

SAMPLE 1

Faculty Development Plan

Department of Computer Science

University mission statement

“The mission of Brigham Young University ... is to assist individuals in their quest for perfection and eternal life.”

The following is a summary of the four university educational goals:

1. Centered on the gospel of Jesus Christ
2. Broad university education
3. Strong education in specific field
4. Research and creative endeavors

source: <https://aims.byu.edu/byu-mission-statement>

Computer Science BS objectives

1. Prepares students qualified and capable of functioning as professional computer scientists in the workplace
2. Prepares students to enter appropriate graduate programs
3. Prepares students for lifelong learning
4. Prepares students that are broadly educated to enrich their life experiences

source:

<https://learningoutcomes.byu.edu/Courses/program-courses/693220/Computer+Science+BS+/1323>

Position description

A typical teaching assignment in the Department is 4 courses or 12 credits per semester during fall and winter semesters and 6 hours during spring or summer term. If your assignment in any semester is twelve credit hours, every effort will be made to see to it that you will be teaching at least two sections of the same course giving you at most three preparations. Teaching and other assignments may be adjusted to meet University, Department, and individual needs in subsequent years. (Dec 2023)

Self-assessment

Strengths: Industry experience, testimony, student centered, teaching, curriculum creation, team contributor, and team management.

Skills: Extensive industry experience with information retrieval, information extraction, distributed systems, databases, HTTP based services, web applications, machine learning based application, and cloud based operations.

Interests: Helping students learn practical skills and getting jobs, leveraging online learning, decreasing professor workload while increasing student value.

Improvement areas: Collaboration with peer faculty. Time management and boundaries. Curriculum development velocity.

Professional goals for 2024

Teaching

1. Master, enhance, and maintain *CS 260 Web Programming* curriculum.
Evaluation: Winter, Spring, and Fall 2024 student surveys reflect positive comments for course content.
2. Master, enhance, and maintain *CS 240 Adv Programming Concepts* curriculum.
Evaluation: Fall of 2024 student surveys reflect positive comments for course content.
3. Teach one or more sections of CS 260 and 240.
Evaluation: Student surveys at or above department averages.
4. Observe other department professor's classes, take notes, and apply findings
Evaluation: Observe one class per semester
5. One on one discussions with all TAs. Provide career advice. Appropriately connect them with my professional network.
Evaluation: Personally know the situation of all my TAs
6. In addition to office hours, create a literal open door policy so that students feel comfortable dropping by.
Evaluation: Office door is open 4+ hours a day.
7. Responsive to students and TAs. This includes answering student's questions, in class, over email, or on Discord.
Evaluation: Answer student questions within 24 hours or less. Know the student's name.
8. Recognize, encourage, and celebrate student and TA work. Include eternal perspectives in all conversations.
Evaluation: Pray for students by name. At least once a day, privately or publicly, as appropriate, let a student know that they are celebrated.

Citizenship

1. Actively participate on the Software Engineering Committee.
Evaluation: Documented feedback on committee proposals. Positive feedback from committee chair.
2. Actively participate on the Undergraduate Committee.
Evaluation: Documented feedback on committee proposals. Positive feedback from committee chair.
3. Actively participate on the Teaching Committee.
Evaluation: Documented feedback on committee proposals. Positive feedback from committee chair.
4. Assist with the Student Research Conference.
Evaluation: participation.

5. Actively participate in the new hiring process.
Evaluation: Attend instruction lectures, colloquium, interviews, and luncheon. Individual conversations with candidates.
6. Provide support for all adjunct faculty members.
Evaluation: Attend at least once class for each adjunct faculty member. Periodically reach out to each adjunct faculty member to provide support and encouragement.

Professional service

1. Technical consulting services for Agilix Labs.
Evaluation: Employment contract, significant contributions, and external review letter from principal officer.
2. Conduct technology reviews with the professional technical leaders.
Evaluation: Formal report of technology with suggestions for improvement of curriculum.

Resources needed

Video recording equipment. Obtained and put to use.

2023 goals review

Teaching

9. Master, enhance, and maintain *CS 260 Web Programming* curriculum.

Evaluation: Winter, Spring, and Fall 2023 student rating surveys reflect positive comments for course content.

