

Experiences in Implementing a Studio Model and Portfolios in a Computer Curriculum

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Introduction

Program Graduate Profiles

Program Overview

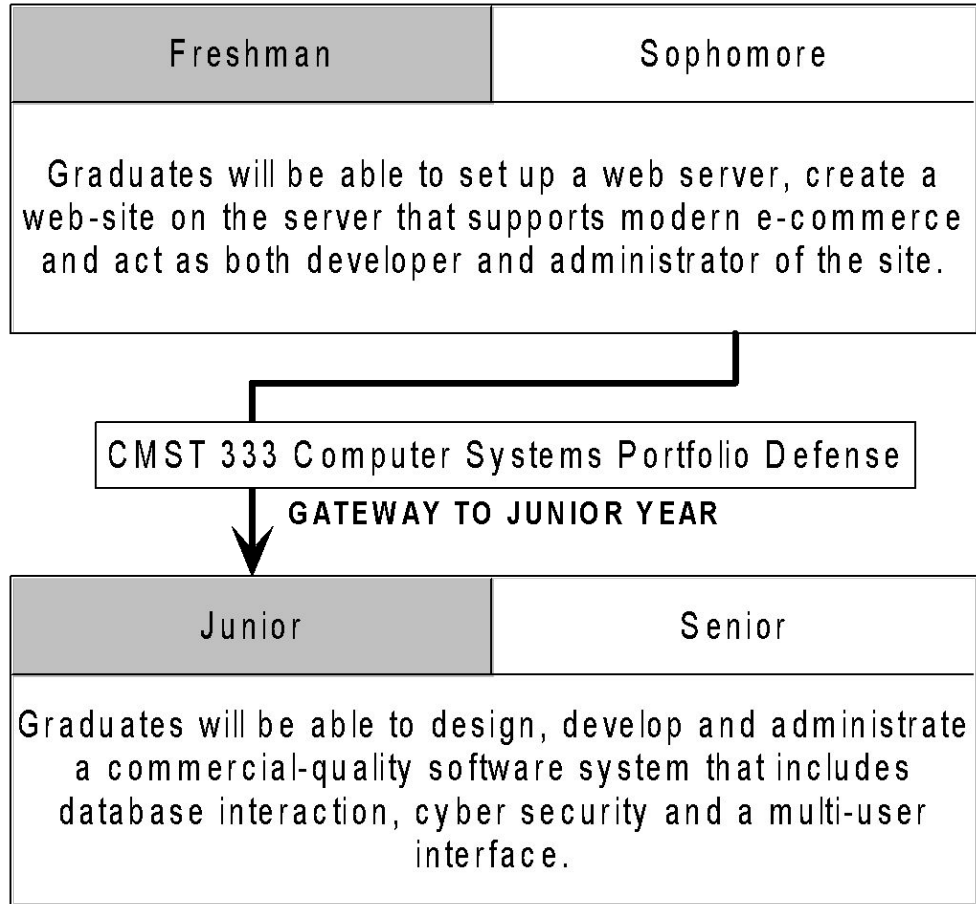
Freshman Studios

Sophomore Studios

Electronic Portfolios



Program Graduate Profiles



Program Overview

Modified
Traditional
Model

Freshman	Sophomore
<ul style="list-style-type: none">• Keep traditional 3-credit courses organized around a single content area• Have a 1-credit studio course in each of the first three semesters• Have an electronic portfolio requirement	

CMST 333 Computer Systems Portfolio Defense

GATEWAY TO JUNIOR YEAR

Polytechnic
Model

Junior	Senior
<ul style="list-style-type: none">• Increase rigor by requiring formal entry into the junior year• Immerse upperclassman in the polytechnic model through 6-credit studio courses• Use live industry projects in the studio courses• Allow each student to have a unique, hands-on experience tailored to his/her individual career goals• Expose students to the full spectrum of working in the field	



Organization of First Two Years

- Use the studios to help students to integrate what they are learning in the content courses to the completion of a project.
- Ease students' transition into the polytechnic model.
- Facilitate transfers from community colleges and other traditional programs.
- Introduce portfolios early for student reflections and longitudinal program assessment.

