Teaching and Learning Innovation Collaborative

Proposal Leads

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Participating Units

Cato College of Education
Department of Educational Leadership
Department of Reading and Elementary Education

College of Computing and Informatics
Department of Software and Information Systems

The William States Lee College of Engineering
Department of Mechanical Engineering
Department of Engineering Technology and Construction Management
Assessment and Advising

College of Health and Human Services
School of Nursing

Center for Teaching and Learning

Keywords: Learning Innovation, Emerging Technologies, Digital Learning, Online Education, Educational Technologies,

Target Category: Areas of Unique Distinction (Small teams of collaborating faculty that have achieved an international prominence in an area or field of study).

Executive Summary

Rogers (1983) in the "diffusion of innovation" model defines an innovation as "an idea, practice, or object that is perceived as new by an individual or another unit of adoption" (p. 11). An innovation could provide an alternative solution to an instructional problem or create new practices that can be more effective (Redding et al., 2013). There is a need for researchers to explore and research innovations to identify if they work in the context of their instructional setting as it provides an opportunity for instructors and students to explore new ways of teaching and learning and adopt the innovation if the evaluation demonstrates positive outcomes. Innovation in teaching and learning is important for education as it has the potential to impact classrooms not only in higher education, but also in K-12 education and learning settings in the community. While technology is not the only way teaching and learning has been innovated, it has been leading the way for innovation. Covid-19 pandemic has shown the importance of online and digital learning while highlighting the inequities in society due to the digital divide. In this proposal, teaching and learning innovation collaborative brings together collaborators from educational technology, K-12 education, engineering, computer science, nursing, gerontology and educational evaluation (See Figure 1 below) to advance innovations, support diverse learners and impact various aspects of teaching and learning. We welcome participation from all colleges.

Figure 1. TLI Collaborative

Based on the 2020 Educause Horizon Report (Brown et al., 2020), some of the emerging technologies and practices include adaptive learning, artificial intelligence/machine learning, analytics for student success, elevation of instructional design, learning engineering and UX design, open educational resources, and XR (AR, VR, MR, Haptic) technologies. These technologies were rated for their usefulness in addressing issues of equity and inclusion, potential to have a significant and positive impact on learning outcomes, their risk of failure, reception of faculty to adopting them, and level of institutional funding needed to adopt them. The Educause Horizon Report identifies innovations each year and in previous years, various technologies such as game-based learning and gamification, MOOCs, flipped classrooms, mobile learning and makerspaces though resulted in different time frames for adoption but impacted teaching and learning. We have identified a few goals through which we can collaborate on this initiative.
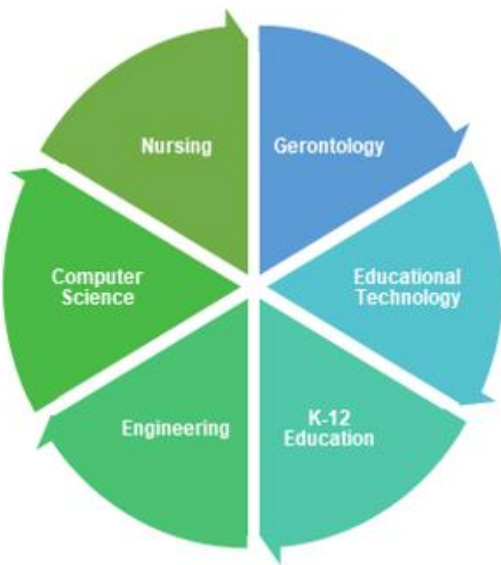
Teaching and Learning Collaborative Goals
1. Lead and support interdisciplinary research on Teaching and Learning Innovations
2. Synthesize and disseminate research on Teaching and Learning Innovations
3. Provide educational and research opportunities for students to investigate Teaching and Learning innovations
4. Collaborate with Center for Teaching and Learning on Implementation of Teaching and Learning Innovations

