



Article

Socratic Prompts: Engineered Dialogue as a Tool for AI-Enhanced Educational Inquiry

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Abstract: This case study explores the integration of the Socratic method with AI-assisted prompt engineering for educational research and course development. It demonstrates how an educator's structured dialogue with an AI system facilitated the design of a course on AI-driven strategies for local businesses while simultaneously developing a research framework to assess its impact. The analysis of this AI interaction highlights the potential and limitations of AI as a collaborative tool in academia, emphasizing the need for critical evaluation and ethical considerations. The findings suggest that this approach can improve efficiency and innovation in educational processes, offering new opportunities for teaching and learning advancement in the AI era. This research contributes to the growing discourse on AI in education and provides practical insights for educators aiming to incorporate AI into their research and pedagogical practices.

Keywords: Artificial Intelligence, Socratic Method, Prompt Engineering, Educational Research

1. Introduction

The rapid advancement of artificial intelligence (AI) significantly impacts education, serving both as a subject of study and a tool for research and course development (Gašević et al., 2023; Goel & Polepeddi, 2018). As AI systems become more sophisticated, educators encounter the challenge and opportunity of integrating these technologies into their pedagogical and research practices (Chiu et al, 2023). This article presents a novel approach that combines the ancient Socratic method (Overholser, 1993) with modern prompt engineering techniques to leverage AI in educational research and course design.

The Socratic method, long valued for its ability to stimulate critical thinking and deep understanding, finds new relevance in the age of AI (Gordon, 2024). Concurrently, prompt engineering has emerged as a crucial skill in effectively communicating with and extracting valuable insights from AI systems (Liu et al., 2023). Synthesis of these approaches allows us to explore a new paradigm for educational inquiry and course development.

This case study demonstrates how an educator can engage in a Socratic dialogue with an AI system to design a research framework to study the course's impact. Most of this article comprises an actual conversation with an AI, showcasing the process and potential of this approach. Through this demonstration, we aim to provide educators with a practical example of how to utilize AI as a collaborative tool in their academic endeavors.

2. Literature Review

This study integrates three key areas: the Socratic method in education, AI in educational research, and prompt engineering.

The Socratic method, a form of cooperative argumentative dialogue, has long been recognized as an effective tool for stimulating critical thinking and uncovering assumptions (Overholser, 1993; Paul & Elder, 2007). In recent years, researchers have investigated its application in technology-enhanced learning environments (Payne, 2021), establishing a foundation for its utilization with AI systems.

Artificial Intelligence (AI) in educational research has gained significant prominence, with applications ranging from personalized learning to data analysis (Zawacki-Richter et al., 2019). Selwyn (2022) emphasizes AI's potential to transform educational practices while also noting the necessity for critical engagement with these technologies.

Prompt engineering, a relatively nascent field, focuses on effectively communicating with AI systems to elicit desired outputs. Liu et al. (2023) describe it as a crucial skill in the era of large language models, underscoring its importance in extracting relevant and accurate information from AI.

The intersection of these areas presents a unique opportunity. While Socratic dialogues with AI have been explored in educational contexts (Gregoric et al, 2024; Held et al., 2024), the utilization of prompt engineering to guide these dialogues in course development and educational research design represents a novel approach.

3. Case Background: AI-Driven Course Development and Research

This case study examines the development of a novel course titled "AI-Driven Strategies for Local Businesses in the Global Economy" at SUNY Empire State University (Chukhlomin, 2024). As the course developer and instructor, the researcher encountered the dual challenge of creating an innovative curriculum and designing a research framework to investigate its impact. The course aims to equip business students with the competencies to utilize AI tools, particularly custom Generative Pre-trained Transformers (GPTs), in international market analysis and strategic decision-making. Given the rapidly evolving nature of AI technology, conventional course development methodologies were deemed insufficient. Furthermore, the novelty of teaching AI applications in business contexts presented a unique opportunity for educational research.

The decision to employ AI as a copilot in this process was motivated by several factors:

- **Relevance:** Utilizing AI to develop an AI-focused course provided a meta-learning opportunity.
- **Efficiency:** AI could potentially expedite the course development and research design processes.
- **Innovation:** This approach could yield novel insights into AI-assisted pedagogy and research methodologies.
- **Demonstration:** The process itself could serve as an instructional tool for students and fellow educators.

However, effectively leveraging artificial intelligence for these purposes necessitated a structured approach to harness the AI's extensive knowledge while ensuring the outcomes aligned with educational best practices and the specific requirements of adult learners in a business program. This case study, therefore, not only documents the development of a course but also explores a novel methodology for AI-assisted educational design and research. It aims to contribute to the growing body of knowledge on artificial intelligence in education while providing a practical exemplar for educators navigating similar challenges.

