

Iterative Learning: Using AI-Bots in Negotiation Training

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Negotiation skills are essential in management education and in engineering practice. Traditional teaching methods, centered around role-playing activities, have often struggled to fully engage students or provide the personalized feedback necessary for mastering such a complex skill set.

To addressing this pedagogical gap, I developed *AdVentures with chatGPT* [1] by leveraging artificial intelligence to create a dynamic, interactive learning experience that adapts to each student's needs and performance. In this two-round negotiation exercise, students assume the roles of job candidates, negotiating terms with an AI-bot recruiter. The AI then provides students immediate, objective feedback after the first round. Students reflect on their performance, and identify improvements and strategies before the second round.

A distinctive feature of *AdVentures* is the ability to treat each negotiation round as a “fresh start.” Unlike human negotiators who often carry past memories and experiences into subsequent negotiations, the AI resets for each round. This unique feature enables students to leverage insights and learnings from Round 1 to their negotiations in Round 2, enhancing students' ability to adapt and apply their negotiation skills effectively.

This extended abstract describes a pilot study of *AdVentures* in which there was an average improvement of 10% in student performance in a group of engineering management master's students. Further research is needed to confirm this finding; should it hold, this AI-enabled iterative approach offers an effective and scalable solution to negotiation/management education.

Theoretical Foundation

AdVentures is rooted in research on negotiation strategies, artificial intelligence, and experiential learning. The use of AI technology in negotiation is an active topic for negotiation, management, and computer science researchers [2]–[4]. With the release of chatGPT in November 2022, interest has skyrocketed; over 100 million users signed up within the first two months alone [5].

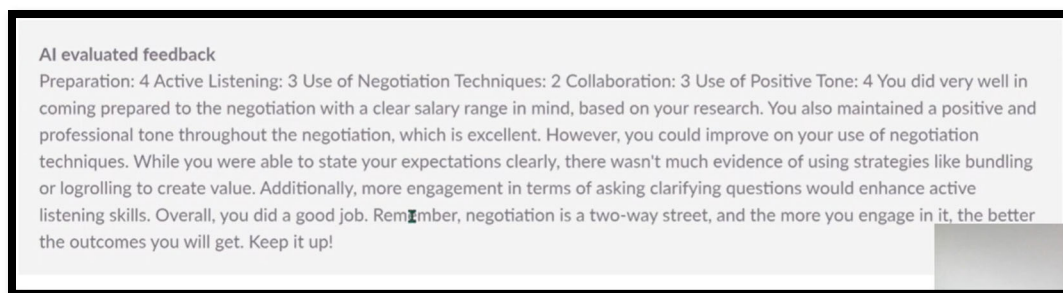
The integration of AI in negotiation training presents a promising frontier in management education, merging technological innovation with pedagogical effectiveness. The exercise is in line with experiential learning theory [6]–[8], emphasizing learning through reflection and doing. Here, AI helps students practice negotiation, offering instant feedback for them to review and adjust their tactics. This way, students not only get to practice but also think critically about their actions, thereby deepening their engagement and understanding [9]–[11].

AI may help address questions of how to measure negotiation performance and learning. There has been scant research on the efficacy of negotiation training (with or without AI) [12]. As recently as 2020, “the question of how to assess negotiation performance systematically and comprehensively remains largely unanswered” [13, p. 365]. Reflection plays a likely role in adult learning [7] and human negotiations [14]. Thus, *AdVentures* provides one possible mechanism of learning: the AI feedback/student reflection step that occurs between the two rounds.

Exercise Description

AdVentures is an online simulation, which can be done at students' own pace, or as part of a live class. In the exercise, students play the role of job candidates, while the AI-bot plays the role of the recruiter. Each negotiation round takes between 20 to 30 minutes to complete, in which students experiment with different strategies, apply the feedback received, and observe the outcomes of their adjustments in real-time. The exercise is conducted in 5 steps:

1. **Initial Negotiation (Round 1):** Students engage in a simulated negotiation with the generativeAI (currently chatGPT4), which is programmed to represent the Recruiter counterpart. The first negotiation round allows students to apply their initial negotiation strategies.
2. **Initial Feedback:** Immediately following the initial negotiation, the AI provides personalized feedback to each student based on their performance, covering key areas such as active listening, use of negotiation techniques, collaboration, and use of positive tone. It provides the student with a score (0-4, with 4 being excellent) on each of these items. A sample of AI-generated feedback is shown in the screenshot below:



3. **Initial Reflection.** Students then reflect on this feedback and identify improvements. They complete a short survey that asks them to reflect on two questions: (1) "What are 2-3 things that you did well in this negotiation? You might give examples, reflect on the feedback, or your score." And (2) "What are 2-3 things that you want to improve in the next negotiation? What might you try? Be specific."
4. **Final Negotiation (Round 2):** With the insights gained from the feedback, students enter the second negotiation round, which is identical to the initial round.
5. **Final Reflection.** Students then reflect on this feedback and identify improvements. They complete a short survey that asks them to reflect on two questions: (1) "What are 2-3 things that you did well in this negotiation?" And (2) "Consider the improvements you identified in Round 1. What tactics or strategies did you try during Round 2 to improve? Were you successful or not?"

Learning Objectives and Outcomes

The primary learning objectives of *AdVentures* focuses on developing negotiation skills. Students gain a deeper understanding of negotiation tactics, by practicing and reflecting on their performance. Learning outcomes are assessed through a combination of direct and indirect measures:

- **Direct Measures:** These include scored negotiation outcomes against predefined benchmarks of integrative potential, and tracking the improvement in students' performance over both rounds. AI-generated feedback scores might also be considered a direct measure, assuming reliability can be established.
- **Indirect Measures:** These include two within-exercise surveys, and course evaluations that provide insights into students' perceptions of their learning, including self-reported growth in confidence and negotiation skill.

