**2019 Technology Fee Full Proposal**

**Title**: zSpace: Mixed Reality Learning Spots (MRLS)

**Joint Proposers**: Brittany Kester, Education Librarian, George A. Smathers Libraries, Education Library
Bojan Lazarevic, Clinical Assistant Professor of Educational Technology, College of Education
Rachael Elrod, Head, Education Library, George A. Smathers Libraries, Education Library

**Contacts:** Brittany Kester, Education Librarian, Education Library, 2-150 Norman Hall, Brittany.kester@ufl.edu, 352-273-2793; Bojan Lazarevic, Clinical Assistant Professor of Educational Technology, Educational Technology Program – School of Teaching and Learning, College of Education, 2-209 Norman Hall, BLazarevic@ufl.edu; Rachael Elrod, Head, Education Library, Education Library, 2-150 Norman Hall, relrod@ufl.edu, 352-273-2627

**Joint Sponsoring Organizations**: Education Library - George A. Smathers Libraries; Education Technology Program – School of Teaching and Learning, College of Education

**Purpose and Specific Objectives**: The Education Library and the College of Education (COE) request $43,284 to purchase six All-In-One (AIO) zSpace desktop units, ten zSpace laptop units, installation, and the needed accessories (camera, laptop cart, batteries) to create zSpace MR Learning Spots (MRLS). The zSpace: MRLS will empower the student learning experience through the innovative use of zSpace technology and creation of authentic augmented/virtual reality, also known as mixed reality (MR). zSpace combines elements of MR with a strong emphasis on human-computer interaction. In essence, zSpace allows users to "pull" 3D objects or concepts from the screen and manipulate them with a stylus.

This project will support the mission of the University of Florida by providing a new resource that will promote excellence in teaching, research, and scholarship. As noted by the US Department of Education in 2017 National Education Technology Plan, zSpace technology represents one of the future technologies that has potential for transforming future learning experience (U.S. Department of Education, 2017). Given these facts, establishing the zSpace: MRLS strongly supports the essential UF mission - to take a leadership role in innovating learning opportunities, transforming teaching practices, and staying current on the global education market.

Upon receiving this Technology Fee award the project team will:

- Establish the concept of “Learning Spots” where students will be able to access technology in a variety of collaborative areas to enhance peer interaction and social aspects of learning.
- Provide access to high-end MR technology through zSpace immersive MR software.
- Facilitate the integration of MR in student learning across the academic disciplines.
- Organize workshops for students to develop MR digital artifacts.
- Conduct professional development for graduate assistants and faculty focused on the creation of customized MR-based instructional materials and learning modules in their respective disciplines.
- Expand access to MR educational content through a check out service of ten zSpace laptop units.

The "Learning Spots" represent a novelty in designing learning spaces to enhance accessibility to high-end educational technology. The zSpace: MRLS project offers locations in multiple learning “spots” across the UF Norman Education Village, including in the Education Library, the COE computer lab, and through laptop check out. Our vision is that the concept of “Learning Spots” spreads across the entire UF campus.

**Impact/Benefit**: The zSpace: MRLS is an innovative concept that offers students and faculty a unique perspective on using and interacting with MR educational multimedia. Being immersed into MR content, as well as the opportunity for users to create their own learning experience, are qualities that cutting-edge zSpace technology provides to the UF academic community.

The impact of the zSpace: MRLS project on learning will be measured and assessed based on continuous data collection about the devices’ usage including individual zSpace MR applications. This data will be utilized for further improvement of the “Learning Spots” concept and its application for academic purposes. Post-use surveys, in combination with semi-structured interviews, will determine what users created and accomplished by using zSpace.

It is anticipated that the zSpace units will be utilized to support instructional activities in a number of courses including EME3813: Technology-Enhanced Learning Environment, EME2040: Introduction to Educational Technology, LAE6348:

Teaching Multiliteracies, EDG6931: Teaching L2 with Technology. A new course developed by Dr. Bojan Lazarevic, Emerging Learning Technologies, scheduled for Fall 2019 will utilize zSpace to conduct needs assessments and identify current instructional problems that could be addressed by using immersive MR content; articulate strategies or lesson plans for effective use of MR in learning across various disciplines; design mini-research projects focused on solving real-life learning problems; analyze patterns of user interaction with as zSpace, develop AR files optimized for zSpace and 3D printers, etc. Dr. Pringle, Associate Professor in the COE, indicates that zSpace will be integrated across the science education curriculum. Lastly, zSpace will be a valuable resource for the upcoming COE Institute of Advanced Learning Technologies.