Result: Spring 2023 I exceeded my previous ratings and the historical course average.

Spring 2023		Winter 2023		Winter 2022	
Composite Student Rating		Composite Student Rating		Composite Student Rating	
Section	4.7 - 5.0	Section	4.4 - 4.8	Section	4.5 - 4.8
Course	4.8	Course	4.3	Course	4.4
Department 100-299	4.2 - 4.7	Department 100-299	4.3 - 4.5	Department 100-299	4.3 - 4.5
College 100-299	4.3	College 100-299	4.3	College 100-299	4.3
University 100-299	4.6	University 100-299	4.5	University 100-299	4.5
Historical Course Average		Historical Course Average		Historical Course Average	
4.3		4.3		4.3	

10. Master and assist with the enhancement of *CS 240 Adv Programming Concepts* curriculum.

Evaluation: Fall of 2023 student rating surveys reflect positive comments for course content.

Result: Overwhelmingly positive student ratings with supporting comments from students that had taken the course with the old curriculum.

"The course is really well organized. I retook this class and I have to say I really liked the new material. The class was not too demanding like in the past, it has become really well balanced and I hope they can keep it this way."

"The github with everything was the BEST. I was able to learn so much by that, and for the projects, the requirements on github made everything super clear."

11. Teach one or more sections of CS 260 and 240.

Evaluation: Student surveys at or above department averages.

Result: At or above department averages.

		Spiritually Strengthening		Intellectually Enlarging		Character Building		Lifelong Learning	
Semester	Course/Section	Section Range*	Dept Range†	Section Range*	Dept Range†	Section Range*	Dept Range†	Section Range*	Dept Range†
Fall 2023	C S 240 (001)	63-95	71-75	77-100	93-95	59-91	78-81	63-95	80-83
Fall 2023	C S 240 (003)	62-90	71-75	100§	93-95	79-99	78-81	69-95	80-83
Fall 2023	C S 240 (004)	77-97	71-75	100§	93-95	83-99	78-81	83-99	80-83
Spring 2023	C S 260 (001)	53-83	75-88	88-100	90-97	76-98	78-90	72-96	75-88
Winter 2023	C S 260 (001)	49-67	68-72	85-95	87-90	71-85	76-79	70-84	74-78
Winter 2023	C S 260 (002)	77-97	68-72	90-100	87-90	74-96	76-79	80-98	74-78

12. Enhance online experience for *CS 260 Web Programming* curriculum.

Evaluation: Winter 2024 student surveys for those in the online section increase year over year from 2023.

Result: Online is a hard nut to crack. It must be approached as a completely different methodology of delivery and requires substantial investment that I just wasn't able to devote this semester. I also don't yet have the data to compare online sections to online sections. However, currently the online section ratings that I have show that they are above the department average for Intellectually Enlarging.

13. Observe other department professor's classes, take notes, and apply findings

Evaluation: Observe one class per semester

Result: I attended and critiqued six different CS classes this semester. 324, 404, 428, 330, 465, 405. Very interesting to see the effectiveness of different teaching styles.

14. One on one discussions with all TAs. Provide career advice. Appropriately connect them with my professional network.

Evaluation: Personally know the situation of all my TAs

Result: I met with and mentored all 24 of my TAs this year.

15. In addition to office hours, create a literal open door policy so that students feel comfortable dropping by.

Evaluation: Office door is open 4+ hours a day.

Result: Very effective. Students greatly appreciated the open door policy. Here is a common representative response from student ratings:

"He was very open about having office hours and was incredibly helpful when I attended office hours. I sought out advice from him and he helped greatly in matters regarding career and industry."

16. Responsive to students and TAs. This includes answering student's questions, in class, over email, or on Discord.

Evaluation: Answer student questions within 24 hours or less. Know the student's name.

Result:

Here is a common representative response from student ratings:

"Always available to give help, and wanted to set us up for success."

17. Recognize, encourage, and celebrate student and TA work. Include eternal perspectives in all conversations.

Evaluation: Pray for students by name. At least once a day, privately or publicly, as appropriate, let a student know that they are celebrated.