Underclass Courses

Freshman Fall	Sophomore Fall
CMST 103 Computing Principles CMST 135 Web Fundamentals CMST 183 Computer Systems Studio I MATH 100 College Algebra EDCEP 111 University Experience ENGL 100 Expository Writing	DIGME 137 Fundamentals of Visual Literacy CMST 180 Introduction to Database Systems CMST 283 Computer Systems Studio III CMST 335 Programming II COMM 106 Public Speaking I Humanities/social science elective
Freshman Spring	Sophomore Spring
CMST 185 Computer Systems Studio II CMST 247 Programming I CMST 250 Hardware & Network Fundamentals MATH 150 Plane Trigonometry PHILO 105 Introduction to Critical Thinking Business elective	CMST 252 System & Software Fundamentals CMST 315 Introduction to System Admin CMST 332 Web Development Project CMST 333 Computer Systems Portfolio Defense ENGL 302 Technical Writing Science elective

Content course
 1-Credit Studio course

3-Credit Capstone course
 General Ed course

Fall 2016 Studio I

CMST 103 Computing Principles
CMST 135 Web Fundamentals
CMST 183 Computer Systems Studio I

- Heavily focused on the project.
- Minimal amount of additional material.
- Project consisted of a responsive design web site of the student's own choosing, combining:
 - HTML, CSS (from Web Fundamentals)
 - A computer game (from Computing Principles)
- Students also had to write a reflection paper and give an oral presentation.

Spring 2017 Studio II

CMST 185 Computer Systems Studio II
CMST 247 Programming I
CMST 250 Hardware & Network Fundamentals

- Similar to first Studio I:
 - Heavily focused on the project.
 - Had a minimal amount of instructor-taught material.
- Project was a web-based network game using WebSockets to create a network game; combining:
 - Programming I: JavaScript programming
 - Network Fundamentals: network communications
- Instructor introduced tutorials and then expected students to complete them on their own.

Summary of Student Comments

(Fall 2016 Studio I and Spring 2017 Studio II)

- Pro
 - Students liked the ability to go deeper into content.
 - Students liked doing things in class.
 - Students liked the integration of topics.
- Con
 - There was too much time spent on project work and not enough activities.
 - Studio time was too unstructured.

Revised Studio I

CMST 103 Computing Principles
CMST 135 Web Fundamentals
CMST 183 Computer Systems Studio I

- Added small projects, usually one every week:
 - Adding structure and a variety of topics.
 - Often taught by different faculty members.
 - Introduced digital media design software (Adobe Photoshop, After Effects, etc.) and the Web Development Lifecycle.
- Still had larger project at the end, combining:
 - HTML, CSS (from Web Fundamentals)
 - A computer game (from Computing Principles)
- Still had students write reflection papers and give oral presentations.

Revised Studio II

CMST 185 Computer Systems Studio II
CMST 247 Programming I
CMST 250 Hardware & Network Fundamentals

- Started the semester reviewing the portfolios.
- Added structure to the tutorial-based material:
 - Instructor led tutorials in-class.
 - Small projects covered the tutorial lessons.
 - Material included GitHub, Bootstrap and WebSockets.
- Ending project extended the Programming I project to a network-based app.

Summary of Student Comments

(Revised Studios I & II)

- Pro
 - Many students liked the variety of topics.
 - Almost all students liked the variety of short, medium and long projects.
 - Students liked the ability to experiment.
 - Students liked the integration of material from other classes.
 - A majority of students felt the portfolios are important and help them learn and understand underlying concepts.

Summary of Student Comments

(Revised Studios I & II)

- Con
 - Half the students would have preferred to “stay focused” on a particular topic.



Faculty Perceptions of Revised Studios

- They are successfully fulfilling our goals of integrating a variety of topics.
- Students are gaining experience applying knowledge learned in one class to a different context.
- The changes made in the revised studios were well-received by the students.

Faculty Perceptions of Revised Studios

- The team teaching was a good model for the students.
- We need to better explain the importance of following the development lifecycle.
- We need to better explain the necessity for the variety of topics and to encourage the students to explore them.

Studio III

DIGME 137 Fundamentals of Visual Literacy
CMST 180 Introduction to Database Systems
CMST 283 Computer Systems Studio III
CMST 335 Programming II

- Only taught once (Fall 2017).
- This is a 1-credit studio.
- Students completed a web project for a real client.
- Timely feedback from the client was a significant problem.
- The project specifications shifted in such a way that the topics from Introduction to Database Systems were not used.

