WIP: The Student's Perspective on CAD Software in a First-Year Civil Engineering Graphics Course

Prof. Raymond Eugene McGinnis Jr., Christian Brothers University

Professor McGinnis is an Associate Professor in the Department of Civil and Environmental Engineering at Christian Brothers University in Memphis, Tennessee. He has thirty-nine years of experience teaching engineering courses. He has taught thirty-four years at Christian Brothers University. He teaches courses in Transportation Engineering and Construction Engineering. Required courses include: Civil Engineering Graphics, Geomatics and Lab, Construction Materials and Lab, Highway Engineering and Engineering Economy. Elective courses include: Traffic Engineering, Heavy Construction Equipment and Methods, Construction Cost Estimating and Cost Control, Construction Management and Planning and Scheduling. He is a registered Professional Engineer in the State of Tennessee. His professional experience includes bridge inspection and evaluation, roadway and interstate design, traffic planning and the design of earth-fill dams. He serves on the Board of Directors of the America Society of Civil Engineers West Tennessee Branch. He serves as the Treasurer for the Memphis Area Joint Engineers Council. He serves as Treasurer of the Memphis Chapter of the Tennessee Society of Professional Engineers. He serves as the faculty advisor for Tennessee Delta Chapter of Tau Beta Pi, the national engineering honor society and as the faculty advisor for the student engineering fraternity Theta Tau. Professor McGinnis served fifteen years as the Department Chair in Civil and Environmental Engineering. He has also served as an Adjunct Professor at the University of Memphis teaching a class in Construction Engineering.

Dr. Andrew Assadollahi, P.E., Christian Brothers University

Dr. Assadollahi is a native Memphian and a 2005 graduate of Christian Brothers High School. Dr. Assadollahi earned a B.S. in Civil Engineering with a concentration in structural engineering from Christian Brothers University in 2009. He also earned a B.S. in Mathematics from Christian Brothers University in 2009, concentrating in applied differential equations. He earned a M.S. in Civil Engineering from The University of Memphis in 2010 with a concentration in structural seismic engineering. Dr. Assadollahi completed his Ph.D. in Engineering from The University of Memphis with a concentration in geo-structures in 2013. He currently an Associate Professor and Department Chair of Civil and Environmental Engineering at Christian Brothers University. He is a registered professional engineer in the State of Tennessee.

WIP: The Students' Perspective on CAD Software in a First-Year Civil Engineering Graphics Course

Introduction

This research focuses on the students' perspective on computer-aided design (CAD) software in a first-year civil engineering graphics course (CE 111). This paper aims to chronicle the students' experience in transitioning from MicroStation to AutoCAD during the semester and to determine the extent of how much of each software program should be taught and discusses how the instructor transitions from MicroStation to AutoCAD and will survey current and prior students who have completed the class to gain their perspective in how well the transition was achieved. The long-term goal of the course it to provide the students with the best educational experience and to best prepare them for future classes, internships, and full-time employment. The results of this research summarize the students' perspectives of using both software programs and their perceptions of transitioning from MicroStation and AutoCAD.

Software Used

The instructor began implementing AutoCAD into CE 111 in early November of the Fall semesters. Prior to early November, the students used the MicroStation software. The reason for covering the MicroStation software first is that the instructor's experience was that teaching MicroStation first makes learning AutoCAD easier for the students. Students from the Fall 2021 section of CE 111 were surveyed to gage their perspective on the two software packages and their ability to learn AutoCAD after already learning MicroStation. A second survey was administered to former students (second through fourth-year students) to gain their perspectives as well.

Constituency Surveys

The first survey was administered to students who took CE 111 in the Fall of 2021. Table 1 summarizes the data from the fourteen responses and Table 2 summarizes comments collected.

Table 1. Results from Survey One (Students Enrolled in CE 111 in Fall 2021).

Survey Item	Results
"Preparation provided by CE 111 to complete AutoCAD tutorials"	Very Prepared: 0% Well Prepared: 29% Adequately Prepared: 29% Somewhat Prepared: 28% Not Prepared: 14%
"CAD Software Preference:"	AutoCAD: 43% MicroStation: 50% Other: 7%
"CAD Software Preference for use on Future Projects:"	AutoCAD: 57% MicroStation: 36% Other: 7%

Table 2. Comments from Survey One (Students Enrolled in CE 111 in Fall 2021).