4. Methodology

The study employs a novel methodological approach that combines the Socratic method with prompt engineering techniques to engage an AI system in course development and research design. The method can be characterized as participatory action research (Kemmis et al., 2014), wherein the researcher actively collaborates with the AI to generate and refine ideas. The process involved a series of structured interactions with an advanced AI language model, specifically GPT-4o. The researcher, an experienced educator developing a new course on AI-driven strategies for local businesses, engaged the AI in a Socratic dialogue. Meticulously crafted prompts guided this dialogue to elicit comprehensive and relevant responses.

The interaction adhered to several key principles:

- **Context Setting:** Providing the AI with requisite background information about the course and research objectives.
- **Iterative Questioning:** Utilizing follow-up questions to probe deeper into initial responses.
- **Hypothetical Scenarios:** Presenting the AI with specific scenarios to generate more concrete ideas.
- **Critical Evaluation:** Encouraging the AI to evaluate and refine its own suggestions.

The conversation was structured around key areas of course development and research design, including learning objectives, assessment strategies, and research methodologies. The researcher's expertise in education and AI was crucial in formulating questions and evaluating responses. Data from this interaction was analyzed using a qualitative, interpretive approach, focusing on the themes and insights that emerged through the dialogue.

5. The Socratic Dialog with the Machine That Is Smarter Than Me

The following section presents a substantial portion of this AI conversation, demonstrating the process in action and serving as both the result and the method of this study.

Researcher: *In the attached documents, you can find three articles explaining my approach to the use of Gen AI in online learning for adults. Can you see it?*

ChatGPT-4o: *Yes, I can see the three articles you mentioned about your approach to using generative AI in online learning for adults. The documents include:*

- *"Cowboys and Aliens in the Digital Frontier: The Emergence of Techno-Social Learning in AI-Enhanced Communities of Practice"*
- *"Exploring the Use of Custom GPTs in Higher Education Strategic Planning: A Preliminary Field Report"*
- *"Generative AI Capability Maturity Model for Online and Adult Learning: Introducing the EMERALD-GenAI-CMM-OAL Framework"*

These articles discuss various aspects of integrating generative AI into online and adult learning environments, including conceptual frameworks, strategic planning approaches, and maturity models for AI adoption in educational institutions. They provide insights into how AI can transform learning experiences, enhance decision-making processes, and support the development of AI-driven strategies in higher education.

Researcher: *Also, there is an actual textbook to accompany a course that I developed.*

ChatGPT-4o: *You're absolutely correct, and I apologize for overlooking that in my initial response. Indeed, there is a textbook included in the documents you provided. This textbook is titled:*

"AI-Driven Strategies for Local Businesses in the Global Economy"

This textbook is designed to accompany the course ECON 3006 "AI-Driven Strategies for Local Businesses in the Global Economy" at SUNY Empire State University. It provides a comprehensive guide on leveraging AI, particularly custom GPTs, for economic and business analysis in the context of international market expansion.

The textbook is structured into modules covering topics such as:

1. *Introduction to AI and the Global Economy*
2. *Advanced AI Models and International Trade*
3. *Custom GPTs and Global Business*
4. *Building and Presenting Your Custom GPT*

It also includes practical exercises, case studies, and assignments to help students apply AI tools to real-world business scenarios. The book aims to bridge the gap between theoretical understanding and practical application of AI in business contexts, focusing on how small and medium-sized enterprises can use AI for strategic decision-making in global markets.

Thank you for bringing this to my attention. The textbook is indeed a crucial component of your work on integrating AI into business education and practice.

Researcher: *Great, now we are on the same page. Now, I want you to be an assistant educational researcher knowledgeable in theories about online learning for adults. I want to create a research project to accompany my teaching and help me observe my teaching, its results, and perhaps contribute to existing theories that were developed in the pre-Gen AI era. Please confirm that you understand.*

ChatGPT-4o: *I understand your request. As an assistant educational researcher specializing in theories of online learning for adults, I'm here to help you design a research project that will complement your teaching, allow you to observe and analyze your teaching methods and outcomes, and potentially contribute to the evolution of existing theories in light of the generative AI era.*

Your position is unique and valuable, as you're actively teaching a course that integrates generative AI into business education for adult learners. This presents an excellent opportunity to study the impact of AI on adult learning in real-time and contribute to the growing body of knowledge in this rapidly evolving field.

The research project we design will aim to:

1. *Observe and document your teaching methods and strategies*
2. *Analyze the effectiveness of integrating generative AI tools in adult online learning*
3. *Assess student outcomes and experiences*
4. *Examine how existing theories of adult online learning may need to adapt or expand to account for the integration of generative AI*

Given your expertise and the materials you've developed, we're well-positioned to create a research project that could make a significant contribution to the field.

Are you ready to start discussing specific research questions or methodological approaches that align with your goals?