Evidence of Strength and Excellence
We have a team of faculty from various disciplines across four colleges at UNC Charlotte collaborating on multiple projects in the last few years. As described in the previous section, teaching and learning innovations, though changing each year, are important to achieve excellence and national prominence. Several faculty from these disciplines have collaborated on projects and proposals on online education, digital technologies, adaptive learning and this has resulted in grant funding and/or publications to extend teaching and learning innovations. While some of the researchers have worked together on projects, this collaborative also provides an opportunity for some new collaboration. Each team member brings various expertise to this group and supports different aspects of the projects. For example, team members with expertise in three different areas, educational technology, K-12 education and cybersecurity have been funded projects to study online cybersecurity education for K-12 students. This project is an example of how collaborators from different disciplines collaborate together on teaching and learning innovations. We have also had opportunities to directly impact the community and school districts including the North Carolina Virtual Public School. We will also plan to collaborate with the Center for Teaching and Learning and industry partners to support research initiatives to create and implement innovations. Some collaborators have worked together within the university's Quality Matters program as Quality Matters Fellows, on various university initiatives to enhance online education, by helping with internal QM reviews and supporting other faculty who have revised courses to be delivered online as a result of the COVID pandemic.

Selected Collaborative Publications
- Martin, F., Polly, B., Jokiaho, A., & Birgit, M. (2017). Global Standards for Enhancing Quality in Online Learning. *Quarterly Review of Distance Education, 18*(2), 1-10.
- Martin, F., Wang, C., Petty, T., Wang, W., & Wilkins, P. (2018). Middle School Students' Social Media Use. *Educational Technology and Society, 21*(1), 213-224
- Martin, F., Wang, C., & Sadaf, A. (2018). Student perception of helpfulness of facilitation strategies that enhance instructor presence, connectedness, engagement and learning in online courses. The Internet and Higher Education, 37, 52-65.
- Martin, F., Gezer, T. & Wang, C. (2019). Educators Perceptions of Student Digital Citizenship Practices. *Computers in the Schools,* 36(4), 238-254
- Martin, F., Hunt, B, Wang, C. & Brooks, E. (2020). Middle School Student Perception of Technology Use and Digital Citizenship Practices. *Computers in the Schools., 37(3), 196-217*
- Barclay, N., Westine, C., Claris, A., & Martin, F. (2020). Development and Implementation of Adaptive Learning to Engage Learners in Engineering Technology. *Journal of Formative Design in Learning, 4, 107-118*
- Martin, F., Polly, D., & Ritzhaupt, A.D. (2020). Bichronous Online Learning: Blending Asynchronous and Synchronous Online Learning. *Educause Review.*
- Martin, F., Sun, T., & Westine, C.D. (2020). A Systematic Review of Research on Online Teaching and Learning from 2009 to 2018. *Computers & Education, 159*
- Martin, F., Polly, D., Coles, S., & Wang, C. (2020). Examining Higher Education Faculty Use of Current Digital Technologies: Importance, Competence and Motivation. *International Journal of Teaching and Learning in Higher Education, 32*(1), 73-86.
- Martin, F., Chen, Y., Moore, R., & Westine, C. (2020). Systematic Review of Adaptive Learning Research Designs, Context, Strategies, and Technologies from 2009 to 2018. *Educational Technology Research and Development, 68(4),1903-1929*

Media Attention
Funded grants have resulted in some media attention from WFAE 90.7 Charlotte's NPR News Source, North Carolina Virtual Public School Announcement, UNC Charlotte University Advancement and UNC Charlotte Inside News. The links to these news stories are included in the references.

