HF001: UNIVERSAL DESIGN FOR LEARNING (UDL) AND MULTI-MODAL TRAINING

PROJECT AT-A-GLANCE

- UNIVERSITY: University of Oklahoma
- PRINCIPAL INVESTIGATOR(S): Ziho Kang (Lead PI), Randa L. Shehab, Lei Ding, Han Yuan
- STUDENTS: Ricardo Fraga, Lauren Yeagle, Amin Alhashim, Mel Rosa Plata, Mattlyn Draggoo, Rashmi Reddi Annandi, Saptarshi Mandal, Kelvin Egwu, Josiah Rippetoe, Jamie Jazier
- INDUSTRY PARTNER(S): Adacel, ATSI, KeyBridge Technologies

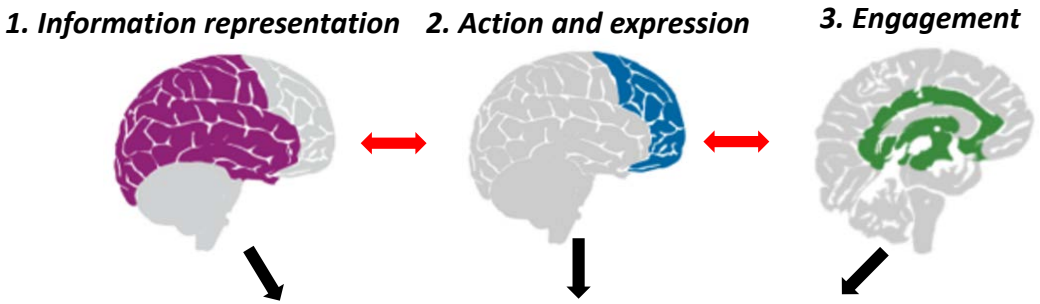
RELEVANCE TO TECHNICAL TRAINING AND HUMAN PERFORMANCE

This project aims to benchmark, adapt, and introduce new approaches in UDL design-based learning and multi-modal training for air traffic controllers through classifying current pedagogical practices, benchmarking existing and new state-of-the-art learning technologies, recommending adapted and new learning pedagogies, and developing protocols for assessing student learning outcomes.

STATEMENT OF WORK

- ATC training content analysis: Map UDL principles to current teaching curriculum and develop classification system.
- Learning style evaluation: Investigate and classify preferred learning styles from ATC candidates.
- Benchmark best practices: Investigate UDL and multimodal training practices.
- Recommend approaches: Align the content analysis with the benchmarking study to recommend adapted and/or new ATC training methods.
- Develop protocols: Develop performance evaluation metrics and procedures to assess the learning outcomes.

UDL and Multi-Modal Training Principles



Accommodate diverse learning preferences to increase learning performance.

STATUS

All milestones complete.

Final technical report to be submitted by 31 Dec. 2018.

- Conducted classroom and lab observations at the FAA academy and mapped the results with the UDL principles.
- Investigated the learning styles of approx. 500 FAA Academy trainees.
- Benchmarked best practices in other areas.
- Developed recommendations through providing implementation examples using actual FAA teaching materials.
- Conducted short-term experiment to evaluate the implemented examples.

FUTURE WORK

- Development of fully implemented training materials for each course.
- Evaluation of the fully implemented materials through experiments.
- Systematic training of instructors and trainees on how to maximize the usage of the UDL and multimodal training approaches.
- Implementing state-of-the-art technologies to support training.

Publications, Presentations & Awards

Publications

- **Journal paper:** Kang, Z., Dragoo, M. R., Yeagle, L. N., Shehab, R. L., Yuan, H., Ding, L., and West, S.G. (2018). Adaptive learning pedagogy of Universal Design for Learning (UDL) for multimodal training. *Journal of Aviation/Aerospace Education and Research*, 27(1), 23-48.
- **Conference paper:** Yeagle, L. N. and Kang, Z. (2018). Universal design for learning (UDL) for STEM and higher education: Characterizations and applicability. In *Proceedings of the 2018 ISER International Conference on STEM*, Jun. 18-19, Seoul, South Korea.
- **Conference paper:** Kang, Z., Dragoo, M. Yeagle, L., Shehab, R. L., Yuan, H., Ding, L., and West, S. G. (2017). Adaptive learning pedagogy in Universal Design for Learning and multimodal training. In *Proceedings of the 2017 National Training Aircraft Symposium (NTAS)*, Aug. 13 - 17, Daytona Beach, FL., USA.
- **Conference paper:** Yuan, H., Rippetoe, J., Ding, L., Kang, Z., Shehab, R. L., and West. S. G. (2017).Universal Design for Learning in the framework of neuroscience-based education and neuroimaging-based assessment. In *Proceedings of the 2nd International Conference on Bio-engineering for Smart Technologies (BioSmart)*, Aug. 30 - Sep. 1, Paris, France.
- Kang, Z. Evaluation of the Universal Design for Learning (UDL) pedagogy through eye tracking analysis and memory tests. (under preparation)

Presentations

- Kang, Z. (2018, June): Human factors research roadmap (invited panel). *Center of Excellence For Technical Training and Human Performance Workshop*, Jun. 5-6, Norman, OK.
- Kang, Z. (2018, June). Universal design for learning (UDL) for STEM and higher education: Characterizations and applicability. In *Proceedings of the 2018 ISER International Conference on STEM*, Jun. 18-19, Seoul, South Korea.
- Kang, Z. (2018, June): Human factors research roadmap (invited panel). *Center of Excellence For Technical Training and Human Performance Workshop*, Jun. 5-6, Norman, OK.

Publications, Presentations & Awards

Presentations (continued)

- Kang, Z. (2017, August). Adaptive learning pedagogy in Universal Design for Learning and multimodal training. In *Proceedings of the 2017 National Training Aircraft Symposium (NTAS)*, Aug. 13 - 17, Daytona Beach, FL., USA.
- Kang, Z., (2017, August).Universal Design for Learning in the framework of neuroscience-based education and neuroimaging-based assessment. In *Proceedings of the 2nd International Conference on Bio-engineering for Smart Technologies (BioSmart)*, Aug. 30 - Sep. 1, Paris, France.

Recognitions/Awards

- Kang was nominated for the ***Dr. Hamed K. Eldin Outstanding Early Career IE in Academia Award*** at the Instituted of Industrial and Systems Engineering in 2018.
- Kang was the ***Keynote Speaker*** at the IEEE BioSmart conference in 2017.
- Kang received the ***Best Presentation Award*** at the IEEE BioSmart conference in September in 2107.
- Kang received the ***Andrew P. Sage Best Transactions Paper Award*** in 2016.