Researcher: I would like to get IRB approval for research. My goals are both pragmatic (to create a research paper trail) and inspirational (significantly updating the existing theories and maybe coming up with a new one). In one of the articles, I explained the need for that and an opportunity for new research.

ChatGPT-4o: I understand your goals, and they align well with the current needs in the field of adult online education, especially given the rapid integration of generative AI. Let's outline a research plan that addresses both your pragmatic and inspirational goals:

1. IRB Approval: First, we'll need to draft an IRB application. This will include:
 - A clear research purpose and questions
 - Methodology overview
 - Participant selection and recruitment process
 - Data collection and analysis procedures
 - Potential risks and benefits to participants
 - Informed consent process
2. Research Questions: Based on your EMERALD framework and the course you've developed, we could focus on questions like:
 - How does the integration of generative AI tools affect adult learners' engagement and learning outcomes in online business education?
 - In what ways do existing adult learning theories need to be modified or expanded to account for AI-enhanced learning environments?
 - How does the use of custom GPTs in coursework impact students' critical thinking and problem-solving skills in business contexts?
3. Methodology: Consider a mixed-methods approach:
 - Quantitative: Surveys to measure student engagement, learning outcomes, and AI tool usage
 - Qualitative: Interviews or focus groups to explore students' experiences and perceptions
 - Observational: Analysis of student interactions with AI tools, including chat logs and generated outputs
4. Data Collection:
 - Pre and post-course surveys
 - Weekly reflective journals from students
 - AI interaction logs
 - Course performance data
 - Semi-structured interviews with a subset of students
5. Analysis:
 - Thematic analysis of qualitative data
 - Statistical analysis of quantitative data
 - Comparative analysis with existing theories
6. Potential Publications:
 - A series of articles focusing on different aspects:
 1. Theoretical piece updating adult learning theories for the AI era
 2. Case study on the implementation of your course
 3. Analysis of student outcomes and experiences
 4. Methodological paper on using AI in educational research
7. Presentations:
 - Consider conferences like AERA, EDUCAUSE, or AI in Education conferences

This research could significantly contribute to updating theories like Knowles' andragogy, Mezirow's transformative learning, or Siemens' connectivism in light of AI integration. It could also potentially lead to a new theory of "AI-enhanced adult learning" or "techno-social learning in higher education," as you've begun to explore in your work.

Does this align with your vision? Would you like to refine any aspects of this research plan?

Researcher: I prefer a mixed method approach where we can use a survey, an interview and maybe a focus group when possible. Now, we should think about a grand overarching research question and a series of subquestions. As we begin teaching students, some working adults and some more traditional age, some with exposure to Gen AI and some without, some AI enthusiasts and some afraid-to-deaths or just in-betweens, we

should be able to capture this. Also, all other factors that might be relevant. After this course, we will need to capture the effect. I think that transformational theory could be useful in this respect. What do you think?

ChatGPT-4o: I agree that a mixed-method approach combining surveys, interviews, and focus groups when possible is an excellent strategy. Your suggestion to consider transformational learning theory is particularly apt, given the potentially transformative nature of integrating generative AI into adult learning. Let's structure the research questions accordingly:

Overarching Research Question: "How does the integration of generative AI in online business education transform adult learners' understanding, skills, and approaches to business problem-solving?"

Sub-questions:

1. **Learner Characteristics and Initial Perceptions:** "How do learners' prior experiences with AI, age, and attitudes towards technology influence their initial engagement with generative AI tools in the course?"
2. **Transformation of Understanding:** "In what ways does hands-on experience with generative AI tools in business contexts challenge and transform learners' preconceptions about AI's role in business decision-making?"
3. **Skill Development:** "How do learners' AI literacy and practical skills in using generative AI for business analysis evolve throughout the course?"
4. **Critical Reflection:** "How does engagement with generative AI tools foster critical reflection on traditional business practices and decision-making processes?"
5. **Application and Transfer:** "To what extent do learners apply their newly acquired AI skills and knowledge to real-world business scenarios beyond the course?"
6. **Ethical Considerations:** "How does exposure to generative AI in business contexts influence learners' perspectives on ethical considerations in AI use?"
7. **Long-term Impact:** "What lasting changes in learners' approaches to business problem-solving and strategic thinking are attributable to their experience with generative AI in the course?"

To capture the diverse backgrounds and initial states of your students, we could:

1. **Develop a comprehensive pre-course survey that assesses:**
 - Prior AI exposure and knowledge
 - Attitudes towards AI (enthusiasm, fear, skepticism)
 - Age and professional background
 - Current business problem-solving approaches
2. **Conduct initial interviews or focus groups to gain deeper insights into learners' preconceptions and expectations.**
3. **Use regular reflective journaling throughout the course to track changes in thinking and approach.**
4. **Implement a post-course survey and follow-up interviews to assess transformations in understanding, skills, and attitudes.**
5. **Consider a longitudinal component, following up with learners 3-6 months after the course to assess long-term impacts and application of learning.**

This approach, grounded in transformational learning theory, allows us to examine how exposure to and engagement with generative AI in a structured learning environment can lead to perspective transformation. We can explore how learners' frames of reference regarding AI in business are challenged, how they critically reflect on these challenges, and how they integrate new understandings into their professional practice.

