The Proposed Research

Active Learning at Scale: Advancing Knowledge in Learning Science and Generative AI

This project seeks to deepen our understanding of active learning within scalable educational contexts by developing the Active Learning at Scale (Active L@S) framework. This framework will allow postsecondary students to engage with course content and practice essential skills through generative learning strategies, such as note-taking, summarizing, self-explaining, question answering, and retrieval practice. These strategies, guided by large language models (LLMs), will facilitate an exploration into how diverse student populations respond to adaptive learning tools across various settings. Through this research, we aim to advance the theoretical and methodological underpinnings of large-scale, generative learning technologies and the mechanisms that influence learning efficacy.

Guided by learning science and cognitive theories, this project will employ a human-centered design approach, iteratively developing the Active L@S framework within the existing mobile platform, INFLO. This research will integrate an LLM to produce contextually relevant, research-informed prompts and feedback mechanisms that adapt to student responses in real-time. By applying machine learning, data engineering, and natural language processing techniques, the project will explore how individual differences impact the effectiveness of active learning. Through extensive A/B testing, this work will contribute to a nuanced understanding of the conditions that foster successful learning outcomes in large, diverse student cohorts.

This research focuses on the foundational aspects of active learning and technology-enhanced learning environments, with implications for how adaptive and personalized learning experiences can be effectively implemented on a large scale. The integration of LLMs in education is at an emergent stage, and this project will explore the theoretical implications of using AI-driven tools to support generative learning across multiple domains. Findings from this research will contribute to the literature on learning sciences, human-computer interaction, and educational technology, offering insights into the interactional dynamics between learners and adaptive AI.

The project will systematically examine active learning processes and outcomes through controlled experimental designs, involving over 100,000 students across multiple institutions. Data collection will include student demographic information, system usability assessments, and satisfaction surveys, as well as granular data from digital learning activities. Using a combination of Bayesian analysis, machine learning algorithms, and natural language processing, the research will identify patterns in student engagement and learning effectiveness, while accounting for individual and contextual factors. These analyses will allow for a comprehensive exploration of the cognitive and behavioral dimensions of large-scale active learning.

The Active L@S platform will be integrated into the Canvas LMS, allowing for future research on adaptive learning systems within established educational technologies. Research findings will be disseminated through peer-reviewed publications, conference presentations, and scholarly reports, furthering academic discourse on the role of generative AI in supporting scalable, evidence-based learning interventions. This project will enrich the theoretical landscape of learning science and inform subsequent studies on the application of AI in diverse educational settings.

Adapted from [D. MacNamara, Active Learning at Scale Transforming Teaching and Learning via Large-Scale Learning Science and Generative AI](#)

The Makeover

Sales Principles	Current	Makeover Guidance	Makeover Text
Value Proposition	Focuses on advancing theoretical and methodological knowledge without clearly outlining the immediate, practical benefits.	Highlight how Active L@S will improve student learning outcomes, engagement, and flexibility, making it clear why this framework is valuable in real-world educational settings. You could rephrase sentences to focus on how Active L@S enables personalized, adaptive learning, making education more accessible and effective for students and providing educators with actionable insights.	*Active L@S empowers students with real-time, tailored learning experiences, significantly improving engagement and academic success across diverse learning environments.*
Storytelling & Emotional appeal	Primarily technical and impersonal, focusing on abstract ideas and methodologies.	Incorporate a narrative that paints a picture of how the technology will transform the student experience. Use language that conveys excitement about how AI can enhance students' academic journeys and address individual learning needs. Consider a brief scenario or "imagine" statement about students engaging with Active L@S in a way that feels natural and impactful.	*Imagine a student struggling with course content who, through Active L@S, receives immediate, personalized support anytime, anywhere - helping them regain confidence and achieve academic success.*
Credibility	While it mentions LLMs and advanced technologies, it doesn't explicitly establish why this team or project is particularly well-equipped to conduct the research.	Emphasize the expertise behind the project and any preliminary data or pilot results that support the effectiveness of the approach. Mention relevant past successes or highlight partnerships with leading educational institutions like Arizona State University and Indiana University.	*Backed by a team of experts in cognitive science and learning technologies, this project builds on proven AI-driven educational models that have already shown promising results in preliminary trials.*
Return on Investment (ROI)	Mentions the potential contribution to academic literature but doesn't focus on the practical or financial benefits.	Discuss how Active L@S can lead to cost-effective, scalable improvements in learning outcomes that benefit institutions as well as students. Mention that the insights gained from this research will enable schools to make data-driven decisions that maximize student success, which is a long-term investment in educational quality.	*By optimizing learning through adaptive AI, Active L@S not only enhances student outcomes but also provides schools with a cost-effective solution to address diverse learning needs at scale, ensuring a high return on investment.*
Call to Action	Ends on a note about theoretical contributions, without prompting the reader to envision or support future steps	Conclude with a forward-looking statement about the transformative potential of the research and how it aligns with the Department of Education's goals. This could inspire the funder to support the project as a catalyst for scalable, impactful change.	*Active L@S is poised to redefine how we approach personalized learning at scale. By supporting this project, the Department of Education can lead the way in bringing cutting-edge AI tools directly into classrooms, empowering the next generation of students and educators.*