Result: I realized how incredibly hard it is for me to remember 250 students by name. I did focus on celebrating students, with good results.

Citizenship

7. Actively participate on the Software Engineering Committee.

Evaluation: Documented feedback on committee proposals. Positive feedback from committee chair.

Result: Completed work on emphasis vision, direction for 329.

8. Actively participate on the Undergraduate Committee.

Evaluation: Documented feedback on committee proposals. Positive feedback from committee chair.

Result: Completed work for seminar classes. Approval of expenditures.

9. Actively participate on the Teaching Committee.

Evaluation: Documented feedback on committee proposals. Positive feedback from committee chair.

Result: Shepherded teaching reviews for advancement.

10. Assist with the Student Research Conference.

Evaluation: participation.

Result: Very interesting to see the dedication of the students.

11. Assist with the ACM annual hackathon.

Evaluation: participation.

Result: Lots of fun to see their creativity.

12. Actively participate in the new hiring process.

Evaluation: Attend instruction lectures, colloquium, interviews, and luncheon. Individual conversations with candidates.

Result: Actively participated in the hiring and interviewing of candidates.

13. Provide liaison support for all adjunct faculty members.

Evaluation: Attend at least once class for each adjunct faculty member. Periodically reach out to each adjunct faculty member to provide support and encouragement.

Result: This was beneficial to the department. The feeling among the adjuncts that the department cared and appreciated their efforts significantly increased. I attended and critiqued six different CS classes this semester. 324, 404, 428, 330, 465, 405.

Professional service

3. Technical consulting services for Agilix Labs.

Evaluation: Employment contract, significant contributions, and external review letter from principal officer.

Result: This work continues with positive associations for both parties. No letter was obtained, but multiple positive verbal confirmations were given. Employment continues through 2024.

4. Conduct technology reviews with the professional technical leaders.

Evaluation: Formal report of technology with suggestions for improvement of curriculum.

Result: Review completed with Ancestry.com. Review completed with UI Charitable Advisors.

History of activities and accomplishments

1. Observed Mark Clement's CS 260 class (Fall 2022)
2. Taught one section of CS 260 (94 students) (Winter 2023)
3. *CS 260 Web Programming* curriculum rewrite. 30,000 lines of instruction created. (Fall 2023)
4. Taught two sections of CS 260 (250 students) (Winter 2023)
5. Review of *CS 329 Test, Analysis, and Verification* (2023)
6. Review of *CS 240 Adv Programming Concepts* (2023)
7. Review of *CS 340 Software Design* (2023)
8. Review of *CS 202, 203, 204 Software Engineering Labs* (2023)
9. Agilix Labs consulting agreement (2023)
10. Meetings with Clint Berry CEO Kolla (2023)
11. Meetings with Cary Hoddy VP Engineering Ancestry.com (2023)
12. Architectural review conducted with Russ Barnett VP Engineering at Ancestry.com. Report reviewed with SE committee (2023)
13. Judge at Student Research Conference (2023)
14. Judge at ACM hackathon (2023)
15. Active participation in hiring process for Scott Ruoti, Seth Poulsen, Michael Reynolds, and Marissa Twitchell (2023)
16. Attended NFS summer seminar (2023)
17. Observed Casey Deccio's CS 236 class (February 2023)
18. Usher convocation (Winter 2023)
19. Eight TAs for 260 (Winter 2023). Two females. Got Austin a job interview at Ancestry.com
20. Four TAs for 260 (Spring 2023). One female. One freshman. Connected Elliot with sony.com engineering staff.
21. New prep for 240 (Summer 2023)
22. Researched and implemented new content for CS 260 (Vite rewrite) (Spring 2023).
23. Served on the Undergraduate and Software Engineering committees (Winter and Fall 2023).
24. Served on the Teaching committee (Fall 2023).
25. Completed Center for Teaching and Learning training with Ken Plummer (Spring 2023).
26. *CS 240 Adv Software Construction* curriculum rewrite with Ken Rodham and Jerod Wilkerson (Sprint/Summer 2023). Move to GitHub for content. Creation of all textual course content. *20,000 lines of instruction created.*
27. 12 TAs for 240 (Fall 2023)
28. Taught three sections of CS 240 (125 students, 12 Credit hours) (Fall 2023)
29. Taught/Mentored CS 498R Benjamin Jacobs (Fall 2023)
30. Communicated with all adjunct faculty members to express encouragement and gratitude (Fall 2023).
31. Attended classes for five adjunct faculty members and provided feedback (Fall 2023).
32. Participated in, and ushered for, commencement activities (Winter 2023).
33. Participated in, and ushered for, CS department open house (Winter 2023).

