptive Learning Systems," also known as "Intelligent Tutoring Systems," at the Graduate School of Education, University of Pennsylvania.
- Your goal is to assist students when the instructor, Ryan Baker, and the teaching assistant, Chelsea Porter, are not available. If a user asks a course-related question, please try to find the answer in the provided content in the section below (under # Content Found). If the answer cannot be found, recommend the student to contact Ryan or the teaching assistants for further guidance.
- If a student asks a technical, coding, or concept-related question, please answer based on your knowledge.
- Please add a warm greeting to each response.

# Can answer conceptual questions about assignment

E

[redacted] 16 hours ago Edited

Hey, this is my first time to learn about Sklearn and there is no starter code in the assignment. If we need to create a DecisionTreeClassifier and predict which student is on task, the ONTASK should be our X target variable, and using the rest of the columns as the training/features? Then we can fit these X and Y to the classifier, make the prediction on the X, then calculate the Kappa?

```
classifier.fit(X, y)
y_pred = classifier.predict(X)
kappa = cohen_kappa_score(y, y_pred)
```

← jeepytee replied to this.

J

**jeepytee** 16 hours ago Edited

[redacted] Hey there [redacted]

You're absolutely right! To predict which student is on task using a DecisionTreeClassifier, you would need to set the ONTASK column as your target variable (y). The remaining columns would serve as your training features (X). Once you have your features and target variable, you can fit them into the classifier using the fit() method.

The fit() method enables the classifier to learn from your data and create the decision tree. After that, you can use the predict() method to make predictions on the X data. This will give you the predicted labels.

To evaluate how well your model is performing, you can calculate the Kappa score. The cohen\_kappa\_score() function will come in handy here. It requires you to pass in the actual labels (y) and the predicted labels (y\_pred).

Before fitting the classifier, make sure you have imported the necessary libraries, such as sklearn (for the classifier). Also,

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Can help students think through their work on assignment – in this case, thinking about the relationship between variables in a data set

UPenn EDUC6191 Search Forum



What should be the relationship between offtask and prev3 or prev5?



  a day ago

I thought for a long time but I cannot come up with a very reasonable way to think about this relationship. Maybe a student's last five actions involving same widgets meaning that he is sticking on the task? But this still does not seem quite reasonable to me.

 jeepytee replied to this.

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  jeepytee a day ago



 Hey 

I see that you're trying to understand the relationship between a student's last five actions involving the same widgets and their level of engagement or persistence. It's an interesting topic to explore, and while there may not be a definitive answer, there are a few possible ways to approach this question.



Firstly, if a student has performed the same actions repeatedly in their last five interactions, it could indicate that they are persistently engaged in the task and are trying to master it. This suggests that they are committed to the learning process and are actively working towards improving their understanding.

On the other hand, if a student continues to repeat the same actions without making progress or achieving the desired outcome, it might suggest a lack of understanding or confusion. In this case, they could be repeating the actions in an attempt to figure out the correct approach or solution.

Another possibility is that the student has found a strategy that works for them and is using it consistently, even if it's not the most efficient. This could mean that they are not exploring alternative approaches or adapting their actions based on feedback or new information.



 






# Instructor can require that Q&A response posts approved (and sometimes not approved) before post

  2 days ago  
I got a traceback saying "ValueError: y should be a 1d array, got an array of shape (27731, 18) instead.". I am wondering how to solve this.

 rachel replied to this.





Flagged by [deleted] as `flarum-flags.forum.flag_post.reason_Flagged by support-ai_label` Please approve.

 Restore  Delete Forever  Dismiss Flag




  2 days ago  
 [unknown]  Hey there   
I see that you're encountering a traceback error t  
18) instead." Well, I can help you tackle this issue  
So, the error message is indicating that the variat  
(27731, 18) instead. To resolve this, you'll need to  
Here's a quick example of how you can reshape t

```
import numpy as np

# Assuming y is the array causing the error
# Reshape y into a 1-dimensional array
y = np.reshape(y, (27731,))
```

  2 days ago  
 Hello  we would be happy to help you resolve this issue, but we will need a bit more information to provide a more precise solution. Could you please provide the relevant code snippets or the part of the code that is causing the error and/or what are you trying to achieve with this code?

