

Empowering Student Groups with Artificial Intelligence for Impactful Projects in Agriculture

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Introduction

The integration of Artificial Intelligence (AI) in group projects offers a unique opportunity for students to engage deeply with real-world challenges in agriculture, food, and natural resource courses. AI enhances organization and idea generation, enabling students to tackle complex issues. In an agri-food systems innovation course, AI was integrated into the curriculum through a flipped classroom model. Students engaged in weekly activities that focused on developing a food product concept project. During these sessions, students utilized AI tools to analyze market trends, predict consumer preferences, and optimize production processes. The AI tools facilitated data-driven decision making and helped refine their product concepts based on ongoing feedback and analysis. This firsthand approach not only enhanced their understanding of AI applications in agriculture but also provided practical experience in using technology to solve real-world problems. The following sections outline the procedures, resources, and assessments used in this course to maximize the impact of AI on student learning and project outcomes.

Procedure

Implementing AI in classroom projects involves a structured approach to ensure effective learning and practical outcomes. Students were instructed to form groups, identify a need in the market, and then generate an idea for a food product they would like to create or improve. In

subsequent class activities, they were instructed to use AI tools to assist them in creating sections of their project report and presentation. This section offers guidance on using AI to support group activities, including selecting tools, integrating research, enhancing collaboration, and providing instructors with tips to facilitate successful project outcomes.

1. Formation of Student Groups and Project Selection:

- Group Dynamics: Have students form diverse groups, as combining different perspectives fosters more innovative problem-solving.
- Project Ideas: Projects should address current agricultural challenges or developing innovative food products or services such as sustainable packaging, plant-based alternatives, or optimizing production activities.

2. AI Tools and Resources:

- ChatGPT, Copilot, and Gemini: These large language model tools support idea generation and data analysis with a user-friendly interface.
- Microsoft Azure AI and Vertex AI: Cloud-based platforms that provide comprehensive tools for building, training, and deploying machine learning models.
- TensorFlow: An open-source library for machine learning and deep learning applications, suitable for students with intermediate programming background.

3. Literature Integration:

- AI-Generated References: Remind students to verify AI-generated references, as they may be inaccurate or fabricated.

4. Implementation and Collaboration:

- Collaborative Platforms: Use collaborative platforms like Microsoft Teams, Dropbox, and Google Docs to organize tasks and timelines. Encourage regular meetings for steady progress.
- Encourage the use of these collaborative platforms with AI tools to enhance teamwork, manage project progress, and integrate AI insights seamlessly into group projects.

5. Assessment and Feedback:

- Impact Evaluation: Assess the projects based on their impact, innovation, and practical applicability using rubrics.
- Peer and Instructor Feedback: Create a feedback loop for peer and instructor input. This process helps in refining their work and enhances learning outcomes.
- Expert Consultations: Connect students with industry experts for insights and real-world project feedback.

AI Prompt Tips

1. Be Clear, Explicit, and Specific in Your Instructions:

- Use precise, detailed instructions to guide students in generating the desired output. Clearly outline the desired format or type of response to guide the model in producing the intended output.

- Example: “List the steps to develop a food safety plan for a new food product, covering hazard identification, control points, and monitoring.”
2. **Provide Background Information:**
 - Include relevant context or background information in your prompts to enhance the model's understanding of the topic.
 - Example: “Provide a brief history of GMO technology in agriculture before discussing its impact on crop production.”
 3. **Use Conversational Language:**
 - Frame prompts in a natural conversational tone to improve the model's understanding and response quality.
 - Example: “In plain language, explain how advancements in agricultural technology like precision farming have influenced farmers’ decision-making processes.”
 4. **Avoid Ambiguous or Open-ended Questions:**
 - Formulate clear and direct questions, avoiding ambiguity to ensure focused and relevant responses.
 - Example: Instead of asking “How has technology impacted agriculture?” be more specific like “What role does satellite imagery play in optimizing irrigation practices in precision agriculture?”
 5. **Break Down Complex Questions into Smaller Parts:**
 - Divide complex problems into simpler components to create detailed responses.
 - Example: Instead of asking “How can AI support new product development?” break it down into parts like, “Explore how AI can identify emerging flavor trends” or “Examine AI's role in optimizing ingredient sourcing for sustainability.”
 6. **Incorporate Examples and Scenarios:**
 - Enhance comprehension by including concrete examples and scenarios in your prompts.
 - Example: “Illustrate the concept of sustainable agriculture by providing real-world examples of farms adopting agroecological practices and their positive outcomes.”
 7. **Establish Roles and Use Appropriate Tone:**
 - Define user roles to guide the model’s behavior, and adjust prompt tone and style for effective, respectful interactions.
 - Example: In a conversational exchange with the AI, clearly define user roles such as “food scientist” or “technology manager” to guide the model's responses.
 8. **Specify Mistakes and Encourage Creativity:**
 - If a mistake occurs, specify errors to guide the model toward corrections and encourage broad, creative solutions.
 - Example: “Identify and correct any misinformation,” such as suggesting preservatives are the only way to extend shelf life, and propose innovative, sustainable alternatives.
 9. **Ask for Potential Challenges and Limitations:**
 - Prompt the AI to identify obstacles or limitations for a balanced, realistic perspective on project feasibility

- Example: “Identify potential challenges in launching a new carbonated beverage, including but not limited to ingredient stability, consumer demand, or regulatory compliance.”

10. Evaluate and Iterate Your Prompts:

- Experiment with different prompts and reiterate to refine the model's performance.
- Example: “Generate a list of innovative flavor combinations for a plant-based snack, then refine suggestions to focus on locally sourced ingredients.”

Assessment and Observations

The responsible use of AI in student projects enhances their ability to tackle complex problems in food, agriculture, and natural resources, fostering essential technical, communication, and ethical skills. Through AI-enabled, real-world projects, students gain deeper subject matter understanding, better preparing them for careers in these fields. Although my observations are anecdotal, over two semesters I noted significant improvements in both work quality and engagement, as AI tools increased student enthusiasm, facilitated project management, and fostered collaboration. Students developed a critical understanding of AI ethics and produced higher-quality projects, leveraging AI to provide deeper insights and comprehensive analyses. These experiences have made AI-based projects a cornerstone of modern agricultural education, highlighting their practical, real-world value.

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