34. Successfully completed the first phase of the CTL faculty development seminar (Fall 2023).
35. *CS 240 Adv Software Construction* curriculum adjustments *with Ken Rodham and Jerod Wilkerson*. Streamlined passoff process. Reduced unnecessary student workload. (Fall/Winter 2023)
36. Curriculum design discussions for DevOps class (Fall 2023)
37. 9 TAs for 260, 13 TAs for 240 (Winter 2024)
38. Taught three sections of CS 260 (264 students). (Winter 2024)
39. Taught one section of CS 240 (58 students). (Winter 2024)
40. Meetings with Andrew Gardner CTO of Devote (Winter 2024)
41. Recruiting Russ Young as potential faculty member (Winter 2024)
42. Served on the Teaching, Undergraduate and Software Engineering committees (Winter 2024).
43. *CS 260 Web Development* curriculum optimization *with Dan Ventura (Winter 2024)*. *Focus on Git history, reduced student workload without reducing mastery results.*
44. Communicated with all adjunct faculty members to express encouragement and gratitude (Fall 2024).
45. Architectural review conducted with Jacob Lundskog CTO at UI Charitable Advisors. Report provided to the SE committee (Winter 2024)

Course Development Project - CS 260

Introduction

Computer Science 260 seeks to provide mastery of the skills necessary to build professional web applications. The course is designed to effectively work for both in person and online students. Historically it was an elective for the Computer Science core, but recently became required. This has caused a shift in the demographics of the course from Seniors to Freshman.

I completely rewrote this course for my first semester of teaching (Winter 2023). Minor refinements were introduced over the next year, but it is essentially stable at this point.

Section 1 - Course Design

Design Process Description

The course design uses the Backward Design methodology (Eliason et al., 2018). This approach consists of five key design elements:

1. Course Purpose
2. Learning Outcomes
3. Culminating Experience or Final Assessments
4. Progress Check(s)
5. Instructional/Practice Plan

Project based mastery is the primary learning and demonstration model for the course. Each of the course outcomes are exemplified by a student defined project that incrementally increases in complexity throughout the course.

Course Design Elements

Course Description

Demonstrate practices, skills, and technologies necessary to build and deploy a full stack web application.

Learning Outcomes

The learning outcomes operationalize the aspirational vision found in the course purpose.

1. **Web Pages:** Utilize HTML, CSS, and JavaScript to create interactive web pages.
2. **Web Frameworks:** Utilize a web framework to modularize and package a web application.
3. **Web Services:** Utilize DNS, HTTPS, WebSocket, service endpoints, authentication, and data persistence to create a backend service.
4. **Infrastructure:** Deploy applications and manage code.
5. **Security and Design:** Utilize production web application design and security practices.

Note that these outcomes do not match the university course catalog. Currently the catalog reflects the pre-2023 curriculum. I am working to push the new outcomes through the undergraduate committee and have them available in 2024.

Culminating Experience(s)

In addition to course instruction and topical homework assignments that cover all of the learning outcomes, the following culminating experiences are generated by the students.

Assessment Type	Description	Learning Outcomes
Project - Specification	Application specification	4, 5
Project - HTML	Use HTML to create application structure	1, 4
Project - CSS	Use CSS for application styling and device responsiveness	1, 4
Project - JavaScript	Use JavaScript to enable application interactivity	1, 4
Project - Server	Deploy a publicly available server	3
Project - Service	Deploy application on the server with public endpoints over HTTPS	3, 4, 5
Project - Login	Enable database support and authentication	3
Project - WebSocket	Enable WebSocket for peer to peer communication	3
Project - React	Port application to use the React web framework	2, 4, 5
Exam - Midterm	Demonstrate understanding of HTML, CSS, and JavaScript	1, 3

Exam - Final	Demonstrate understanding of HTTP, WebSocket, DNS, React, and security	2, 4, 5
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Progress Check(s)

Progress checks occur based on consistent homework assignments, project deliverables, and two exams.

