

Faculty Innovator Grant 2013
Center for Learning and Teaching

Final Report Form

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Project Title: (10 words or less)	Online Modules for Computer Aided Drafting

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1. Describe the specific teaching and learning issues being addressed by the proposal.

MET 120 - Computer Aided Drafting is a freshman course in the Frank Batten College of Engineering and Technology. In this course, computer based drafting methods are taught with a major emphasis on 'Hands On' practice using 2-D AutoCAD software in the computer lab, along with the various methods of editing, manipulation, visualization and presentation of technical drawings. This course includes the basic principles of engineering drawing/hand sketching, dimensioning and tolerancing.

This course is offered every Fall, Spring and Summer semester. Every semester there are 5 sessions of 28 students each over Fall and Spring and 1 session of 30 students over the summer. There are approximately 140 students enrolled in this class every Fall and Spring semester and 30 over the summer, which makes it around 310 students per year. Students from four different departments are taking this class: Mechanical Engineering Technology, Mechanical Engineering, Civil Engineering and Civil Engineering Technology.

During this class, students learn the following topics: how to create two dimensional engineering drawings in AutoCAD; learn about engineering orthographic projection; dimensioning; sectioning; tolerancing; fasteners and drawing threads; and assembly drawings. All these topics are very important to a future engineer to learn some fundamental understanding of American and international standards that are used for engineering communication through engineering drawings.

One of the issues that has been identified by a provost, chair and department head is that although this class is perceived as being "easy", still there are many students who earn D and F grades or withdraw (W) from the class in the past years. Faculty, department director and chair are observing closely what some possible reasons are for this.

2. Describe the revised specific teaching and learning issues being addressed by the proposal (if applicable):

Computer Aided Design and its related technologies are changing rapidly. However, principles of engineering graphics are staying the same over longer period of time and understanding the basics of engineering graphics as important engineering communication tool is essential. This course will be improved with the set of supplemental materials would include:

1. Concepts of using different line types and line weights in engineering drawing.
2. Strategies for successful dimensioning.
3. Understating of connection between engineering tolerance and fits.
4. Learn about different fastener type for engineering applications.

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3. Describe the development activities involved addressing the learning or teaching issue.

The research team developed twenty online modules that covered these topics listed previously in the form of video tutorials and narrated presentations. These tutorials covered various topics related to successful completion of assignments given in this class, improvement of success in the assessment given to students and also strengthen their overall engineering knowledge related to engineering graphics and related standards. These online modules are now integrated in a Blackboard course management system and shared among faculty who are teaching this class through ODU Box.

4. Describe the learning outcomes attained by the project.

The main goal of this project was to provide students opportunity to use these online learning modules which are specifically tailored for MET 120 class Computer Aided Drafting as a support to their own, self-paced learning. Understanding how to read and how to create new engineering drawings is one of the basic skills needed for any engineering profession, especially for the areas of mechanical engineering / engineering technology and civil engineering / engineering technology. For this purpose, various skills have to be mastered, such as how to distinguish between various orthographic projections and how to create freehand drawings. Several online modules would be developed to cover the basics of engineering graphics.

Another learning objective was learning how to understand and calculate engineering tolerances. For this purpose, understanding typical surface roughness, machining processes and fits is essential. In addition learning how to find the right table related to specific engineering standard is also another skill that students would have to develop for their future successful work as an engineer. For that purpose, several online modules will be developed to cover these important topics.

Dimensioning was another topic that is sometimes hard to grasp for students who are just entering the world of engineering. Problem solving skills have to be matched with exact rules related to dimensioning. The problem is that class time might be too short to showcase various different problems since students have to work on their assignments. For this purpose, several online learning modules will be developed so that students could easily access these rules and examples through Blackboard system. In this way they will learn how to adhere to the standard conventions for terminology, symbols, and styles used in engineering graphics.

In addition, one of the main engineering skills for any mechanical engineering / engineering technology and civil engineering / engineering technology professional is learning how to create engineering drawing in Computer Aided Design software such as AutoCAD, which is used in this class. Therefore, ten online learning modules will focus on this learning objective and try to focus on some typical questions that were raised during the class or during the office hours.