The Pitch, 2 ways

The Abstract

We designed Active Learning at Scale (Active L@S) to revolutionize postsecondary education by leveraging advanced AI to provide students with personalized, interactive learning experiences tailored to their unique needs. Our research builds on cognitive science and learning technologies to develop and refine Active L@S. This platform integrates seamlessly with the Canvas Learning Management System (LMS) and offers real-time adaptive feedback to enhance student engagement, skill acquisition, and overall academic outcomes.

Traditional e-learning tools have improved accessibility, but they often fail to adapt to diverse student needs in real-time. Active L@S addresses this gap by using Large Language Models (LLMs) to deliver customized learning prompts that align with each student's specific course content. By embedding evidence-based generative learning strategies—such as note-taking, summarization, self-explanation, and retrieval practice—within a scalable, mobile-friendly platform, Active L@S empowers students to engage with course materials anytime, anywhere.

In this study, we will assess the efficacy of Active L@S in increasing academic achievement and improving self-regulation among postsecondary students. Our primary objective is to develop a system that adapts to the individual learning styles and preferences of over 100,000 students across multiple institutions, including Arizona State University and Indiana University. We will investigate:

- How Active L@S enhances student engagement, comprehension, and retention of course content.
- The impact of LLM-driven, real-time feedback on students' learning outcomes and self-determination.
- The platform's scalability and potential to address diverse learning needs across large student populations.

Using a human-centered design approach, we will iteratively test and refine the Active L@S framework. The platform will employ rapid-cycle experimentation and A/B testing to adapt learning strategies based on real-time student data. We will collect data on student engagement, learning behaviors, and feedback effectiveness using machine learning, data engineering, and natural language processing. These analyses will enable us to identify patterns that inform adaptive interventions, optimizing learning outcomes for diverse student groups. Furthermore, we will provide educators with comprehensive data analytics, empowering them to make informed instructional decisions and offer targeted support.

Our multidisciplinary team of experts in cognitive science, educational technology, and artificial intelligence brings extensive experience with large-scale educational interventions. We have built on established, evidence-based AI-driven models that have shown significant improvements in student engagement and learning outcomes in preliminary trials. Our team's expertise ensures a rigorous and reliable approach to advancing personalized learning technologies within postsecondary education.

Active L@S sets a new standard in adaptive, scalable learning technologies. By providing real-time, personalized support, this platform promotes accessibility, flexibility, and individualized learning experiences at an unprecedented scale. Our project will generate substantial data on the cost-effectiveness and scalability of AI-driven educational tools, helping institutions enhance student outcomes while reducing instructional costs. Funding for Active L@S will help us transform higher education by ensuring that students from diverse backgrounds have access to cutting-edge resources that support their academic success and lifelong learning.

We will share the outcomes of this research through peer-reviewed publications, conference presentations, and institutional reports. The requested funding will allow us to integrate Active L@S into the Canvas LMS, facilitate future research on adaptive learning technologies, and encourage their adoption across educational settings nationwide. This project aims to inform subsequent studies on the application of AI in higher education, advancing the fields of learning sciences and human-computer interaction. Ultimately, Active L@S represents a substantial contribution to developing evidence-based, scalable interventions that empower students and support educational institutions.

The Elevator Pitch

Active Learning at Scale (Active L@S) is a groundbreaking platform designed to provide students with personalized, interactive learning experiences that meet them wherever they are in their educational journey [Value Proposition]. Leveraging advanced AI, Active L@S uses Large Language Models (LLMs) to deliver customized prompts and real-time feedback, helping students stay engaged, enhance their skills, and improve learning outcomes.

Imagine a student struggling with foundational concepts who, thanks to Active L@S, receives tailored, interactive support in real-time—transforming their academic challenges into opportunities for growth and success. This adaptive platform adapts to each student's unique learning needs and preferences, ensuring that every student has access to meaningful, effective support, wherever and whenever they need it. Guided by experts in cognitive science and learning technology, Active L@S goes beyond traditional e-learning tools by integrating directly with Canvas LMS and providing educators with actionable insights on student progress. By employing data analytics and machine learning, this platform will offer educators the resources to make data-driven instructional decisions, driving significant improvements in student engagement and learning outcomes. Over the next three years, this project will engage students and instructors across major institutions to pioneer a new era of scalable, AI-driven educational support, positioning Active L@S as the future of personalized learning.