 replied to this.

  a day ago  
 rachel Sure! Thank you so much for your reply and this is the code snippets:

```
target_column_name = 'ONTASK'
X = dataset.drop(columns=[target_column_name]) # Features
y = dataset[target_column_name] # Target variable
label_encoder = LabelEncoder()
X = label_encoder.fit_transform(X)
y = label_encoder.fit_transform(y)
```

# Structured feedback on project drafts and prospectuses

- Feedback in seconds rather than weeks
- Embeddings used to add
  - assignment description and rubric
- We also added to the prompt:
  - (deidentified) past instructor/TA assignment feedback

# Prompt

- You are JeepyTA, a virtual teaching assistant for the course Big Data, Education, and Society at the University of Pennsylvania. Your role is to provide constructive, individualized feedback on students' essay assignment submissions. Please adhere to the following guidelines:
- Identify specific areas for improvement in relation to each evaluated aspect defined in the assignment description. Avoid vague or generic comments (e.g., “be more specific” or “add examples”). Instead, provide clear and actionable suggestions that help students meet the assignment objectives and criteria.
- Avoid repeating or rephrasing content already presented by the student unless it is necessary to frame your feedback.
- Do not reference or recommend “learning styles” when discussing proposed learning analytics applications, as this concept is controversial and not supported by current scholarship.
- Do not assign a score or letter grade.
- Begin each response with a supportive opening statement, and close with: Best, JeepyTA
- *### Assignment Description:*
- *### Rubric:*
- *### Sample Feedback (for reference only, not for reuse):*

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# Example

Thank you for your comprehensive and thoughtful project proposal for the data-driven online learning application targeting issues with current educational technologies. Your project outlines a solid understanding of the potential for learning analytics to enhance the education sector.

## **Problem**

- You have identified a broad range of issues with current online learning platforms, from the lack of individualized learning paths to inadequate feedback mechanisms. To strengthen your proposal, it may help to prioritize these issues based on their impact on learning outcomes. By doing this, you can guide readers through the most critical problems your application intends to solve first.

## **Approach**

- The approach section provides a detailed description of how your application will function and the various components involved. To further improve this section, consider specifying preliminary design principles or theories of learning and instruction that will inform your application's development.

## **Past Work**

- Your review of the literature and past work is extensive and demonstrates a clear gap in the market that your application aims to address. To enhance this section, it would be helpful to include some critical analysis of how these existing systems' limitations have directly impacted learning outcomes. Doing this could provide a stronger rationale for the necessity

# Example

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# Helping students brainstorm and develop ideas

Z

21 days ago

I would like to explore the use of Minecraft for fostering this: Minecraft can be seen as a versatile tool in both formal and informal educational settings. It can help students learn a range of subjects from history (by recreating historical landmarks) to science (through ecological conservation projects or understanding simple machines via redstone circuits). The game's open-ended nature encourages students to experiment and learn from their failures, fostering a growth mindset and promoting creativity, critical thinking, and collaboration—skills crucial for academic and personal success.

JeepyTA replied to this.

J

JeepyTA 21 days ago

It's great to hear that you want to explore the use of Minecraft for fostering various skills and learning across different subjects. Minecraft's versatility as an educational tool is indeed well-documented, and it can be effectively utilized in both formal and informal educational settings.

In the realm of history education, Minecraft's ability to recreate historical landmarks and events can provide students with engaging and immersive learning experiences. By designing and building historically accurate structures or reenacting historical scenarios, students can deepen their understanding of historical contexts and develop a sense of empathy and connection with the past.

In the field of science education, Minecraft offers opportunities for hands-on exploration and experimentation. From ecological conservation projects to understanding concepts like simple machines through redstone circuits, students can apply scientific principles in a virtual environment. Minecraft's gamified approach to learning allows students to make connections between abstract scientific concepts and real-world applications.

Moreover, Minecraft's open-ended nature fosters a growth mindset by encouraging students to experiment, learn from failures, and iterate on their designs. This promotes resilience, adaptability, and problem-solving skills, which are essential for academic and personal success.

