Dear CGA Selection Committee,

As advisor, I am writing to you to express my full commitment to mentoring and supporting Abigale Stangl's proposed STEM research activities as outlined in her proposal for STEM Chancellor's Fellowship. Abigale is proposing to design and develop the Tactile Picture Book (TPB) Intervention that aims to support students' STEM competencies and dispositions.

Over the past three years, Abigale has been making significant contributions to our lab's research on the question of how we can more effectively create 3D tactile picture books for children with visual impairments. This research question is rooted in a subfield of computer science called Human-centered Computing. We have been investigating how a range of computational tools can or can not adequately support the task of designing and printing 3D pictures. Abigale has published five papers on this topic and has traveled internationally to present her work.

About one year ago, the TPB project took on a new, exciting direction that was never my original research plan. Abigale and a number of colleagues at the CU Science Discovery began to recognize a strong potential of the activity of "designing and making tactile picture" as an intervention strategy to engage young students (middle and high school) and to provide a pathway into STEM. They noticed a widespread interest among teachers in local schools as well as librarians in local libraries who want to give young students in local communities an opportunity to participate in "maker" activities; teachers and librarians believe that these could be a way to help students gain competencies and dispositions in STEM. However, many teachers and librarians are struggling to find a suitable maker curriculum; most existing curriculums are about building robots, rockets, and a variety of contraptions that carry limited social value. Abigale saw an opportunity that the Tactile Picture Book design activities could be developed into a curriculum to help teachers and librarians fill this gap!

Aside from her main research responsibilities in my lab, Abigale began to work with the CU Science Discovery as a team to pilot this idea. Working with a teacher, this team designed a "pilot" curriculum and taught 150 students at that school over a six-week period. Each student wrote a story she or he would like to share with children with visual impairments. Each student designed 3D models to illustrate the story and 3D printed the story. I was invited to the end-of-the-semester exhibition. For me personally, it was a really powerful experience to witness the more than a hundred books made by these students! I was then totally convinced that students were extra motivated because they knew they were making things for help others, in this case, children with visual impairments.

Here are some photos from the classrooms in Abigale's pilot work, and two examples (out of more than a hundred) of the books students made.

From the books students made, I saw strong evidence of learning on computer science, engineering, literacy, design thinking, and empathy!

After this successful pilot, Abigale became very passionate about pursuing this new direction she's identified. She would like to devote the next year to formally develop the curriculum grounded in education theories and study it in the context of library maker spaces. STEM Chancellor's Fellowship will provide not only the financial support but also the support network that will be made available, such as the annual Symposium on STEM Education and DBER seminar.

If you have any question about Abigale's qualification and my role in her proposed effort, please do not hesitate to email me at tom.yeh@colorado.edu.

Sincerely,

Tom Yeh
Assistant Professor
Department of Computer Science
University of Colorado Boulder