Collaborative Funded Grants
- Perez-Quinones, M., Pugalee, D., Martin, F. (2020-2022). Preparing High School Teachers to Broaden Participation by Teaching Programming Online, National Science Foundation, RPP HS, $299,848
- Martin, F., Polly, D. & Wang, W. (2020-2023). Digital Safety Immersion for Elementary School Students, National Science Foundation, SaTC: EDU, $399,999
- Martin, F., Petty, T., Wang., C., & Wang, W. [Principal Investigator] (2017-2020). Establishing Digital Citizenship by Implementing Cyber Safety Curriculum with Middle School Students, National Science Foundation, SaTC: EDU, $300,000

Collaborative Unfunded Grants
- Martin, F., Wang, W., Barclay, N., & Westine, C. (2020). Graduate Engineering Educators and Students Lived Experiences Transitioning to Online Courses during Covid-19. National Science Foundation, RAPID $199,993
- Martin, F., Flowers, C., Polly, D. & Pugalee, D. (2020). Professional Development for K-12 Teachers for Online and Blended Learning (PDOBL). Institute for Education Sciences, $1,506,836
- Martin, F., Cherukuri, H., & Westine, C. (2019). IUSE: Exploring the impact of adaptive learning on faculty, instructional designers, and students in online courses. National Science Foundation. $694,002
- Martin, F., Pugalee, D., Westine, C., & Venkatasubramanian, K. (2018) Preparing High School Students and Teachers for Data Science Using Flipped Learning, National Science Foundation, IUSE, $694,002
- Martin, F., Wang, C., Maher, M., Markant, D. (2018) Cyberlearning: Exploring the impact of adaptive learning on faculty, instructional designers and students in online courses, National Science Foundation, Cyberlearning, $749,935
- Cherukuri, H., Martin, F., Thomas, M., Dutta, D. (2015). Enhancing Engineering Education through Instructional Design, Culturally Responsive Teaching and Writing Pedagogies, USIEF, $189,685

Resources Requested. Innovation implementation requires an investment in resources. The support from administration to establish a center or institute will provide visibility and increase collaborative efforts. In addition, faculty fellowships to focus on research and grant activities with reduction in teaching/service commitments, and graduate assistantship support will be helpful to advance research on teaching and learning innovations. We hope to provide workspace and digital devices for the graduate assistants if hired. We can also benefit

Student Education and Training. Several graduate students have collaborated on grant and research projects on educational innovation. We plan to recruit and support students from underrepresented backgrounds from various programs by providing opportunities to research teaching and learning innovations. Our team has an extensive and long-standing track record of mentoring and supervision of graduate as well as undergraduate students.

Alignment with Regional and National Priorities (1 page)

UNC Charlotte: This research area addresses all four aspects of University of North Carolina Charlotte's vision and mission. Through innovative teaching and learning technologies, the university is able to deliver high quality and effective learning to all students including liberal arts, humanities, engineering, computing, etc. This project also brings together social and cultural diversity in terms of its leaders, collaborators, instructors, and also learners for whom the innovations are designed.

Charlotte and North Carolina: Through the teaching and learning innovations, this team will also be able to engage with the community and support UNC Charlotte's Civic action plan. We will engage with the community to share knowledge and resources and build a partnership. According to Charlotte Region Business Alliance (2020), Charlotte is a hub for several jobs and economic drivers including advanced manufacturing, automotive industry, financial services, healthcare and information technology. Innovation in teaching and learning of all these disciplines assists preparing 21st century learners for the workforce. In the North Carolina Tomorrow: Building Communities for Tomorrow's Jobs (2017) report, the North Carolina Regional and Statewide Strategies for Comprehensive Community and Economic Development states leaders had identified tremendous growth potential for companies capable of leveraging new technologies in emerging areas including: Video modeling and gaming, Nanomaterials, Pervasive computing, Digital design, Advanced materials and Rapid prototyping. As part of their strategies and tactics, they recommend improving efforts to prepare workers for available jobs especially these technology focused jobs.

U.S. Education: To advance the transformation of American education, the U.S. Department of Education is encouraging a culture of learning powered by technology. In the 2016 National Educational Technology Plan, John King, U.S. Secretary of Education, states "One of the most important aspects of technology in education is its ability to level the field of opportunity for students" (p.7). Technology is a powerful tool for transforming learning; however, learning, teaching, and assessment enabled by technology require a robust infrastructure. Through innovative technologies, learners can have engaging and empowering learning experiences. This report reinforces the preparation of 21st century learners with critical thinking, complex problem solving, and collaboration, by adding multimedia communication into teaching. Adaptive learning, games and simulations, and augmented reality are some of the futuristic technologies identified in this report (Thomas, 2020).

