RESEARCH SYMPOSIUM

## Room 316 Breakout Session 2 Abstracts

### Gerry Derksen, instructor, Graphic Communications

*Usability and User Experience with Interactive Media*

The idea for the toy came about with the advent of machine learning (ML) becoming more accessible and a need for education to enlist this technology to improve efficiency and performance measure in children with autism. The toy operates as a tutor helping children learn colors, and basic math. This project uses ML to capture unique patterns of play collected from children for the training set to improve the predictability offering an easier, harder or similar next question. Children with autism spectrum disorder (ASD) who are considered 'moderate' functioning individuals but still have cognitive capacity for learning are understudied because they are not on either end of the spectrum. This toy is positioned to help this demographic specifically however its success has much broader implications for other neuro-diverse populations as well as the general population of learners.
Constructionist learning paradigms that currently proliferate school programs are based in the concept of transference of knowledge from one subject to another, using math equations to understand physics, for example. Autistic students have difficulty making this transition both physically transitioning between classrooms as well as cognitively transitioning between concepts. This presentation discusses the educational toy that 'learns' student's patterns, habits and difficulties in order to accommodate learning preferences and aid in their transition between subjects. Using a sensor driven interactive interface equipped with machine learning technology this project examines how adaptive technologies can support autistic learners and customize each experience making learning more efficient while capturing unique patterns of learning.

### Sudeep Popat, associate professor, Environmental Engineering and Earth Sciences

*Wastewater Treatment, Anaerobic Digestion, Electrochemical Treatment, and Resource Recovery.*

Source-separated urine presents an opportunity to isolate nitrogen and phosphorus from sanitary wastewater for on-site recovery of the nutrients. However, storage of source-separated urine remains a primary challenge due to the problem of urea

hydrolysis. In this talk, I will present our work on using an electrochemical technology to prevent the hydrolysis of urea in source-separated urine as an alternative to the current approach of adding external acids or bases. In our technology, urine is fed to the cathode of an electrochemical cell wherein hydrogen peroxide is produced from oxygen reduction. Peroxide is a potent oxidizing agent and biocide, inhibiting the urea enzyme responsible for urea hydrolysis. In addition to showing results from proof-of-concept experiments, I will also present our recent focus on expanding the applications of our technology to include phosphorus recovery as struvite. Moving forward, we want to scale up our technology to a restroom- or building-scale and explore applications such as urine treatment for space missions.