Instruction/Practice Plan

In order to preserve clarity, this plan does not include the 25 topical homework assignments that are consistently assigned throughout the course.

Week	Outcomes	Experience
1		
2	5	Application specification
3	3, 4	Server deployment, GitHub repository creation
4	3	DNS/TLS deployment
5	1, 4	HTML application
6		
7	1, 4	CSS application
8		
9	1, 4	JavaScript application, Midterm
10	3	Service application
11	3	Login application
12	3	WebSocket application
13		
14	2	React application
15	2, 4, 5	Final Exam

Section 2 - Results

Student Learning

Course Level Results

Winter 2022 was taught with a curriculum that centered on in class lectures and assorted non-sequential projects.

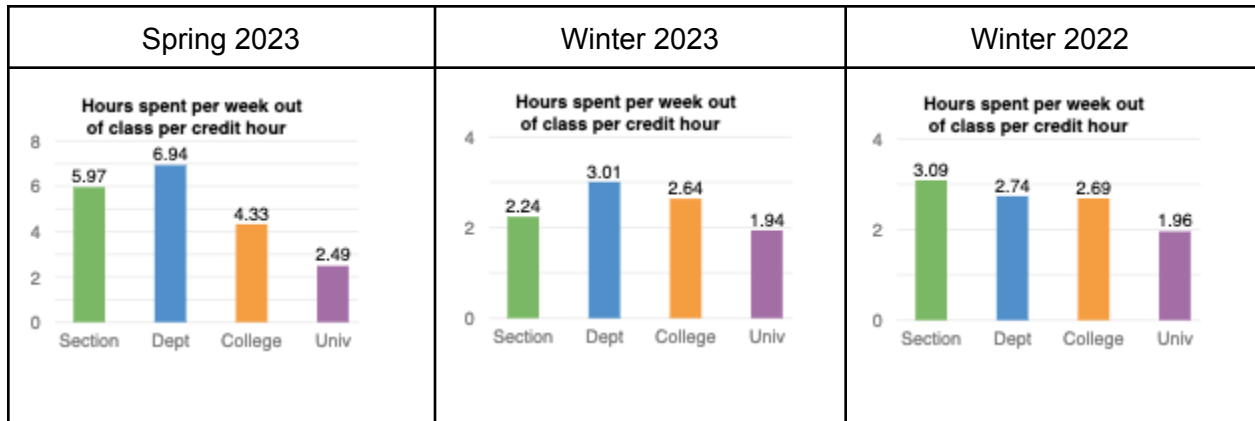
Winter 2023 and Spring 2023 was taught with the current course curriculum that centers on multiple modes of delivery (online, video, and classroom), along with student designed mastery projects that evolve with the student's learning.

Historical grade distribution

Spring 2023					Winter 2023					Winter 2022				
Grade distribution (%)*					Grade distribution (%)*					Grade distribution (%)*				
A	60.4	27.6	33.6	54.9	A	66.7	30.3	41.4	56.7	A	60.2	60.4	44.0	57.6
B	15.1	6.2	19.8	15.1	B	7.7	7.8	20.9	16.2	B	12.6	13.4	22.3	16.4
C	0.0	3.1	8.4	4.7	C	6.4	3.3	10.6	5.6	C	6.8	5.9	10.4	5.6
D	1.9	1.3	1.7	1.3	D	0.0	0.8	3.2	1.6	D	3.9	2.2	3.3	1.9
E	13.2	2.9	3.7	2.0	E	11.5	3.8	2.6	1.8	E	6.8	5.4	3.3	2.3
W	9.4	5.2	4.0	2.5	W	7.7	4.1	5.6	4.0	W	8.7	10.4	6.7	4.9
	Section	Dept	College	Univ		Section	Dept	College	Univ		Section	Dept	College	Univ

The curriculum changes are the only difference between Winter semesters, and therefore is attributed to the increase in GPA. The compressed term schedule is the only difference between Spring 2023 and Winter 2023, and therefore is attributed to the decrease in GPA. More data is required for these assertions to be validated.