Summary of Student Comments

(Studio III)

- Pro
 - Students felt they learned a lot about teamwork.
 - Students appreciated the need for project planning.
- Con
 - The experience with a real client was too real.
 - Using a real client is more of a “capstone” experience and shouldn’t be used in the studio class.

Capstone Project

CMST 252 System & Software Fundamentals
CMST 315 Introduction to System Admin
CMST 332 Web Development Project
CMST 333 Computer Systems Portfolio Defense

- This class is a 3 credit class.
- The students completed a semester-long team project for a real client.
- The scope of the project was much larger than any they had done before (including database component).
- Project management and team dynamics were heavily emphasized.

Portfolios

- Contains a student's projects and his/her reflections on what was learned in completing them.
- Student reflection enhances learning.
- Students begin building their portfolios in their first semester.
- Portfolios are used for longitudinal program assessment.

Portfolio Defense

CMST 252 System & Software Fundamentals
CMST 315 Introduction to System Admin
CMST 332 Web Development Project
CMST 333 Computer Systems Portfolio Defense

- 0-credit class that students must pass to move on to the junior year.
- Provides the opportunity for faculty to assess the readiness of students to be successful in the upper-class polytechnic curriculum.

Example Portfolio

kylerbeshers.com



```
var name = "Kyler Beshers";  
// Let's make your next project happen!
```

My Work

Contact Me!

Smoky Hill Vineyard



This was a group project where a team of 3 members recreated a website for a local vineyard with an intuitive management system.

[Read more →](#)

System Admin



This project was creating an active directory structure for an imaginary company that had different departments in different locations.

[Read more →](#)

Kakariko Online



This was a solo studio project where we were required to make an online multiplayer game using backend javascript.

[Read more →](#)

Technical Writing

Big
Rubber



This technical communication project involved making a marketing plan for a company and included many areas of project management.

[Read more →](#)



Project Overview

For this project I was on a team that was to make a website for Bulk Solids that would allow users to log in and run tests from data inputs that would calculate the total pressure drop from pneumatic systems.

Skills Learned

During this project we used Angular 4 and Firebase to manage the website. I had used angular before but I hadn't seriously touched firebase which gave me a bit to learn to get both authentication and data management working the way we wanted.

Challenges

The main problem in this project was communication between my group and the client. The client was very intelligent in his field, but was not the greatest at explaining what he wanted or how the formulas worked. After we were nearly finished we realized that there was an update to firebase that caused our project to break if we updated the node modules which caused for an interesting couple hours of debugging.

Questions? Comments?



Features of a Polytechnic Education

- Emphasizes practice-based learning.
- Incorporates projects with industry partners into the curriculum.
- Promotes attainment of important career skills including written/oral communication, problem solving, teamwork, life-long learning and ethical behavior.
- Encourages creativity.
- Allows for successful learning through failure.



Problems with a “Traditional” Model

- Content separated into discrete “content” courses.
 - Course focuses on proficiency in that one topic.
 - Students don’t adequately connect the topics in different classes.
 - Students aren’t adequately exposed to the full spectrum of working in the field.
- Students don’t retain information for subsequent classes.
 - Especially problematic in the final capstone course.

Program Revision Goals

- Address the problems identified above.
- Increase the rigor of the programs.
- Retain desirable features of the current programs:
 - Good alignment with 2-year computing degrees at Kansas community colleges.
 - Around 97% job placement rate.
- Adopt a “polytechnic” approach in keeping with college and department strategic goals.
- Facilitate academic assessment activities.



The Underclass Program (freshman & sophomore years)

Modified Traditional Model

Underclass SLOs and Skills

Freshman		Sophomore	
Graduates will be able to set up a web server, create a web-site on the server that supports modern e-commerce and act as both developer and administrator of the site.			
FALL	SPRING	FALL	SPRING
Client-side web page construction	Networks and Client-side web page programming	Database and Server-side web page programming	System/network administration and capstone project

Modified Traditional Features

- Kept the traditional model of courses organized around a single content area.
- Added a 1-credit studio course to each of the first three semesters.
- Added a requirement that the students build a portfolio.

1-Credit Studio Course

- Primary student learning objective is for the students to apply what they are learning in the content courses to the completion of a project.
- Helps students to “connect the dots” – i.e. see how the topics in the content courses relate.
- Requires students to revisit topics learned in previous semesters.
- Allows instructors to work with students having individual needs.