Moreover, this framework is flexible enough to accommodate emerging themes and unexpected outcomes, allowing for the potential development of new theoretical insights specific to AI-enhanced adult learning in business education.

Does this align with your vision for the research? Would you like to adjust or expand any aspects of this framework?

Researcher: You know, this detailed approach may work with my planned certificate (16 credit sequence of courses) where we should be able to build a longitudinal cohort. Right now, we have an 8-week course only, so we should probably plan small keeping the overarching plan in mind for the future grant.

ChatGPT-4o: You're absolutely right, and I appreciate you refocusing our approach to fit the current context of your 8-week course. Let's adjust our plan to create a more focused, manageable research project that can still yield valuable insights and lay the groundwork for future expansion. Here's a revised approach:

Overarching Research Question: "How does a short-term, intensive engagement with generative AI in an online business course impact adult learners' understanding of and approach to AI in business contexts?"

Sub-questions:

1. "What changes occur in learners' perceptions and understanding of generative AI's role in business during the 8-week course?"

2. "How do learners' skills in using generative AI for business analysis and decision-making evolve over the course duration?"
3. "What factors (e.g., prior AI exposure, age, professional background) influence learners' engagement with and learning from generative AI tools in the course?"

Research Design:

1. Pre-course Survey:
 - Assess initial AI knowledge, attitudes, and demographics
 - Include questions about current business problem-solving approaches
2. Weekly Reflective Prompts:
 - Short, focused questions about their experiences with AI tools that week
 - Can be integrated into course assignments to ensure participation
3. Post-course Survey:
 - Measure changes in AI understanding, skills, and attitudes
 - Include questions about intended future use of AI in their professional contexts
4. Optional Short Interviews:
 - Conduct brief (15-20 minute) interviews with a small subset of willing participants at the end of the course
 - Focus on their most significant learnings and any perspective shifts

Data Analysis:

- Quantitative analysis of pre- and post-course surveys
- Qualitative analysis of weekly reflections and interviews (if conducted)
- Look for patterns in how different learner characteristics relate to course outcomes

This streamlined approach allows you to:

1. Capture essential data about learners' transformations over the 8-week period
2. Minimize additional workload for you and your students
3. Generate insights that can inform both your teaching and future research plans
4. Lay the groundwork for more extensive research in your planned certificate program

As you teach multiple iterations of this 8-week course, you can:

- Refine your data collection tools based on initial findings
- Start to build a longitudinal dataset, comparing cohorts over time
- Identify key areas for deeper investigation in your future certificate program

This approach gives you a manageable starting point while keeping the door open for more extensive research in the future. It allows you to gather valuable data and insights that can inform both your teaching practice and the development of your broader research agenda.

Does this more focused approach align better with your current needs and constraints?

Researcher: *I like the idea of integrating some questions into assignments. I do have four reflective discussions. I can recalibrate them to capture some of the data without torturing students with extra research work.*

ChatGPT-4o: *That's an excellent approach. Integrating research questions into existing reflective discussions is an efficient way to gather valuable data without overburdening your students. Here's how we could structure this:*

1. *Recalibrate Existing Reflective Discussions: Adjust your four reflective discussions to include prompts that align with your research questions. This way, you're collecting data organically as part of the learning process.*
2. *Suggested Structure for Reflective Discussions:*
 - Discussion 1 (Early in the course):*
 - Focus on initial perceptions and experiences with AI
 - Example prompt: "Describe your initial thoughts on using generative AI for business analysis. How do you think it might change your approach to problem-solving?"
 - Discussion 2 (Mid-course):*
 - Explore evolving skills and challenges
 - Example prompt: "What has been the most surprising aspect of using AI tools in our course so far? How has it challenged or changed your thinking about business decision-making?"
 - Discussion 3 (Later in the course):*
 - Examine practical applications and ethical considerations

- *Example prompt: "Provide an example of how you've applied AI tools to a business problem in this course. What ethical considerations came up, if any?"*

Discussion 4 (End of course):

- *Reflect on overall transformation and future intentions*
- *Example prompt: "How has your understanding of AI's role in business changed since the beginning of this course? How do you envision using these tools in your future work?"*
- 3. *Additional Data Collection:*
 - *Consider adding a few Likert-scale questions at the beginning and end of the course to quantitatively measure changes in attitudes and perceived skills.*
 - *You could integrate these into your first and last discussions or as part of a brief pre/post course survey.*
- 4. *Consent and Ethics:*
 - *Include a statement in your course syllabus about using anonymized discussion responses for research purposes.*
 - *Offer an opt-out option for students who prefer their responses not be used in research.*
- 5. *Analysis Approach:*
 - *Use thematic analysis to identify patterns in students' reflections over time.*
 - *Look for evidence of perspective transformation, skill development, and changes in attitudes towards AI in business.*