Student	Comments
1	"MicroStation is older and less aesthetically pleasing in my opinion. I only prefer it because I was taught it and not AutoCAD. However, I would rather learn and master AutoCAD because it looks a lot better and is more common in the workplace."
2	"I prefer AutoCAD in general, but MicroStation is fine too."
3	"From the beginning of the course we have been using MicroStation and not really AutoCAD. We just used AutoCAD for an extra credit assignment so since we were used to MicroStation it was difficult for us to figure out how to use it. If we have used both the same amount of time it will be much easier to compare them. For that reason, I prefer MicroStation."
4	"When I completed the AutoCAD drawings, I had to completely relearn everything. MicroStation helped me get an idea of how to DRAW the drawing."
5	"They are similar. AutoCAD may take longer to understand."
6	"MicroStation is definitely for the more tech-savvy people. AutoCAD is easier to use, but takes some getting used to."
7	"Unpopular opinion, MicroStation was harder to learn but easier to get good at."
8	"Software MicroStation seems to be showing its age, and I am under the impression that AutoCAD has more features and allows more productivity. MicroStation seems more user friendly, so for that reason it is probably better to start with, but after fall break transition to AutoCAD."

A second survey was administered to students who had taken CE 111 prior to Fall 2021 (second-year students and older) and had the same questions and comment section as Survey One and yielded 21 responses. Table 3 summarizes the results from Survey Two and Table 4 summarizes the comments.

Table 3. Results from Survey Two (Students Enrolled in CE 111 Prior to Fall 2021).

Survey Item	Results
"Preparation provided by CE 111 to complete AutoCAD tutorials"	Very Prepared: 0% Well Prepared: 0% Adequately Prepared: 58% Somewhat Prepared: 19% Not Prepared: 23%
"CAD Software Preference:"	AutoCAD: 76% MicroStation: 24% Other: 0%
"CAD Software Preference for use on Future Projects:"	AutoCAD: 81% MicroStation: 19% Other: 0%

Table 4. Comments from Survey Two (Students Enrolled in CE 111 Prior to Fall 2021).

Student	Comments
1	"I wish the course was nothing but AutoCAD. It is an easier program to catch onto and is so much more user friendly. Also, this software is more relevant to the software that is used after graduation."
2	"I feel that MicroStation is a harder CAD software to grasp, although it is the most widely covered software package in the course."
3	"MicroStation is rarely used in businesses outside of college. I believe changing to AutoCAD will set up students for success!"
4	"MicroStation was harder to learn but easier to get good at."
5	"A small number of companies use MicroStation nowadays. There is no use for it. We just learn it in class."
6	"AutoCAD was easier to use once I understood how to do tasks."
7	"AutoCAD is more commonly used after the undergrad world."
8	"MicroStation seems to be limited to 2D drawings only, while AutoCAD there is the ability to draw both in 2D and 3D. Learning AutoCAD helps students learn other drafting programs such as "Inventor" or "Revit" which are used in industry."
9	"I personally it at my internship and what I have been told from other people is that AutoCAD is used way more in most companies than MicroStation."
10	"The first few times using MicroStation were somewhat rough but after that everything went smoothly."

Conclusion

The preliminary findings of this research are of value to the students and instructor of the course as to the future direction of the CE 111 course. The findings may also benefit other first-year engineering courses to help determine which software program may be best for their curricula. Tables 2 and 4 show that ten out of eighteen responses indicate a preference of learning AutoCAD due to its industry usage. Preliminary results indicate that the instructor's assumption that learning MicroStation makes learning AutoCAD easier is verified. Specific survey comments tend to support commentary which states that AutoCAD and MicroStation have similar learning curves but many users feel that AutoCAD is more intuitive and MicroStation tends to be less user-friendly [1].

As a result of the research for this paper, the instructor will prepare more detailed tutorials both written and video to assist in the learning of AutoCAD beginning in the Fall of 2022. Future research will include correlations between students' perceptions on their performance and their graded performance of various assignments in CE 111.

References

[1] J. Chiffey, "MicroStation vs AutoCAD [2022]: Which is Right for You?". *Total 3D Printing*. 2002. [Online]. Available: https://total3dprinting.org/microstation-vs-autocad/ [Accessed May 31, 2022]