Examples of MR instructional materials will meet the needs of courses across disciplines:

- Medicine: anatomy models (muscular, nervous, respiratory, endocrine system, etc.)
- Engineering: engines, machineries, force, string of lights
- Biology: biomes, leaf structure, photosynthesis, mitosis vs. meiosis
- Chemistry: molecules, atoms, chemical reactions
- Mathematics: geometry, graphing force and time, volume and surface area scaling
- Music: idiophones, musical ensemble
- Language & Literature: dramatic structure, prefixes, roots and suffixes, story starters
- Social Sciences and History: Hammurabi's Code, Roman ruin expeditions, medieval weaponry
- Multimedia Production: creation of MR instructional activities

An array of emerging technologies (e.g. Microsoft Hololens, HTC Vive, 3D scanners/printers, AR tablets) have been acquired across the UF campus. However, innovative zSpace technology offers unique instructional potential and features that are not available anywhere else on campus. A zSpace unit has tracking sensors built into the display that track the users' hands (zSpace stylus) and head motion (glasses). As a user tilts his/her head to look around an object, zSpace dynamically updates to display the correct perspective in full, high-definition. In essence, zSpace enables experiential and collaborative learning through user-centered activities while maintaining a full tactile and audio-visual immersion in spatial educational content. As a high-end MR technology, zSpace provides a substantially different learning experience than regular AR tablets or phone devices, which typically create only informational overlay (graphics & sounds) on top of images or videos that represent real surroundings.

zSpace learning technology received public recognition from Forbes (Fink, 2018) and INC Magazine (Ryan, 2016) as one of the fastest growing emerging technologies in the USA with over 1 million users (Graham, 2018). However, the innovative zSpace system is neither present at UF nor in the larger Gainesville area nor surrounding counties. Over 180 higher education institutions worldwide have added zSpace to the technology they offer.

The utility of zSpace units extend beyond the MR experience by serving as regular PC Windows based computers with capability to be connected to printers, scanners, lab projectors or other peripherals and are compatible with Canvas. An array of academic and business software packages (e.g. MS Office, Adobe products, SPSS, Mathematica, etc.) can be installed on both zSpace laptops and AIO desktops. zSpace MR learning content is optimized for 3D printing using the Leopoly zSpace software, which allows 3D objects in .stl or .obj file formats to be printed out using 3D printers across campus. Or vice versa, objects scanned with a 3D scanner have the capability to be imported in to zSpace and viewed as MR content. The zSpace Studio software offers users the change to explore thousands of models from diverse categories, including dissectibles, biomes, animated models, and more. Users can complete premade learning activities or create their own. In addition, all activities within the zSpace system can be recorded and integrated in Canvas as instructional materials.

The project team will conduct zSpace workshops for students and professional development for graduate students and faculty focusing on the integration of MR content in learning and teaching at UF. These workshops will provide a customized hands-on experience tailored to the learning/instructional needs in different disciplines. The workshops will be offered at four different levels: a) Explanatory workshop: mastering the use of zSpace hardware and software; b) Application workshop: an in-depth exploration of content/discipline specific zSpace apps; c) Implementation workshops: providing conceptual solutions coupled with best practices focused on the implementation of MR in the class to support experiential learning; and d) Creation workshops: focused on the content design and development. The zView camera will allow participants in classes or workshops the capability to view the multimedia instructional materials.

UF students and faculty have expressed enthusiastic support and interest in zSpace. The project team conducted three zSpace demonstration workshops for UF affiliates throughout the Fall 2018/Spring 2019 semesters with more than 90 attendees. During these workshops, engagement in the zSpace learning modules was extremely high, coupled with positive feedback. To date, we have received a number of support letters that reflect interest in using this technology in future instruction. Please refer to the appendix.

Accessibility standards are embedded within the zSpace educational software. zSpace is ADA and UF Electronic and Information Technology Accessibility Policy compliant. The zSpace applications include an option for the information to be read aloud and are also compatible with commonly used screen readers. All applications are available in English, Spanish, Chinese, and French. A selection of the applications are available in up to eight languages, which will undoubtedly be welcomed by a large population of international students at UF.

*Circulation Policies*
The ten zSpace laptop units will be available at the Circulation Desk at the Education Library for a seven-day loan period. Four desktop units will be located in the Education Library and three units will be available in the COE's computer lab. Students and faculty wishing to use the desktop units in the Education Library can check out the accessories (glasses and stylus) from the Circulation Desk, while students using the units in the COE computer lab can check out the accessories from the IT Desk in the Educational Technology Department.

**Sustainability:**
The Education Library in collaboration with the COE supports this proposal and takes full responsibility in terms of maintaining the equipment as needed. UF Academic Technology has committed to maintaining the zSpace AIO units in the Education Library and COE computer lab, and the George A. Smathers Libraries IT has committed to maintaining the zSpace laptops.

**Timeline:**

| Timeline: Month(s) | Action |
|---|---|
| Jun./Jul. 2019 | Preliminary plan for deployment. |
| Aug. 2019 | Funds awarded and technology purchased. |
| Sept. 2019 | Material is cataloged (EDLIB) and prepared for circulation. Workshop development and integration to the regular library and COE service offerings. |
| Oct./Nov. 2019 | Faculty professional development sessions. Student workshops. Course specific instruction. |
| Future Semesters | Continuation of development of MR content which will be preserved as downloadable .stl or .obj files in the UF Institutional Repository. |