This approach allows you to:

1. *Collect rich, qualitative data without adding extra work for students.*
2. *Track changes in students' thinking and skills over the course duration.*
3. *Gather insights that are directly tied to course content and learning objectives.*
4. *Build a dataset that can inform both your teaching practice and contribute to broader research on AI in business education.*

By integrating these research elements into your existing course structure, you're creating a seamless experience for students while still gathering valuable data for your research. This method respects students' time and effort while providing you with authentic insights into their learning journey with AI in business contexts.

Researcher: Let's focus for a minute on the transformational approach. In light of the Mezirow(1991) and King (2009) approaches, how would you describe transformation in the course?

ChatGPT-4o: *Excellent question. Applying Mezirow's and King's transformative learning theories to your course on AI-driven strategies for local businesses in the global economy provides a rich framework for understanding the potential transformations students may undergo. Let's break this down:*

1. *Disorienting Dilemma (Mezirow): In your course, the introduction of generative AI tools for business analysis and decision-making likely serves as a disorienting dilemma for many students. This is especially true for those with limited prior exposure to AI or those who have preconceived notions about AI's role in business.*
2. *Critical Reflection: Students are encouraged to critically reflect on their assumptions about:*
 - *The nature of business decision-making*
 - *The role of technology in strategic planning*
 - *Their own capabilities and limitations in analyzing global markets*
3. *Perspective Transformation: As students engage with AI tools and apply them to real-world business scenarios, they may experience shifts in their:*
 - *Epistemological perspectives: How they view knowledge creation and validation in business contexts*
 - *Ontological perspectives: Their understanding of what it means to be a business professional in an AI-enhanced world*
 - *Methodological perspectives: How they approach problem-solving and strategic planning*
4. *Experiential Learning (King): Your course provides hands-on experience with AI tools, aligning with King's emphasis on experiential learning in transformation. Students are not just learning about AI theoretically but are actively using it to solve business problems.*
5. *Empowerment: As students gain proficiency in using AI tools, they may experience a sense of empowerment, realizing they can leverage these technologies to enhance their decision-making capabilities.*
6. *Contextual Understanding: Students develop a more nuanced understanding of how AI fits into the broader context of global business, including ethical considerations and cultural implications.*
7. *Identity Shift: Some students may experience a shift in how they view themselves as business professionals, moving from 'traditional' analysts to 'AI-augmented' strategists.*

8. *Collaborative Learning: If your course includes group work or peer discussions, this aligns with both Mezirow's and King's emphasis on dialogue and collaborative meaning-making in transformation.*
9. *Action: The course culminates in students applying their new knowledge and skills to real-world scenarios, potentially leading to transformative action in their approach to business problems.*
10. *Continuous Learning: The rapidly evolving nature of AI may instill in students an appreciation for continuous learning, aligning with the lifelong learning aspect of transformative learning theory.*

In the context of your course, transformation might be observed through:

1. *Changes in how students articulate business problems and solutions*
2. *Shifts in their confidence levels when dealing with complex, data-driven decisions*
3. *Evolution in their ethical reasoning about AI use in business*
4. *Alterations in their career aspirations or professional self-concept*
5. *Development of a more global and technologically-informed perspective on business strategy*

To capture these transformations, you might consider:

- *Asking students to articulate their "before and after" views on AI in business*
- *Encouraging reflection on how their problem-solving approach has changed*
- *Observing changes in the sophistication of their AI use over the course duration*
- *Noting any shifts in their expressed career goals or professional identities*

This transformative learning lens provides a powerful framework for understanding the deep, potentially life-changing impact your course may have on students' professional development and worldview.

Researcher: In a matter of 8 weeks, I want the students to move through I-do-not-know-about-it to some degree of acceptance, maybe through an aha moment, and I would like to capture that.

ChatGPT-4o: I understand your goal completely. In an 8-week course, capturing the transition from "I don't know about it" to a degree of acceptance, potentially through an "aha moment," is a more focused and realistic aim. This aligns well with the early stages of transformative learning. Here's how we might structure this to capture that journey:

1. *Initial State Assessment: In week 1, have students complete a brief reflection or survey that captures their initial state:*
 - *Current knowledge of AI in business (likely limited)*
 - *Attitudes towards AI (possibly skeptical or uncertain)*
 - *Expectations for the course*
2. *Weekly Mini-Reflections: Incorporate very short (1-2 question) reflections at the end of each week's assignments:*
 - *"What was the most surprising thing you learned about AI in business this week?"*
 - *"How has your view of AI's role in business changed, if at all, based on this week's learning?"*
3. *"Aha Moment" Capture: Around week 4 or 5, when students have had some hands-on experience with AI tools, include a specific prompt in your discussion or assignment:*
 - *"Describe a moment in the course so far where your understanding of AI in business significantly shifted. What prompted this change?"*
4. *Final Reflection: In the last week, have students reflect on their journey:*
 - *"Compare your current understanding and attitude towards AI in business with where you started 8 weeks ago. What's the most significant change?"*
 - *"Describe how you see yourself using AI in your professional future based on what you've learned."*
5. *Observational Data: Throughout the course, pay attention to:*
 - *Changes in the sophistication of students' questions about AI*
 - *Improvements in their use of AI tools for assignments*
 - *Shifts in the language they use to discuss AI and business*
6. *Optional "Transformation Journal": Encourage students to keep a brief journal noting any moments of realization or changing perspectives throughout the course. This could be submitted at the end for extra credit.*

Analysis Approach:

- *Look for patterns in when and how students' perspectives start to shift*
- *Identify common triggers for "aha moments" across the cohort*
- *Note the progression from uncertainty to acceptance in students' language and tool usage*

By focusing on capturing this specific transition – from unfamiliarity to acceptance and basic proficiency – you're targeting a realistic and meaningful transformation that can occur within the 8-week timeframe. This approach allows you to:

1. Document the initial state of knowledge and attitudes
2. Track incremental changes week by week
3. Identify key moments of realization or acceptance
4. Assess the overall shift in perspective and capability by the end of the course

This focused approach should provide valuable insights into how adult learners begin to accept and integrate AI into their understanding of business practices, even in a relatively short timeframe. It sets the stage for deeper transformations that might occur in longer programs or through continued professional application of what they've learned.

Researcher: I still need to visualize that. Can we do a simulation? For example, you would come up with four artificial personas to represent different demographics in a state college for adults, undergraduates in business completing their degree, with various exposure to Gen AI. As you have the course text, you can see what the learning experiences they will go through in 8 weeks are and desired learning outcomes. Not all of them will progress equally. So, you should factor it in and come up with different outcomes for each of them. Also, you should come up with four phases of how their learning progresses from the beginning of module 1 to the end of module 4. So, this is our simulation, and you are to describe this journey. Give them names, too. Then, rethink their journeys in terms of transformation. How did it happen? How differently for each one of them? Finally, think about how we can capture it and what our conclusions might be.

ChatGPT-4o: Certainly! I'll create a simulation with four artificial personas representing different demographics and their journeys through the 8-week course. I'll base their experiences on the course text and learning outcomes, factoring in their diverse backgrounds and varying levels of progress.

Artificial Personas:

1. Sarah Johnson (Age 35):
 - Mid-level manager at a local manufacturing company
 - Limited exposure to AI, skeptical about its practical applications
 - Pursuing her degree to advance her career
2. Michael Chen (Age 28):
 - Recent immigrant, working in his family's small import/export business
 - Tech-savvy but no formal AI experience
 - Eager to apply new technologies to expand the business
3. Emily Rodriguez (Age 42):
 - Career-changer, former teacher transitioning to business
 - Some exposure to educational AI tools, curious but cautious
 - Seeking to build a new career in corporate training
4. David Thompson (Age 23):
 - Traditional-age student, part-time retail worker
 - Frequent user of consumer AI (e.g., Siri, ChatGPT for homework help)
 - Excited about AI but lacks depth in business applications

Their Journeys:

Phase 1 (Weeks 1-2: Introduction to AI and Global Economy)

- Sarah: Struggles with basic AI concepts, feels overwhelmed
- Michael: Quickly grasps technical aspects, eager to learn more
- Emily: Connects AI concepts to her teaching experience, intrigued by possibilities
- David: Overconfident at first, realizes he needs to learn business-specific applications

Phase 2 (Weeks 3-4: Advanced AI Models and International Trade)

- Sarah: Has an "aha moment" when using AI for market analysis, sees potential for her work
- Michael: Excels in applying AI to international trade scenarios, starts envisioning applications for family business
- Emily: Finds AI-driven learning strategies fascinating, begins to see career opportunities
- David: Struggles with complex business applications, but perseveres

Phase 3 (Weeks 5-6: Custom GPTs and Global Business)

- Sarah: Gains confidence in creating basic custom GPTs, sees direct application to her job
- Michael: Creates advanced custom GPTs, emerges as a peer leader in class discussions

- *Emily: Focuses on ethical implications of AI in business, develops nuanced perspective*
 - *David: Has breakthrough in understanding, starts to catch up with peers*
- Phase 4 (Weeks 7-8: Building and Presenting Custom GPT)*
- *Sarah: Successfully builds a custom GPT for supply chain optimization, plans to propose implementation at work*
 - *Michael: Creates sophisticated GPT for market entry analysis, applies it to family business expansion plans*
 - *Emily: Develops GPT for corporate training programs, solidifies her new career direction*
 - *David: Completes a solid custom GPT project, gains new appreciation for AI in business*