Student reported effort

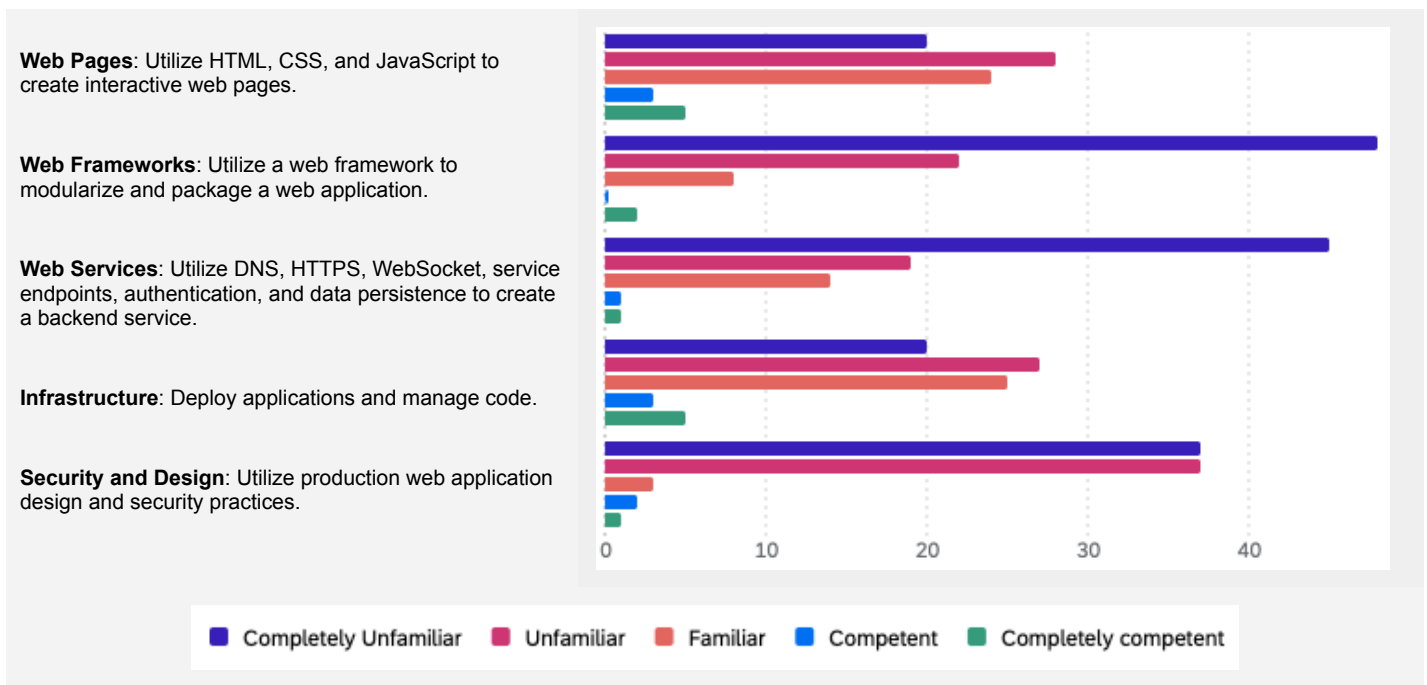


Outcomes

Formative Survey

At the beginning of the semester I conduct a formative survey to see where the students are with regard to the course outcomes. This serves multiple purposes.

1. It allows us to determine if a required course has become redundant based upon the mastery of the students at the beginning of the class.
2. It provides us with a measure of improvement over the course of the class.
3. It helps the students recognize the important concepts that the course is attempting to convey.



From this survey we determined that the course content is appropriate for the targeted audience.

