In recent years design industries have witnessed an ever increasing demand for rapid prototype manufacturing technologies. The use of equipment such as Laser cutters, 3D printers, computer controlled milling machines and lathes has seen a change in the skills required by employers not only at the production stage but more importantly at design conception and pre-production processing. The need for producing designs via Computer Aided Design (CAD) software packages requires designers and makers to be capable of working in a digital environment. Middleton (2005) highlighted in his paper Creative Thinking, Values and Design and Technology Education in the International Journal of Technology and Design Education that the 21st Century thinking skills of creativity, critical thinking and problem solving are highly regarded by industry and therefore imperative that as Maker Learners are prepared for life after school they must be ready and able to immerse themselves within this paradigm.

The Research Question

Firstly, investigate if student creativity is being stifled by the requirement to produce virtual products prior to manufacture. Secondly, determine the effectiveness of directly linking physical prototypes to the CAD processes when students generate designs ideas.

Data Collection

Data for this project were collected by a variety of methods, including:
- Individual interviews recording the significance of the prototyping task.
- Direct observations of students during the activity and photos of student work.
- A research journal was kept throughout the action research project.
- Student pre and post activity questionnaires.

Data Analysis

Qualitative data from student interviews, researcher journal and images of the activity were subjected to thematic analysis. Underlying themes from student responses and other evidence were used to determine the effect of the research action. The pre and post activity questionnaires were compared and statistical variations using Cohen’s effect size scores were analysed with consideration of the thematic analysis. The questionnaires were also scrutinised for common themes in student responses.

Key Findings and Discussion

Based on the results from this study there is evidence to support the use of prototypes prior to the development of CAD models. The clay prototype helped me to understand modeling the shape on CAD... redesigning the front face and the back to get a clear picture of what it was going to look like. I could easily copy what the design was like onto the computer.

The Research Action

Churchie students engage in Maker Learning using a process of research, ideation, concept selection, CAD modelling, manufacture and finally evaluation. It was proposed that between the concept selection and CAD documentation stages a clay prototype would be made by all students. On completion of the prototype students analysed the prototype to determine its appropriateness and the most efficient way to develop their design into a CAD model. They then developed a sequence for producing their CAD model and documentation.

Introduction

In the questionnaire responses and in student observation, creativity was improved by the prototyping task, and some boys indicated in interviews that creativity may have been enhanced during this project. The improvement, however, was not statistically significant enough to confidently report improvement.