Transformation Analysis:

Sarah's Transformation:

- *From skeptic to advocate*
- *Key moment: Using AI for market analysis (Week 4)*
- *Outcome: Plans to implement AI tools at work*

Michael's Transformation:

- *From tech enthusiast to strategic AI implementer*
- *Consistent growth throughout the course*
- *Outcome: Positioning himself as an AI leader in family business*

Emily's Transformation:

- *From cautious explorer to ethical AI strategist*
- *Key moment: Realizing potential of AI in corporate training (Week 6)*
- *Outcome: New career path in AI-driven corporate training*

David's Transformation:

- *From surface-level user to business AI practitioner*
- *Struggled initially, breakthrough in Weeks 5-6*
- *Outcome: More mature understanding of AI in business contexts*

Capturing the Transformation:

1. *Weekly Reflective Discussions:*

- *Week 1: "Describe your current understanding and expectations of AI in business."*
- *Week 4: "Share a moment that changed your perspective on AI's role in business."*
- *Week 6: "How has your approach to business problem-solving evolved with AI?"*
- *Week 8: "Reflect on your AI journey. How has your understanding and intended use of AI changed?"*

2. *Assignment-Embedded Reflections:*

- *After key AI tool uses: "How did this AI application change your approach to the task?"*

3. *Pre and Post-Course Surveys:*

- *Likert scale questions on AI understanding, attitudes, and intended use*

4. *Final Project Analysis:*

- *Examine the sophistication and practical application of students' custom GPT projects*

Potential Conclusions:

1. *Diversity of Transformation: Each student's journey is unique, influenced by their background and initial attitudes.*
2. *Critical Moments: Hands-on experiences with AI tools often trigger significant perspective shifts.*
3. *Practical Application: Students are more likely to embrace AI when they see direct relevance to their work or goals.*
4. *Ethical Awareness: Exposure to AI in business contexts raises important ethical considerations.*
5. *Skill Development: All students, regardless of initial knowledge, can develop practical AI skills within 8 weeks.*
6. *Confidence Building: Successful creation of custom GPTs markedly increases confidence in AI use.*
7. *Career Impact: The course can influence career directions and strategies for using AI professionally.*

This simulation provides a framework for understanding and capturing the diverse transformative journeys students might experience in your course. It highlights the importance of regular reflection, practical application, and connecting AI to personal and professional goals in facilitating meaningful learning and transformation.

The dialogue represents the introductory segment of the Researcher-ChatGPT-4o interaction. In the subsequent portions of the discourse, we examined a Likert scale survey, its structure, and its optimal placement within the course curriculum. Additionally, we discussed the interview protocol and focus group questions,

potential methodologies for data analysis, a consent form, an Institutional Review Board (IRB) application, and strategies for data collection. The concluding segment of our discussion addressed anticipated findings and potential avenues for reporting the research outcomes. The researcher invited another educational researcher to review the outcomes and finetune them for the actual research project. In addition, the researcher updated the course materials (reflective discussions) to capture transformational learning of the course participants.

6. Results

The dialogue between the researcher and the artificial intelligence (AI) can be considered Socratic for several reasons, while also differing from traditional pre-AI Socratic dialogues in significant ways:

Socratic elements:

- *Guided inquiry*: The researcher led the AI through a series of questions, each building on previous responses, to develop a comprehensive research plan. This mirrors the Socratic method of utilizing questions to guide thought and explore ideas.
- *Critical examination*: The researcher encouraged the AI to examine and refine its responses, particularly when requesting more focused approaches or specific examples. This reflects the Socratic practice of critically examining assumptions and ideas.
- *Collaborative knowledge construction*: The reciprocal nature of the interaction resembles the dialogic aspect of Socratic method, wherein knowledge is constructed through conversation.
- *Conceptual exploration*: The researcher guided the conversation to explore complex concepts such as transformative learning theory and its application in AI education, similar to how Socrates would explore philosophical concepts.

Differences from traditional Socratic dialogue:

- *Knowledge base*: Unlike a human interlocutor, the AI possesses access to a vast knowledge base, allowing for more rapid and comprehensive responses. This alters the dynamic of the dialogue, as the "teacher" (the researcher) is often guiding the exploration of knowledge the AI already possesses, rather than eliciting hidden knowledge from a student.
- *Lack of genuine ignorance*: In traditional Socratic dialogues, Socrates often professed ignorance to encourage others to question their assumptions. The AI, however, does not claim ignorance but rather offers information and subsequently refines it based on the researcher's prompts.
- *Absence of emotional or social factors*: Traditional Socratic dialogues often involved managing the emotions and social dynamics of human participants. The AI interaction lacks these elements, focusing solely on intellectual exchange.
- *Scalability and repeatability*: Unlike traditional Socratic dialogues, this method can be readily repeated, refined, and scaled, potentially allowing for more systematic exploration of ideas.
- *Power dynamic*: In this dialogue, the researcher (the human) ultimately guides and controls the conversation, whereas in traditional Socratic dialogues, Socrates often led his interlocutors to uncomfortable realizations or contradictions.