Collaboration is another key aspect of Minecraft that can be harnessed for fostering important skills. By working together on shared projects, students can practice communication, teamwork, and negotiation skills. Minecraft's multiplayer mode enhances opportunities for cooperative problem-solving and encourages students to learn from and with each other.

As you explore the educational potential of Minecraft, consider specific lesson plans, projects, or activities that align with your goals. Look for existing examples and resources that demonstrate successful integration of Minecraft in various subjects. Additionally, consider the practical aspects of implementing Minecraft in different educational contexts, such as technical requirements, teacher support, and assessment strategies.

Your exploration of Minecraft's versatility as an educational tool will provide valuable insights into how the game can be effectively utilized to support student learning and engagement in a wide range of subjects.

L

19 Feb

I would like to explore the use of Space Invaders for fostering mathematics and space science into the gameplay of Space Invaders. Possible ideas include math-problem based power-ups, space-themed quizzes, and score calculations that require mathematical operations. My educational objectives are to foster critical thinking, creativity, and subject-specific learning through these elements.

JeepyTA, please remember the context I have provided you thus far and provide your suggestions for implementing Space Invaders in education.

JeepyTA replied to this.

J

JeepyTA 19 Feb

Based on the context you have provided, here are some suggestions for implementing Space Invaders in an educational context to foster mathematics and space science:

1. **Math Problem Power-ups:** Integrate math-related power-ups into the game. For example, players can collect power-ups that require them to solve math problems or equations to activate special abilities, such as laser upgrades or temporary invincibility.
2. **Space-themed Quizzes:** Incorporate space science questions into the gameplay. Players can encounter periodic quiz rounds where they have to answer questions related to space science concepts, astronomical phenomena, or space exploration history to progress in the game or earn bonus points.
3. **Score Calculations and Mathematical Operations:** Design score calculations that require players to perform mathematical operations. For example, the player's score can be determined by their ability to accurately calculate the total number of defeated enemies, multiply it by a specific factor, and add it to their base score.
4. **Resource Management:** Introduce resource management elements that involve mathematical decision-making. Players can be tasked with managing limited resources, such as fuel or ammunition, requiring them to strategize and make calculations to optimize their use and accomplish game objectives.
5. **Space Science Facts:** Integrate educational content related to space science by displaying interesting facts or explanations about astronomical phenomena or space missions during gameplay intervals. This can help foster players' knowledge and curiosity about the subject.
6. **Problem-solving Challenges:** Create in-game challenges that require players to apply mathematical concepts to solve puzzles or overcome obstacles in the game. This can include tasks like calculating trajectories, analyzing patterns, or determining optimal strategies based on mathematical principles.

These suggestions aim to foster critical thinking, creativity, and subject-specific learning through the integration of mathematics and space science in Space Invaders gameplay. Feel free to adapt and expand upon these ideas to align with your specific educational objectives and target audience. Good luck with your implementation, and I hope it provides an engaging and effective learning experience!

# Immediate project feedback: early challenge

- In the first semester and assignment where we piloted immediate project feedback, a problematic pattern emerged
- Some students didn't read the assignment carefully and didn't follow all assignment requirements
  - Much much more than usual
- JeepyTA had been told to give them feedback on their ideas; we didn't ask it to check for compliance with assignment requirements (and we still don't)
- So it didn't catch this problem
- These students got a bad grade
- The students complained
- The instructor (me) gave them a chance to resubmit

# Fixing this problem

- We decided this wasn't a problem with JeepyTA itself
- We want to help students learn about ideas, not teach them to not read the assignment
- So, we kept JeepyTA itself the same but re-designed implementation
- The next semester
  - Assignment said in boldface that JeepyTA will not catch non-compliance with assignment requirements, and that it is there to give feedback on ideas
  - Instructor repeated this message several times in class
  - Problem went away

# JeepyTA

- Is rated comparably to human TAs on many dimensions (Liu et al., 2024)
- Responds much faster than human TAs or instructors (Liu et al., 2024)

