

Effects of Video Lecture on Students' Mastery of Engineering Design Software



Austin Robbins, Glacier High School, Kalispell, MT

Background

Students use technology everyday to simplify tasks, entertain, and learn. Over the past several years I have experienced more and more students that immediately search the internet for videos to address misconceptions. Students are more likely to spend two hours watching a video to learn a concept than twenty minutes reading a textbook. Research is not in agreement on the effectiveness of video instruction with some indicating its positive effects and others showing it has very little effect on learning. In light of this, I conducted this study on the effects of video instruction on acquiring skills in a three-dimensional design software, Autodesk Inventor. This study was conducted in three sections of Introduction to Engineering Design which is primarily a freshman engineering course. There were 62 students in the study, 79% ninth graders, 10% tenth graders, and 11% juniors and seniors.

Methodology

Two sections of engineering were taught basic modeling skills in the software exclusively through two tutorial videos. During instructional time students followed along the video tutorials to complete two modeling activities. The third section of engineering received live lecture instruction identical to that in the video. Both the treatment and non-treatment groups were allowed to ask questions during work time. Time required for students to complete each modeling task in the software was recorded and used to measure rate of mastery. As a summative assessment, all students modeled a dimensioned part and the time required to complete the model was recorded.

Research Questions

Primary Research Question

- What are the effects of video lecture instruction when compared to traditional instruction on students' rate of mastering three-dimensional software?

Secondary Research Questions

- Does video lecture instruction increase student engagement in learning?
- Does video lecture instruction decrease the frequency of student questions regarding the software?

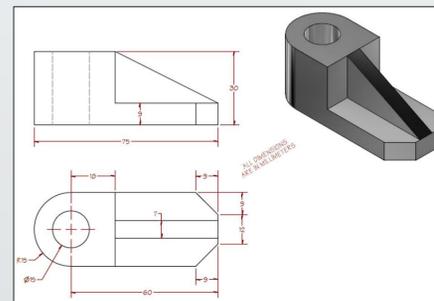


Figure 1. Post treatment modeling test part.

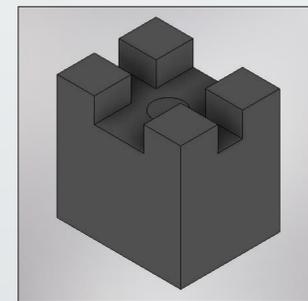


Figure 2. Video Tutorial Part.

Surveys

The majority of the class had very little confidence in the software to start with 85% of the class selecting a confidence level of 3 or less. After treatment, only 24% of students selected a confidence of 4 or less demonstrating a statistically significant increase in confidence ($p < 0.05$).

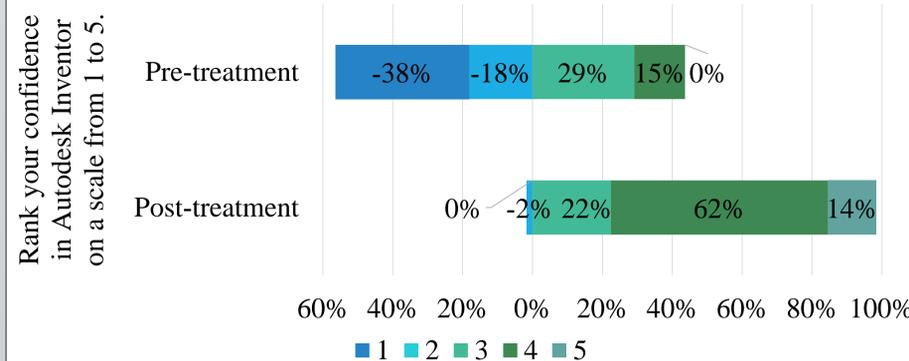


Figure 3. Autodesk Inventor confidence responses, (N=55, N=58).

Analysis

Students receiving video lecture instruction had shorter learning times and greater retention than those with live lecture. On the Intro Activity, video lecture students had 41% faster median completion times ($p < 0.05$). Both the live and video lecture groups had equal completion times on the 3D Modeling Activity but video lecture students had 43% faster median completion times on a 3D Modeling Test at the end of the unit that required transfer of acquired software skills ($p < 0.05$). The treatment did not significantly impact frequency of student questions or student engagement.

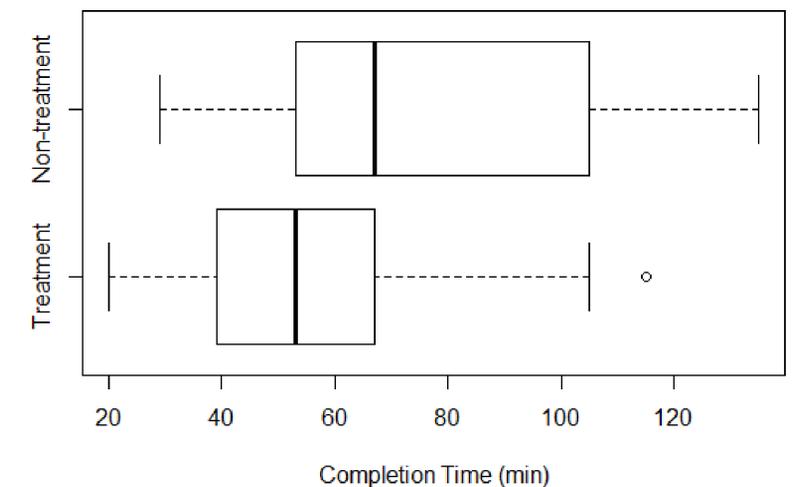


Figure 4. 3D Modeling Test completion times, (N=40, N=18).

Values

When used as an instructional tool, video lecture instruction has the potential to increase students' rate of mastering new concepts due to students' ability to instantaneously adapt playback to suit their needs while increasing student retention. Additionally, students demonstrated a strong preference towards having access to video lecture instruction when learning something new.