Overall, this case study demonstrates the potential of utilizing a Socratic approach with AI for course development and research design in online adult education. The AI-assisted process proved highly effective in generating comprehensive ideas and frameworks, often surpassing traditional brainstorming methods in breadth and depth.

Key findings include:

- *AI as a Knowledgeable Collaborator*: When guided by targeted questioning, the AI's extensive knowledge base facilitated novel connections and ideas that might not have emerged through conventional methods.
- *Iterative Refinement*: The dialogic exchange allowed for continuous improvement of concepts, mirroring the iterative nature of course design and research development.
- *Transformative Learning Potential*: The process aligned closely with Mezirow's (1991) and King's (2009) transformative learning theory, suggesting new dimensions of perspective transformation in AI-enhanced education.
- *Personalized Learning Pathways*: The AI demonstrated an ability to generate diverse learner personas and tailored learning journeys, highlighting the potential for highly personalized adult education experiences.
- *Ethical Considerations*: The study revealed the need for ongoing critical evaluation of AI-generated content and raised important questions about the role of AI in shaping educational experiences and research methodologies.

- **Rapid Prototyping:** The AI-assisted approach allowed for quick development and refinement of research instruments, including surveys and interview protocols.

These results suggest that AI-assisted Socratic dialogue can be a powerful tool for educational researchers and course developers, particularly in the rapidly evolving field of online adult education.

7. Discussion

This study's findings have significant implications for the field of online adult education and the broader landscape of AI in education research.

First, AI's capacity to function as a knowledgeable collaborator in course development and research design represents a paradigm shift in how educators and researchers can approach their work. This aligns with recent research by Gašević et al. (2023), which emphasizes the necessity of empowering learners and educators in the age of AI. This study extends this concept by demonstrating how AI can empower educators in designing learning experiences.

The iterative refinement process observed in our AI interactions mirrors the principles of design thinking in education (Henriksen et al., 2024). This suggests that AI could be a valuable tool in implementing design thinking approaches to curriculum development, potentially leading to more innovative and student-centered learning experiences.

The alignment of our AI-assisted process with Mezirow's transformative learning theory is particularly noteworthy. As King (2009) has argued, technology can significantly facilitate transformative learning experiences. These findings suggest that AI might facilitate such experiences for learners, educators, and researchers as they engage with these tools in their professional practice.

The AI's capability to generate diverse learner personas and learning journeys highlights its potential to address one of the key challenges in online adult education: personalization at scale. This aligns with the work of Zawacki-Richter et al. (2019), who identified personalization as a key area for AI applications in higher education.

However, the ethical considerations raised by this study warrant careful attention. As Selwyn (2022) cautions, we must approach the integration of AI in education with a critical perspective. These findings underscore the necessity for human oversight and critical evaluation in AI-assisted educational processes.

The rapid prototyping capability demonstrated in this study has implications for educational research and development agility. This could be a significant advantage in a field that often struggles to keep pace with technological change.

Future research should focus on:

- Long-term studies on the effectiveness of AI-assisted course design on student outcomes
- Comparative studies between traditional and AI-assisted research design processes
- Development of ethical frameworks specifically for AI use in educational research and development
- Exploration of how AI-assisted processes might impact the professional development of educators.

8. Conclusion

This case study elucidates the transformative potential of AI-assisted Socratic dialogue in educational research and course development for online adult learning. By integrating classical pedagogical methodologies with advanced AI capabilities, we have demonstrated an innovative approach that can significantly enhance efficiency and creativity in academic processes. The implications of this research extend far beyond the immediate context of course development. We are at the threshold of a new era in education, where AI has the potential to be not merely a subject of study but a collaborative partner in the very process of designing and conducting educational experiences and research. This study invites educators, researchers, and policymakers to reconceptualize the role of AI in education. It challenges us to move beyond viewing AI as solely a tool for task automation and instead to explore its potential as a catalyst for innovation and a partner in intellectual discourse. However, as we embrace these new possibilities, we must also address the ethical implications and the necessity for human oversight. Integrating AI in education can transform not only the content and methods of instruction but also how we conceptualize the very nature of learning and knowledge creation.

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However, it is imperative to emphasize that the fundamental ideas, analyses, and conclusions presented in this paper are the author's sole responsibility. The artificial intelligence tools were employed as assistive technologies to augment the research process, not to generate original content or draw conclusions. Any errors or oversights in the paper are entirely attributable to the author.

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