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United States Department of Agriculture
Project Initiation

Project Data for Accession Number 1033676

Project Title

AMA: An AI-Driven Special Education Support Platform for Education in Rural Communities.

Project Details

Sponsoring Institution National Institute of Food and Agriculture	**Project Status** COMPLETE
Funding Source NIFA Non Formula	**Grant Year** 2025
Grant No. 2025-33610-45055	**Cumulative Award Amt.** $125,000.00
Proposal No. 2025-00558	**Multistate No.** (N/A)
Project Start Date Sep 01, 2025	**Project End Date** Apr 30, 2026
Program Code [8.6] Rural & Community Development	

Project Director

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Recipient Organization

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Performing Department

(N/A)

Non Technical Summary

Project Summary:Nationwide, 14.1% of students have special needs, yet only 17% of educators feel prepared to teach them. Simultaneously, 98% of districts report shortages of special education personnel. In rural schools, the acute shortage of personnel and limited resources create significant challenges in providing support for students with special needs. Outside of schools, families of special needs students also have limited access to therapy and services. As a solution,NarrateAR proposes to develop and commercialize Ama AI, a special education tool that uses personalized AI learning companions tailored to each student's needs. Ama AI will assist teachers in delivering differentiated and interactive lessons in literacy, writing, and mathematics, while promoting accessibility, engagement, and compliance.Phase I will focus on developing a prototype for rural 3rd-6th grade classrooms, integrating AI-based learning companions, multimodal inputs, and a dashboard for lesson differentiation. The pilot test involves several rural classrooms to evaluate usability, feasibility, and effectiveness. Byautomating individualized instructional support

and providing insights into student progress, Ama AI can alleviate the burden on rural teachers while improving outcomes for students with learning differences.Anticipated Results, Commercial Applications:This project aims to demonstrate that Ama AI can significantly improve outcomes for rural students with special needs by providing tailored support both in and out of the classroom. Successful Phase I development will validate the platform's potential to address educational disparities in rural areas. Commercial applications include subscriptions for schools and direct-to-parent models, with a focus on scalable, cost-effective solutions for resource-limited environments.

Animal Health Component

Animal Health Component: 0%

Research Effort Categories

Basic	0%
Applied	30%
Developmental	70%

Classification

Knowledge Area (KA)	Subject of Investigation (SOI)	Field of Science (FOS)	Percent
806	6099	3020	100%

Knowledge Area

[806] Youth Development

Subject Of Investigation

[6099] People and communities, general/other

Field Of Science

[3020] Education

Keywords

AI, Education, K-12, Accessibility, Accommodations, EdTech, Rural Schools, SPED, Special Education

Goals / Objectives

Our work has three primary goals:Goal 1: Demonstrate the early-stage usability, feasibility, and improved educational outcomes for Ama AI, focusing on individualized learning and AI differentiation.This objective focuses on testing Ama AI's ability to personalize learning experiences, improve engagement, and address the needs of diverse learners, particularly students with learning differences. The prototype will be tested in inclusive classrooms, demonstrating how Ama AI supports literacy, mathematics, and social-emotional learning. We will need to test how well Ama AI's tools for differentiation help teachers create individualized lesson plans and support unique learning needs. It will involve developing lesson templates and differentiation tools, allowing educators to adapt classroom content for students with different learning challenges. Collaborators will include classroom teachers and special education experts to test the efficacy of the AI.Key Research Questions: 1) Does Ama AI effectively engage students in personalized learning

activities and support differentiated instruction? 2) Can students and teachers utilize Ama AI to successfully complete differentiated lessons in core subjects like reading, writing, and math? 3) Does Ama AI improve academic outcomes in classrooms with diverse learners, including special needs students?Milestones and Metrics: A) Conduct beta testing with multiple sites, 100-150 students, in Phase I; B) Achieve a System Usability Scale (SUS) score of 75 or higher; C) 90% of students complete assigned learning activities with Ama AI.Goal 2: Assess the potential for Ama AI to support the long-term academic growth and inclusion of students with learning differences in general education classrooms. This objective will focus on evaluating the preliminary educational and social impacts of Ama AI on students with learning differences. It will assess the potential for long-term improvements in foundational academic skills and social inclusion in both special education and general classrooms.Phase I will also collect qualitative feedback from teachers, parents, and students on Ama AI's ability to foster engagement and improve learning outcomes.Key Research Questions: 1) Does Ama AI improve students' reading, writing, and mathematics skills over time? 2) Does the solution enhance social-emotional learning and support inclusion in the general education classroom? 3) How do teachers, parents, and other stakeholders perceive the long-term value of Ama AI for inclusive education?Milestones and Metrics: A) Conduct pilots in 4-5 rural inclusive classrooms (3rd to 6th grade) with 100-150 students; B) Achieve increased engagement in 90% of students using Ama AI; C) Measure at least a 5-10% improvement in literacy and mathematics achievement in pre to post-testing; D) Collect qualitative data from teachers regarding Ama AI's impact on students.Goal 3: Assess the preliminary socioeconomic and educational impacts of Ama AI on rural students, teachers, and community stakeholders.This objective will assess how Ama AI impacts rural students' academic growth and engagement, as perceived by teachers, administrators, and community stakeholders. The study will focus on evaluating whether Ama AI supports differentiated instruction and inclusion for students with learning differences, while also exploring its potential to foster long-term socioeconomic benefits, such as improved academic performance and workforce readiness.Key Research Questions: 1) How do community stakeholders perceive the impact of Ama AI on improving access to differentiated instruction and inclusive learning in rural schools? 2) Is the integration of Ama AI perceived to support long-term socioeconomic benefits, such as fostering higher academic performance outcomes, and greater future workforce participation?Milestones and Metrics: A) Conduct surveys and interviews with 50-100 teachers, administrators, and stakeholders in rural communities participating in the pilot; B) 75% of community stakeholders (teachers, administrators, and parents) report that solution like Ama AI positively contributes to the educational and social needs of rural special needs students; C) Use interviews and educational systems research to quantify cost/benefit of Ama AI.