CMST 103
Computer Principles

SLO

Use an event-driven construct
to interact with a user

CMST 135
Web Fundamentals

SLO

Create and format a web
page using HTML and CSS

ENGL 100
Expository Writing I

SLO

Produce focused papers that
have a consistent purpose
and significance

CMST 103 Computing Principles
CMST 135 Web Fundamentals
CMST 183 Computer Systems Studio I
MATH 100 College Algebra
EDCEP 111 University Experience
ENGL 100 Expository Writing

CMST 183
Freshman Studio I

- Build a web site about the game pong
- Use HTML5, CSS3 and responsive design
- Articles must describe the history and workings of the game
- Include the ability for the user to play pong

Example use of a
studio to
integrate content
within the
modified
traditional model



Upperclass Program (junior & senior years)

Polytechnic Model

Upperclass SLOs and Skills

Junior		Senior	
Graduates will be able to design, develop and administrate a commercial-quality software system that includes database interaction, cyber security and a multi-user interface.			
FALL	SPRING	FALL	SPRING
Data structures and advanced programming	Systems and database administration	Emerging technologies	Project management

Polytechnic Program Features

- Most content courses replaced by 6-credit studio courses.
- Each studio includes content taught to all students.
- Each studio course allows students to pursue additional content of individual interest.
- All content is taught in the context of completing a project.



Upperclass Courses

Junior Fall	Senior Fall
CMST 383 Prgrmng and Data Struct Studio MATH 205 General Calculus and Linear Algebra ENGL 200 Expository Writing II Humanities/social science elective	CMST 460 Software Engineering CMST 483 Emerging Technologies Studio PHILO 390 Business Ethics Unrestricted elective
Junior Spring	Senior Spring
CMST 385 Systems and Database Admin Studio STAT 325 Introduction to Statistics Business elective Unrestricted elective	CMST 485 Comp Sys Senior Capstone Project Humanities/social science/business elective Science elective