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5. Describe unexpected outcomes, if any.

N/A

6. Describe the impact of the completed project on your colleagues, department, college, or community.

As a result of this project, set of supplemental online learning modules was developed to supplement the class Computer Aided Drafting so that can students learn at their own pace and use training materials when needed. In this way, learning experience in our class became more flexible, and creates a more comfortable, low stress environment even if some class was missed for some reason. Thus, face to face learning environment would became a blended learning environment which might serve as a great base to match out different learning styles of our students or as a basis for a future online course that might be developed based on a teaching model presented in this grant.

7. Describe how the project can be a model, template, or prototype for use by other instructors.

The proposed solution was to create twenty different online modules in the form of video tutorials and narrated presentations. Each faculty from Mechanical Engineering Technology created a set of four different online modules. They were designed in consultation from a faculty from STEM Education and Professional Studies department and instructional specialist from Center for Learning and Teaching. In this way, a successful methodology for sequencing, module educational parts and structure matched pedagogical objectives.

8. Describe the technology used to help address the issues described in the proposal.

Camtasia was selected as a software application for creating video tutorials and presentations through screen video capture. Faculty were be able to show on their screens different things related to use of engineering software used in this class and to record their voice at the same time. In this way, more interactive video were developed. The reason that this software is selected is related to consultation with the staff at Center for Learning Technologies and their recommendation. They were advised that Camtasia would be easy to use, with no need to learn some advanced programming or debugging. It has been widely used at many U.S. universities and at ODU for similar purposes.

9. Describe products, if any, that are a result of the project.

Online modules, developed as a part of this grant, focused on providing supplementary information related to engineering graphics and Computer Aided Design in AutoCAD software. New concepts were be developed as standalone units which would be available to students. There are total of twenty learning modules (ten AutoCAD tutorials and ten engineering graphics tutorials). These modules are:

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1. Introduction to 2D AutoCAD
2. Line weight for engineering drawings in AutoCAD
3. Use of layers in AutoCAD (assigning pen thickness to line weight).
4. Creating title block in AutoCAD
5. Creating border in layout drawing in AutoCAD
6. Inserting title block into 2D model space in AutoCAD
7. Managing viewport and scale and printing drawing in AutoCAD
8. AutoCAD scale management (inside model space and printing)
9. Setting up the dimension/multileader style (metric) in AutoCAD
10. Setting up the dimension/multileader style (imperial) in AutoCAD
11. Fasteners - bolts and nuts
12. Fasteners – screws and washers
13. Fasteners - Threads
14. Fasteners – keys and pins
15. Different materials in sectioning
16. Assembly drawings basics
17. Tables in engineering drawing
18. Practical aspects of tables in engineering drawing
19. Dimension placement rules
20. Dimension placement examples

The tutorials were created as videos and narrated presentations. Both of these were given to all faculty who teach MET 120 in Fall 2014. They uploaded to Blackboard and viewed online through secure website.

10. Describe the future plans for this project, if any.

The online modules which were developed during this project are delivered to the students in Fall 2014 semester. IRB was approved nonexempt in March 2014 (Spring 2014). Data will be collected in the Spring 2014 semester. Students will be asked to provide their opinions related to these modules on a Linkert scale.

11. Attach a financial report with updated Budget Plan Matrix.

Final Budget Matrix

Budget Item (equipment, personnel, software, etc.)	Qty	Total Cost	Source of Funds	
			Amount from FIG	Amount from Other Source
Faculty involved in the project	4	\$1,800.00	\$1,800.00	\$0
Techsmith Camtasia Studio + Snagit https://store.techsmith.com/education.asp	3	\$600.00	\$600.00	\$0
Adobe Presenter 8 http://www.adobe.com/products/presenter.edu.html	1	\$600.00	\$600.00	\$0
Total:		\$3,000.00	\$3,000.00	\$0