Project Methods

MethodsThis Phase I SBIR will develop and test an Ama AI prototype in 3rd-6th grade classrooms. Leveraging our experience in AI, game-based learning, and K-12 EdTech, we will rapidly build and refine prototypes in months 2-4, culminating in a fully integrated MVP by month 6, followed by two months of final proof-of-concept testing. We will create three example lessons (reading, math, writing) for inclusive pilot testing. Initially, the Ama AI web app will combine models from OpenAI, Anthropic, AWS (OCR), and OpenCV for text completion, image generation, vision input, speech, and document/image extraction. Early prototypes will use Python tools like LangChain.Task 1.1 Training and Update of Ama AI Models for Each StudentWe propose a novel approach using LLMs in special education, creating individualized AI companions that adapt to each student's interaction preferences, accessibility needs, and teacher input. We fine-tune a base model with student data--documents and conversational histories--using OCR and NLP tools. This data populates learning support templates, generating prompt-response pairs for fine-tuning (initially guided by humans, later automated). The model updates frequently as the student progresses.Model Update and Refinement:Ama AI's automated process refines the model by creating synthetic datasets and using ML algorithms (TensorFlow/PyTorch) to evaluate interactions, monitor response quality, and identify new data sources. When needed, it triggers further fine-tuning with fresh or synthetic data.Data Privacy Considerations:Student data is encoded and nearly impossible to extract. Only parents, teachers, and students have access, and all persistent data is encrypted. Parental consent is required before new data collection, and training data is deleted once models are created.Key Efforts:Adding OCR tools for training dataCreating scripts for organizing form/interaction dataAutomating the training and deployment processDeveloping the ML algorithm to trigger re-trainingTask 1.2 Create Complex AI

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Companions (chaining, prompting, MoE & RAG)After fine-tuning for student engagement, we will deploy the AI for lesson differentiation, support, and motivation. We will utilize prompt chaining, Mixture of Experts (MoE), and Retrieval-Augmented Generation (RAG) to make outputs more context-aware. Tools like LangChain will prototype prompt chains. RAG retrieves external knowledge to simulate memory by referencing past conversations and teacher-uploaded content. The AI will also perform function calls (e.g., generating graphs, animating concepts), broadening its educational utility.Key tasks:Create prompt chaining templatesImplement a complex multidatabase RAG approach for conversation memory and lesson contextImplement function and external API calling for the learning companionTask 1.3 Multimodal Input and AccessibilityOur goal is a universally accessible UX, following Web Content Accessibility Guidelines. We will integrate speech-to-text and text-to-speech (OpenAI's Whisper, Google's Web Speech API, Amazon Polly) and visual inputs (Google Vision, Azure, or OpenAI vision models). Students can respond with hand drawings or worksheets, captured and recognized by the system.Key Efforts:Image and video still processing for student workSpeech-to-text and text-to-speech for non-keyboard interactionsTask 1.4 Create the UX and UI for the StudentFor grades 2-3, including learners with differences, we will develop a simplified, context-adaptive interface with varied input options. Wireframes and mockups will emphasize a central conversational space for lesson interaction and creation/editing. Engagement features include rewards, awards, AI companion check-ins, and brain breaks. Moderation tools, such as blacklisted words or phrases and AI moderation models, ensure safe interactions.Key Efforts:Create mockups and conduct user testingIntegrate moderationTask 1.5 Teacher Management and Support ToolsWe will build a teacher dashboard for classroom management, lesson assignment, and performance monitoring. Teachers can add students and feed lesson materials via OCR to produce differentiated activities. Alternatively, they can input parameters into lesson templates, prompting Ama AI to automatically personalize lessons. We will also refine differentiation for images (plots, charts) and include automated rubric generation for assessment.Key Efforts: Creation of AI tools to upload and differentiate lessonsExpand tools to handle images (plots, charts, figures)Implement automated evaluation/testingTask 2.1 Curricular Lesson Activity Templates and Example LessonsAma AI will remain curriculum-agnostic, providing templates for common 2nd-3rd grade lessons. In Phase I, we will develop two support templates--one for ASD and one for dyslexia--and three trial activities in math, writing, and literacy for classroom testing.Key Efforts:Create common lesson activity templatesDevelop three example lessons for trialsDefine support templates for ASD and dyslexiaTask 2.2 Pilot Research at the End of Phase IWe will pilot-test Ama AI in inclusive classrooms (4-5 general education teachers, ~100-125 students; 2 special education teachers, 5-10 students) to assess usability, feasibility, and impact on engagement and learning outcomes. Beta testers will refine early concepts in months 2-4. During months 7-8, pre/post assessments (using curriculum-based measures) will track gains in reading, writing, and math, with a target of 5% improvement. Teachers will be interviewed for usability feedback, and students will complete the System Usability Scale (target >72%). Qualitative data will be coded and analyzed with NVivo.Key Efforts:Pilot Ama AI in classrooms for refinementAnalyze quantitative growth using CBMConduct interviews and analyze qualitative dataTask 3.1 Estimate Socioeconomic ImpactWorking with Iowa State University's CyBiz Lab, we will evaluate how Ama AI might improve student outcomes and broader socioeconomic factors, especially in rural communities. Surveys and interviews will measure student interest in post-secondary education, aiming for a 10% improvement on a 5-point scale, and assess parent/community perceptions of Ama AI's value. These findings will help quantify potential social and economic benefits.