

POSE: Phase I: Establishing an Ecosystem for Open-source Educational CAD Models

During the past decade, many K-12 schools have established makerspaces with 3D printers, digital die cutters, and other fabrication tools. To facilitate effective use of school makerspaces, an open-source ecosystem is being developed to provide students and educators with curated, carefully reviewed Computer-Aided Design (CAD) models. The ecosystem will be structured around an existing open-source *Educational CAD Model Repository* developed through prior NSF support. The long-term ecosystem includes a clearinghouse for CAD models with (a) peer-reviewed articles describing classroom use, and (b) the models linked to associated downloadable files in the repository. Accepted practitioner-based articles will be published in a new journal, *Educational Fabrication & Design* (ED&F), established as one component of the ecosystem. The project's novelty is that educational CAD models will be externally reviewed, tested, and validated before they are added to the repository. The widespread availability of design and fabrication tools in K-12 makerspaces offers the potential to create new objects and remix existing designs. Science, mathematics, and engineering educators and their students will benefit from access to carefully curated models and associated instructional materials. The resulting open-source ecosystem's impact will increase effective use of K-12 makerspaces across all of the relevant disciplines and lead to broader literacy in design and fabrication.

During the one-year scoping activities of this project, the International Technology and Engineering Education Association (ITEEA) will revise its flagship curriculum, *Engineering by Design* (EbD © ITEEA), to incorporate the ecosystem constructed around the repository of CAD models. More than 5,000 teachers and more than 50,000 students using the curriculum will engage with the models integrated as a keystone element of the revised curriculum. In addition, the Fab Foundation, established through the Center for Bits and Atoms at MIT, will collaborate to engage a network of 2,000 Fabrication Laboratories (FabLabs) in this process. The eduFAB Network, an educational extension of the Fab Foundation, will work to coordinate activities across the respective disciplines.