Summative Survey

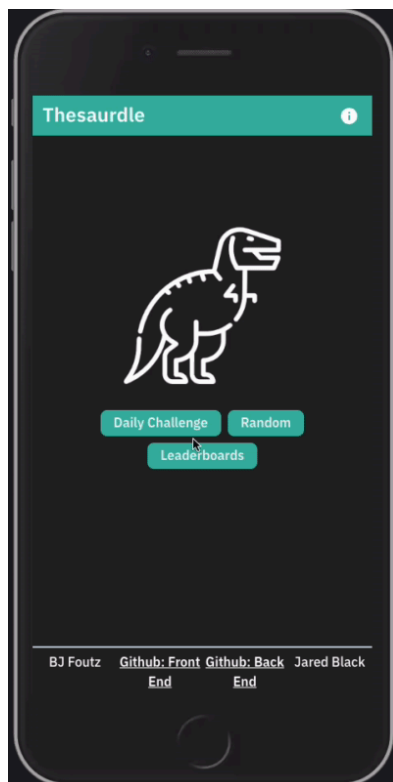
<results pending>

Example Mastery Projects

The incremental project deliverables result in a completely functional professional web application by the end of the course. On the last day of class a competitive demo day is held where the students attempt to win the coveted Ghirardelli prize. The following are two examples of student created work.

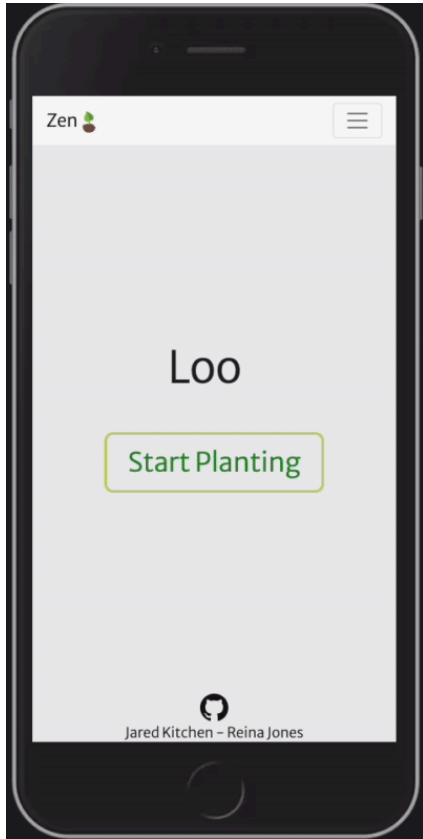
Thesaurdle

Given a starting word, a user attempts to navigate to a goal word by traversing synonyms. The application clearly demonstrates their mastery of responsive web design, integrating third party APIs, and performant client server architecture.



Zen Garden

Create potted plants and put them in your very own relaxing Zen Garden. This student application demonstrates the power of simple clean design to produce an effective appealing result.



Learning Environment

Historical student ratings reports

Spring 2023		Winter 2023		Winter 2022	
Composite Student Rating		Composite Student Rating		Composite Student Rating	
Section	4.7 - 5.0	Section	4.4 - 4.8	Section	4.5 - 4.8
Course	4.8	Course	4.3	Course	4.4
Department 100-299	4.2 - 4.7	Department 100-299	4.3 - 4.5	Department 100-299	4.3 - 4.5
College 100-299	4.3	College 100-299	4.3	College 100-299	4.3
University 100-299	4.6	University 100-299	4.5	University 100-299	4.5
Historical Course Average		Historical Course Average		Historical Course Average	
4.3		4.3		4.3	

Helped Students Achieve the Aims

Semester	Course/Section	Spiritually Strengthening		Intellectually Enlarging		Character Building		Lifelong Learning	
		Section Range*	Dept Range†	Section Range*	Dept Range†	Section Range*	Dept Range†	Section Range*	Dept Range†
Spring 2023	C S 260 (001)	53-83	75-88	88-100	90-97	76-98	78-90	72-96	75-88
Winter 2023	C S 260 (001)	49-67	68-72	85-95	87-90	71-85	76-79	70-84	74-78
Winter 2023	C S 260 (002)	77-97	68-72	90-100	87-90	74-96	76-79	80-98	74-78
Winter 2022	C S 260 (002)	72-92	64-68	93-100	91-93	81-97	76-79	81-97	76-79

Note that the Winter 2023 section 001 is an online section where interactions for spiritually strengthening and character building are limited.