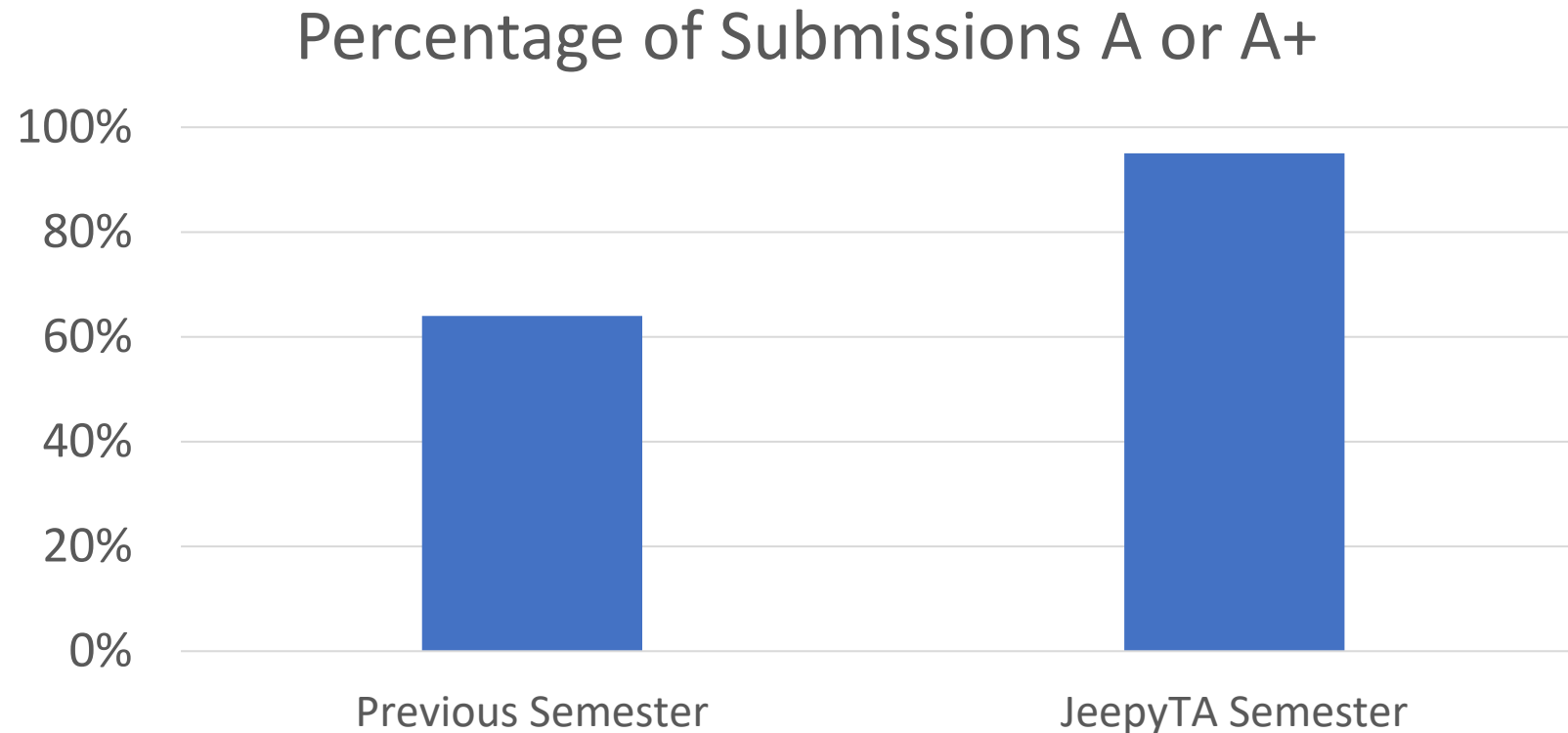
# Impacts

- Liu, X., Nasiar, N., Pankiewicz, M., Baker, R.S. (under review) How Do Students Revise Their Essays Using AI-Generated Feedback? A Case Study with JeepyTA.
  - Comparing performance across same course in two different semesters
  - JeepyTA available in experimental semester
- Liu, X., Wei, Z., Baker, R.S., Pankiewicz, M., Dai, Y., Vanacore, K. (in press) Do Students Learn from Writing Feedback from an AI Teaching Assistant? To appear in *Handbook of Writing Assessment*.
  - Two courses where similar assignments given
  - Both courses used JeepyTA
  - Many students took both courses
  - So we could follow specific students across courses