Pilot Study Results

A STEM masters-level class of 53 students in Spring 2023 completed the *AdVentures* exercise. The students conducted the exercise asynchronously (online) in the eighth week of a 10-week negotiation course, after they had learned various negotiation principles and developed their skills by negotiating (in-person) with one another. Students had previously conducted a simple negotiation directly with chatGPT during the first week of the in-person course, ensuring that all students had some familiarity with genAI interaction.

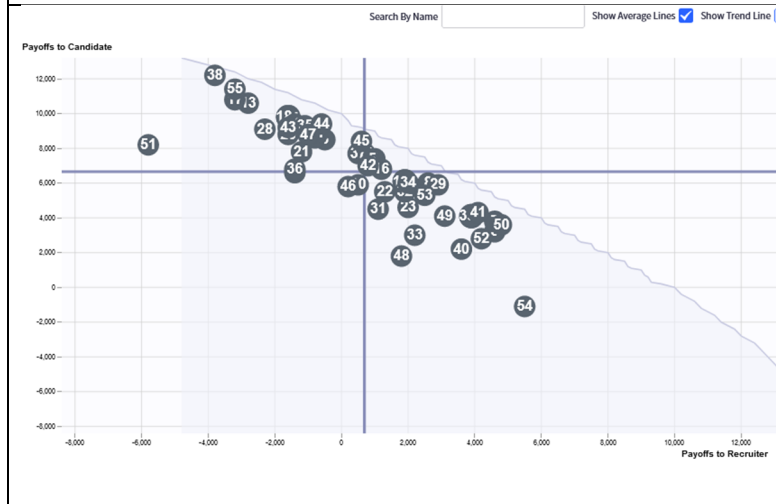
Direct assessment included the objective measurement of “integrative potential” score in each round, as well as the change in scores from Round 1 to Round 2. Integrative potential in negotiation refers to the ability to create mutually beneficial outcomes for both the Recruiter and the Job Candidate. This concept is closely related to the Pareto curve principle in economics, which represents the idea of efficiency in allocations. In the context of negotiation, achieving a point on the Pareto curve indicates an optimal, cooperative agreement where no party can be made better off without making another party worse off.

Preliminary findings from pilot use of *AdVentures* in negotiation course indicates a significant improvement in students' negotiation outcomes, with an average performance increase of 10% from the first to subsequent rounds. This is graphically illustrated below:

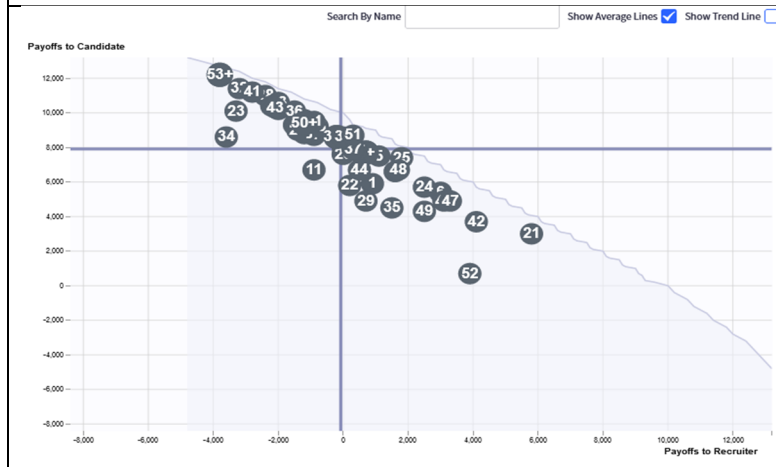
Indirect assessment included survey responses after each round, and student evaluations at the end of course. Qualitative feedback from students underscores the value of personalized, actionable feedback and the opportunity to practice in a risk-free environment. Here are a few representative comments:

- “Incorporating AI-bots and interactive tools has offered a personalized learning experience tailored to my individual needs....encouraging me to explore different perspectives....This is truly an innovative way of learning.”
- “I found using chatGPT in my negotiations a very useful tool for learning....While it is different from having human negotiations, it lets me practice my skills, build my confidence before I negotiate with other people. Furthermore, chatGPT gave personalized feedback which was crucial in my development and improvements.”
- “[E]ngaging with chatGPT gave insight on what the future may look like and how we can incorporate technology into our learning practice.”

Class performance improved by 10% using this chatGPT-enabled exercise.



Round 1: Students engaged in negotiations with the AI-bot and were evaluated based on their outcomes. Optimal results align closely with the upper boundary of the gray region, representing the Pareto frontier. Few students are close to optimal deals in Round 1.



Round 2: Upon negotiating a second time with the AI-bot, students demonstrated an 10% overall improvement in their performance. The majority of students also achieved deals that were closer to optimal in Round 2.

Limitations and next steps

As with any pilot study, conclusions are provisional. Furthermore, extant research provides very little guidance on how to measure learning outcomes of negotiation training [12]–[13]. However, there is one learning mechanism—student reflection on their negotiation experiences—which appears supported [7] [14] and may explain why performance went up. Therefore, to rigorously evaluate the learning outcomes of the *AdVentures* negotiation exercise, a team of negotiation researchers has launched a multi-site study to better measure and verify these claims. Prior research on other AI-enabled exercises such as IAGO [15] has “showed that personalized feedback based on the user’s recent negotiation session is most effective at helping a student claim more value. The researchers were not as successful in teaching users how to create more value,” as noted by Dinnar and colleagues [16]. The pilot study of *AdVentures* suggests that students could both create *and* claim more value in negotiations. If this finding holds, it will enable us to address the call for a rigorous evaluation of AI’s role in negotiation training [17].

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