CTL Student Rating Summary Report

<results pending>

Section 3 - Improvement Plan

Key Focus Elements

- *Deliverable schedule imbalance* - The deliverables at the beginning of the semester are less demanding than the deliverables at the end of the semester. This causes frustration at the end of semester and decreases the students ability to do quality work.

- *Student delay of project work* - The students tend to delay the project deliverables until just before the deadline. This causes them to reduce the quality of their work as they seek for shortcuts.
- *Bipolar results* - The final grade consists of mostly *As* (66.7%) and *Es* (11.5%). That leaves only 14.1% in the *B-D* range and 7.7% withdrawn. This would suggest that the class is either too easy or too hard. After surveying students who earned an *E* the general takeaway was that it was not the content, but personal situations that caused the failure.
- *Too much content* - A common comment for the course is that it is like drinking from a firehose.

Future Action Plan

- *Remove database deliverable* - Combine the database and login deliverable. This doesn't remove any content, however it will reduce the overhead associated with segmenting, deploying, reviewing, and grading.
- *GitHub commitment requirement* - Require that all deliverables document the student's progress. By requiring the Git history to contain frequent consistent commits effort it is hoped that the student will space out their work. This will also better document their efforts and protect them when they go down ineffective development paths.
- *Early reach out and often* - At key points in the semester (EC2, HTML, JavaScript) reach out to the students that have not submitted a deliverable.
- *Consider removing WebSocket* - While this is a key technology, it could be easily removed.

References

Eliason, S., X, K., & Swan R. (2018). The Art and Discipline of Educational Consulting: Overview, Key Elements of Training, and prospects for the Future of the Field. Forum for the Center for Teaching and Learning, Teikyo University, Tokyo, Japan, Volume 5, 53-69.

Citizenship Development Goals

1. Building a culture of friendly openness with the faculty. This includes:

a. Keeping my door open for impromptu drop by visits.

Result: This has gone really well. Informal chats with other faculty members as they wander by has built relationships and strengthened community in the department.

b. Inviting others to go to lunch.

Result: Regularly going to lunch with two or more faculty members has allowed us to connect on a personal level. This makes it easier to discuss difficult department problems because we respect and know each other.

c. Attending department and college sponsored activities.

Result: Mixed bag. The department and college have done a great job providing these opportunities. Offsite retreat, sailing, kickball, pool party, 50th celebration, faculty lunches. However, with busy schedules, it is difficult to really embrace the opportunity. I always feel hurried. I attended almost everything, but always felt rushed.

2. Actively serving on department committees. I am currently participating on the Undergraduate, Software Engineering, and Teaching committees. I plan to actively engage in all committee discussions and execute productive assignments.

Result: Mixed bag. I'm doing my best here, but the discussions often feel unfocused. I need to learn how to push progress without being offensive.

3. Assist and constructively critique adjunct faculty. I plan on attending at least one lecture of each of the department's adjunct faculty during the Fall 2023 semester. The focus of these visits and communications is to help them feel more connected with the department and to improve their experience and the experience of their students.

Result: This worked great. The adjunct faculty felt appreciated and had a resource to use when they had questions.

Teaching Grant Proposal

I have already explored the power of little rewards in class. I often will throw out a small treat for someone who makes an interesting contribution to the class. This creates a significant increase in engagement with the discussion.

The research shows that as long as the “treat” is not the focus, but the acknowledgement of the contribution, it doesn’t replace the intrinsic value of learning for the benefit of learning. I have found this to be true in practice.

I would like to dial this up a little bit and occasionally throw out tee-shirts for outstanding performance.

Something like this:



I can use BYU’s printing service and get 20 shirts for \$200. If it works well I will do another round.

I will measure success by only using the shirts in one section. I can then gauge the response from the students when the tee-shirts come out and general observance of how engagement increases overall.

- Kohn, A. (1993). [Punished by rewards](#): The problem of positive reinforcement. Houghton Mifflin Harcourt.
- Cameron, J., & Pierce, W. D. (1994). [Reinforcement, reward, and intrinsic motivation: A meta-analysis](#). Review of Educational Research, 64(3), 359-401.