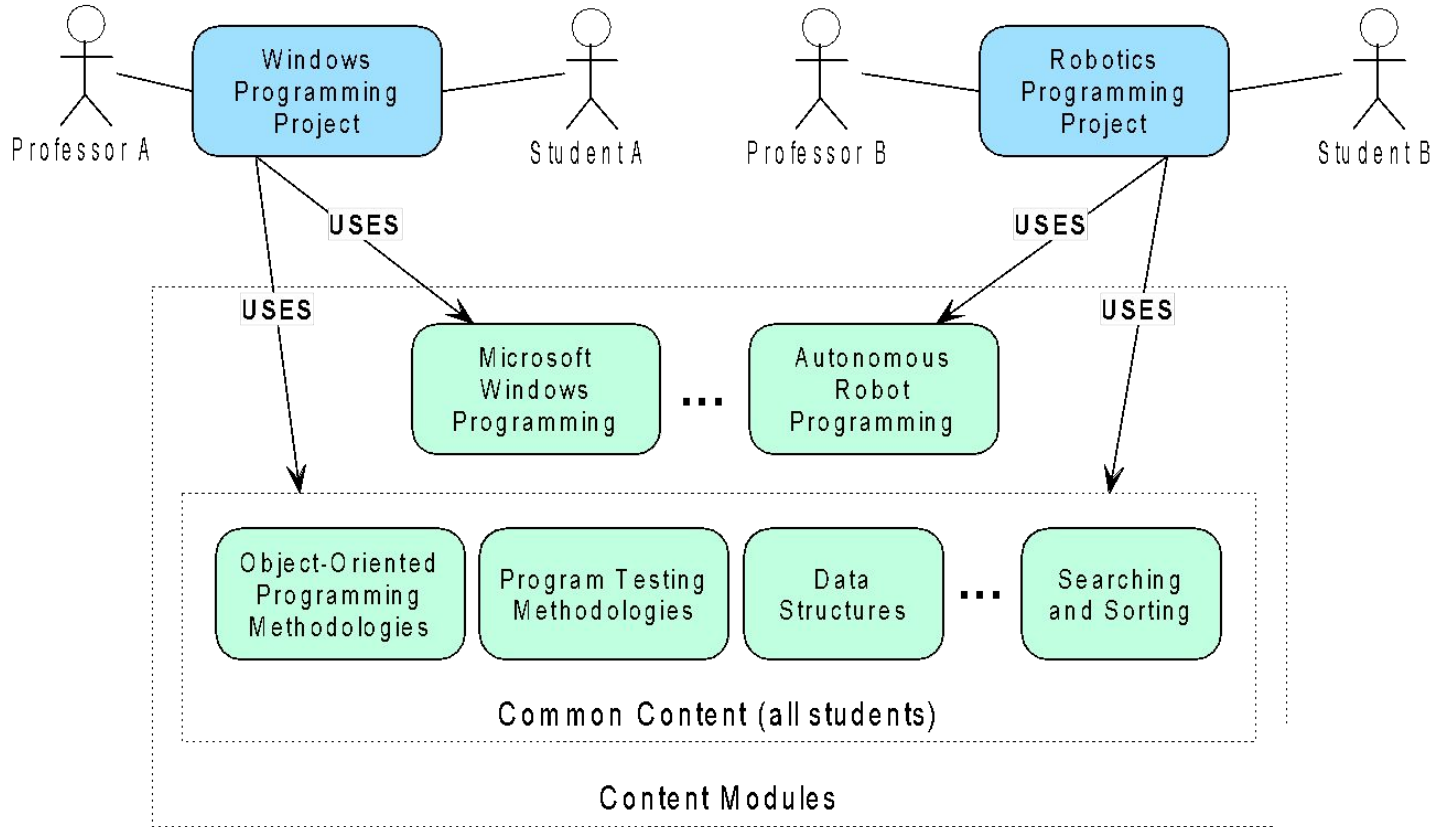
Content course

6-Credit Studio course

6-credit Capstone course

General Ed course

Example use of a studio to integrate content within the polytechnic model



6-Credit Studio Advantages

- Team teaching increases content flexibility and allows instructors to model teamwork.
- Allows students to pursue individual interests.
- Allow team members with different interests to work on different aspects of the same project.
- Allow students to focus on current, relevant and/or emerging technologies.
- Reinforces the concept of life-long learning.

Upperclass Portfolios

- Students can use their portfolios to demonstrate their skills to potential employers.
- Portfolios are used for final academic outcomes program assessment.





Observations of the First Year

Unforeseen Assessment Benefits

- Student weaknesses discovered during assessment of the fall semester projects were able to be addressed during the spring semester studio course.
- The current cohort of students can make up important concepts needed in later courses.
- Program improvement isn't held up – only benefiting future cohorts.

Other Unforeseen Benefits

- Freshman studios allowed the development of a student cohort.
- Exposed students to project management from the first semester.
- Students exposed to teamwork from the second semester.
- Provided a “gentle introduction” to the polytechnic method.

Challenges of Studio Courses

- Satisfying administration's idea of standard faculty work loads in the context of **team taught** 1-credit and 6-credit courses.
- Tracking and delivery of content modules within the 6-credit studio courses.
- Assigning grades in a studio course that is such an amalgam of common and individual work.
- Requiring faculty members to work effectively as a team and demonstrate such to the students.

Mission

- We educate students from Kansas and the Midwest, transforming them into capable, ethical members of the computing profession.
- We provide Kansas and Midwestern industries with employees that are ready to take responsibility and meet the needs of industry now and in the future.

Vision

- The program will be the preferred choice of students in Kansas and the Midwest and it will attract superior students because of its unique focus on entrepreneurial and project-based experiences tailored to the specific needs of students and industry.

Student Learning Outcomes

1 **Technical ability**

Graduates will demonstrate an ability to identify and apply current technical concepts and practices in the core computer systems technologies of database management, web technology, computer programming, digital media, and network/system administration.

2 **Application ability**

Graduates will demonstrate an ability to analyze, design, implement, test, and maintain complex computer systems that meet stakeholder requirements.

3 **Communication skills**

Graduates will demonstrate an ability to communicate effectively with a range of audiences.

4 **Professional and ethical knowledge**

Graduates will demonstrate an ability to recognize professional, ethical, legal, security and social issues and responsibilities to make informed judgments, while considering the impact of computing solutions.

5 **Lifelong learning**

Graduates will demonstrate an ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.

6 **Teamwork and project management skills**

Graduates will demonstrate an ability to function effectively on teams that establish goals.