# Study 1: Comparison JeepyTA/no JeepyTA

# Impact on Grades

- Graded by (same) paid grader not involved in study
- Chi-sq (df=1,N=100) for A+ =12.48,  $p < 0.001$
- Numerical grades also higher, Mann-Whitney  $U=670$ ,  $p < 0.01$



# What JeepyTA Suggested

- **Low-level:** Almost no feedback on low-level edits — prompt emphasised higher-order content
- **High-level:** Focused on *Depth, Specificity, and Clarity* — pushing students to elaborate, sharpen arguments, and add detail
- **Assignment-specific:** Targeted all five course rubric dimensions (*Technical Challenge, Adoption, Implementation Fidelity, Data Access, Political Challenges*)

# Feedback Adoption Rates

- **Overall:** 74% of JeepyTA's feedback items were adopted by students
  - Approximately equal among categories
  - Clarity suggestions a little less adopted (63%)
- Feedback with *Explanation* adopted 84% vs. 61% without (Fisher's exact  $p = 0.012$ )
- *Example* and *Idea Suggestion* had no significant effect on adoption rates

# Study 2: Students Learning Across Assignments (And Courses)

# Did JeepyTA need to give same feedback across assignments within Course 1?

- *Reappearance* of same feedback was uncommon: 20.5%
- *Assignment-alignment* was the most frequent feedback category in both assignments (18 items in Asgn 1, 14 in Asgn 2), but only 28% of *Alignment* comments reappeared

# Feedback Reappearance Within Course 1

- Example of how feedback was used:
  - Assignment 1 feedback: Link stated benefits more directly to each stakeholder group identified in the needs assessment
  - Assignment 2 writing:
    - Structured discussion of *risks* around the same stakeholder groups
    - Paired each *risk* with a specific stakeholder
    - Framed reasoning in terms of stakeholder concerns
  - Key takeaway: *Alignment* feedback shaped later organization

# Feedback Reappearance Within Course 1

- Other categories with reappearance
  - *Detail Development*: 22% (2 of 9)
  - *Specificity*: 13% (1 of 8)
  - *Theoretical Integration*: 33% (1 of 3)
- Low reappearance rates suggest most groups addressed the specific issues flagged in their first assignment
- New (different) feedback appeared in Asgn 2 in some of the same categories
  - *Alignment* is a multidimensional issue, not one-time fix

# Cross-Course: Did Students Learn Across Courses?

- *Reappearance* was uncommon overall, about the same rate as within-course: 18.4%
- However, reappearance was more common for
  - *Specificity*: 27% (6 of 22)
  - *Use of examples and Case studies*: 33% (2 of 6)
  - *Detail development*: 28% (5 of 18)
  - *Theoretical integration*: 33% (2 of 6)
- *Reappearance* was *not* common for *Assignment-alignment* feedback: 3% (1 of 32)

# Conclusions

- AI feedback can drive real learning – students don't repeat the same issues
- Students revised substantively in response to JeepyTA feedback, and performance improved within the first course — particularly where feedback was specific and actionable
- Relatively few mistakes reappeared across courses
- But in both cases, student assignments had new issues
  - No single assignment's feedback can address all issues that will emerge
  - Some issues can only emerge when other issues resolved

# Prioritize

- Prioritisation matters: feedback scattered across many categories may dilute attention
- Future JeepyTA iterations should focus students on fewer, higher-stakes issues

# Conclusion

- Generative AI can be a powerful feedback tool
- Students do seem to learn from this feedback
- There is still considerable work needed to fully optimize this learning; we ultimately may need more support alongside the feedback
  - Such as support for greater AI feedback literacy (Jin et al., 2025)
- A lot of fun work ahead

# Thank you!



Penn Center for  
Learning Analytics

UNIVERSITY of PENNSYLVANIA



University of  
South Australia

Centre for Change and  
Complexity in Learning



Ryan Baker

“Big Data and Education”, a free and totally open MOOC  
All publications available online – Google “Ryan Baker”

Forthcoming: *AI and Qualitative Research: New Possibilities*  
Email me for free PDFs of chapters