The Scenario

A major donor to the COE, who spent many years working as a teacher in her local school district, has been known to award $1-2M grants to faculty to advance their research. Your department chair has asked you to meet her at an upcoming dinner, and they warn you that the donor often requests a concept paper on the spot.

The donor typically takes the concept paper back to her board to discuss and decide if and how they will support the researcher. Or, she may elect to simply write a check for research that she is particularly interested in.

You have an idea to pitch a project you've been working on, which will test the effectiveness of a combined intervention for high school students with disabilities at risk of school failure. You thought this project might be a good fit for the U.S. Department of Education funding, but you have not made much progress pursuing it. A few months ago, you wrote a brief abstract just to get your ideas on paper, so you decided to update this brief write-up in case the donor requests it.

How should you update your abstract in preparation for this meeting?

The Proposed Research

This study examines the initial efficacy of a combined intervention utilizing two established evidence-based programs, Check and Connect (C&C) and the Self-Determined Learning Model of Instruction (SDLMI), specifically for students with disabilities who are at significant risk for school failure. C&C and SDLMI have each demonstrated positive impacts on academic achievement, self-determination, and school completion in students with disabilities. Previous research has established the foundational effectiveness of each intervention in isolation.

Check and Connect (C&C) serves as a Tier 2 intervention model, which incorporates structured mentoring to enhance students' academic and behavioral engagement. C&C emphasizes relationship-building and the use of school and community resources to support students. SDLMI, meanwhile, is an instructional model aimed at enhancing self-determination and goal-setting abilities in students. This model has been widely applied across curricular areas, encouraging students to set and pursue personal educational goals.

The integration of these two interventions offers the potential to address the complex, multifaceted needs of secondary students with disabilities, drawing on C&C's focus on mentoring and school engagement, and SDLMI's emphasis on self-determined learning and goal-setting. This study explores whether the combined features of these interventions can provide a more comprehensive approach to supporting students with disabilities, particularly in enhancing both secondary school outcomes (e.g., academic achievement, self-determination, and graduation) and postsecondary outcomes (e.g., access to education and employment).

The PI and Co-PIs will employ a cluster randomized controlled trial to assess the combined efficacy of C&C and SDLMI. This methodological approach allows for a rigorous comparison between two conditions: C&C alone and C&C combined with SDLMI. Forty high schools across Georgia will be included in the study, with a sample size of approximately 480 to 560 students in grades 9 through 12, identified as at risk based on indicators such as low academic performance and high absenteeism. Schools will be randomly assigned to one of the two conditions. This design is consistent with previous studies that aim to determine the additive benefits of layered interventions, particularly when addressing complex educational challenges among at-risk populations. The integration of SDLMI with C&C is intended to provide a holistic approach to student engagement by combining one-on-one mentoring with small-group instruction on self-determined learning. Teachers in the C&C + SDLMI condition will be trained to implement SDLMI at least twice weekly in small groups during advisory periods, where students will focus on goal-setting, attainment, and the utilization of community resources. The mentor teachers will be trained to tailor their instruction to meet individual student needs and to incorporate familial and community resources in the educational process.

The primary outcome measures for this study will include both secondary school/transition outcomes and postsecondary indicators. Secondary outcomes will be collected through the Georgia Department of Education, including metrics such as attendance, course completion, academic achievement, and graduation rates. Additional measures will include assessments of cognitive and affective engagement, self-determination, and goal attainment. Postsecondary outcomes will be tracked based on student enrollment and completion in higher education, as well as employment status. Implementation fidelity will be rigorously monitored using tools specific to each intervention, such as the C&C Core Components and Elements Self-Assessment and the SDLMI Fidelity Measure. The feasibility and social validity of the combined intervention will be assessed using the Usage Rating Profile–Intervention. The study will utilize multivariate multilevel modeling (M-MLM) to explore changes in both secondary and postsecondary outcomes. This approach will allow for the examination of growth trajectories and patterns across various outcome measures over the intervention period. In addition, the analysis will investigate the moderating effects of implementation fidelity and student demographic characteristics. Regression analyses will explore associations between intervention conditions and long-term outcomes, while organizational analyses will help to identify factors influencing the effectiveness of the combined intervention.

This project aims to contribute to the growing body of research on interventions for students with disabilities at risk for school failure by evaluating the combined impact of C&C and SDLMI. Findings will offer insights into the efficacy and potential scalability of a layered intervention model that addresses academic engagement and self-determination simultaneously, with implications for supporting at-risk youth in secondary and postsecondary settings.

Adapted from Shogren, K. Enhancing Secondary/Transition Outcomes Using Check and Connect with the Self-Determined Learning Model of Instruction

The Makeover

Sales Principles	Ideas for reframing the abstract following sales principles
Value Proposition	
Storytelling & Emotional appeal	
Credibility	
Return on Investment (ROI)	
Call to Action	