U.S. Workforce: The National Science Foundation's 10 big ideas (2021) include, Future of Work at the Human-Technology Frontier which is to understand how constantly evolving technologies are actively shaping the lives of workers and how people in turn can shape those technologies, especially in the world of work. This encourages researchers to conduct basic scientific research on the interaction of humans, society, and technology to help shape the future of work to increase opportunities for workers and productivity and sustainability for the American economy. Teaching and learning innovations provides opportunities for broadening participation among various audiences including underrepresented learners, and also advance the intellectual merit in different fields. This proposal has the potential to partner with industries to collaborate on the development and implementation of educational technology innovations and support economic development.

Supporting Documents

Participating Faculty Members

Name	Titles	Expertise	Contribution
Florence Martin, PhD	Professor, Learning, Design and Technology Cato College of Education	Learning Technologies and Online Education	Lead the grant proposals and research studies that focus on online and digital learning and integration of learning technologies
Weichao Wang, PhD	Professor, Computer Science College of Computing and Informatics	Cybersecurity, Computer education	Lead the integration of advances in computer sciences with teaching and learning
Harish Cherukuri, PhD	Professor, Mechanical Engineering College of Engineering	Mechanical Engineering and Engineering Science	Lead the integration of emerging teaching and learning technologies into mechanical engineering curriculum.

Contributing Faculty Members

Name	Titles	Expertise	Contribution
Manuel Pérez-Quiñones, DSc	Professor, Software Information Systems College of Computing and Informatics	Human Computer Interaction and Computer Science Education	National leader for Broadening Participation in Computing efforts with focus on student engagement. Managed mentoring programs & undergraduate research programs at multiple institutions. Created advising center in CCI. Directed office of

Name	Titles	Expertise	Contribution
			Diversity Initiatives at Graduate School at Virginia Tech. Research in CS Education, co-creator of multiple tools for CS Education.
Nicole Barclay, PhD	Assistant Professor, Engineering Technology College of Engineering	Engineering Technology and Engineering Education	Support research studies for advancing teaching and learning technologies in engineering and engineering technology courses
Drew Polly, PhD	Professor, Elementary Education Cato College of Education	Elementary Education, Mathematics Education and Instructional Technology	Technology integration, mathematics education in Grades K-5; design and research of teacher learning experiences and their impact on their teaching and students' learning
David Pugalee, PhD	Professor, STEM Education Cato College of Education	Mathematics Education	STEM teaching and learning support for teacher education and PK-20 students; research in STEM education
Ayesha Sadaf, PhD	Assistant Professor, Learning, Design and Technology Cato College of Education	Learning, Design and Technology	Digital technologies and instructional strategies to facilitate 21st century skills in varied learning environments (online, blended, and K-12).
Beth Oyarzun, PhD	Clinical Assistant Professor, Learning, Design and Technology	Learning, Design and Technology	Lead and support research studies in effective online learning strategies and effective

Name	Titles	Expertise	Contribution
	Cato College of Education		technology integration in k-12 schools.
Carl Westine, PhD	Assistant Professor, Educational Evaluation, Cato College of Education	Educational Evaluation	Synthesis research on teaching and learning innovations. Support grant writing. Research and evaluate STEM education interventions and technology integration.
Meredith Troutman, PhD	Associate Professor, School of Nursing College of Health and Human Services	Nursing; development and delivery of online and hybrid courses, including practica	Support teaching and learning research in nursing education and gerontology
Heather McCullough, PhD	Associate Director, Center for Teaching and Learning	Teaching and Learning	Support for faculty development in teaching and learning; oversight of the university's Quality Matters and Scholarship of Teaching and Learning programs.
Stephanie Galloway, PhD	Director of Assessment and Advising, College of Engineering	Assessment of Student Learning; and STEM research	Lead and support grants in STEM education; support research on teaching and learning in STEM; assessment and evaluation.

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