RADGRAD: CREATING SOFTWARE TO ACADEMICALLY, PROFESSIONALLY, AND SOCIALLY OPTIMIZE THE UNDERGRADUATE EXPERIENCE

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Coming soon!

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ABSTRACT

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CHAPTER 1
INTRODUCTION

There are a lot of things that can make a department like no other–exceptional people, exceptional facilities, exceptional events, or exceptional work. I may be biased, but I believe the ICS department at UH Manoa is a department like no other–and is exceptional in all these ways. The people are exceptional–I came into this major not knowing what to expect, but the people I have met along the way have exceeded all of my expectations. I have met some of the most brilliant, the most passionate, the most interesting and the most genuine people in this department. The facilities are exceptional–the computer labs are well maintained, and the new ICSpace is a great place for members of the department to socialize and create a sense of community. The events are exceptional–within this major, there are so many opportunities to participate in events. There are workshops, hackathons, competitions, and open source projects just waiting for participants. Finally, the work itself is exceptional–again, I may be biased, but I have grown to become very passionate about computer science, and I have met many others in the department who feel the same way. Computer science is constantly changing and it is a challenge to keep up with it, but it definitely keeps things interesting.

But nothing is perfect. Data gathered from ICS students from 2008 to 2016 on the Hawaii technology community site, TechHui, suggests that the following ten categories have constantly displeased students over the past 8 years:

1. The ICS department needs to offer classes more frequently.
2. The ICS department needs to offer a wider variety of classes.
3. The ICS department needs a better sense of community.
4. Some of the professors in the ICS department need improvement teaching.
5. The ICS department should offer more focused areas of study.
6. ICS classes are too time consuming and take up more time than anticipated.
7. The ICS department should offer more classes that meet focus requirements.
8. ICS books are too expensive.
9. Classes should be offered more frequently.
10. ICS courses should involve more group work and there should be more interaction encouraged among students in general.

There were also some other complaints among students on TechHui that werent as common but stuck out to me nonetheless. There were at least eight students who mentioned that they felt intimidated when they started out in ICS, due to the impressions they got from their classmates and the major overall. This discouraged them in several ways and had an overall negative impact on their ICS experience. As ideal as it would be, it is hard to meet the needs of all current, past and present students in a department. However, after taking student feedback into consideration, several of these problems could potentially be alleviated by creating an online platform (what could computer science students want more?) which provides students with the help they need–academically, professionally, and socially. By combining three aspects (degree planner, social network, and gamification), a new concept called RadGrad could change the department completely.

CHAPTER 2
RELATED WORK

RadGrad can be reduced into three major parts: degree planner, social network, and gamification. All three of these parts are combined to create a robust, interactive, and effective system to enhance the academic journeys of current and future ICS students.

2.1 Degree Planners

2.1.1 STAR

STAR is the degree planning system currently used by the University of Hawaii. As of September 2016, the student interface provides five main capabilities: Academic Essentials, Graduation Pathway, What If Journey, Transcripts, and Scholarships.

2.1.1.1 Academic Essentials

This interface provides information about the student's academic progress, and compares it to the student's academic requirements to show how close the student currently is to graduation. This information includes credit totals, grades, and required courses. This interface also includes a section for "Advisor Notes", which is filled out during advising sessions. There is another section for "Events and Actions" which lists important student academic events such as college applications, admittance, and graduation, and student academic actions such as Deans List award. A third section is called "Educational Goals", which provides the student's "immediate goals" and "highest ed goals" on a semester-by-semester basis. This information is provided by the student through occasional assessments upon log-in to STAR. The top of the page also has a section for students with financial aid.

2.1.1.2 Graduation Pathway

This interface is provided for certain programs or exploratory or pre-major students. It shows the course information for the courses that the student has taken previously and is currently enrolled in, and shows which requirements each course fulfills. It also shows future semesters and suggests future types of classes that the student should enroll in, in order to fulfill their major requirements. This interface does not suggest specific classes, but only lists the requirement that the class will need to fulfill.

2.1.1.3 What If Journey

This interface is provided for undergraduates at UH Manoa. It allows students to choose a different major than the one they are currently in. The page then reloads to show the STAR homepage, altered to show the requirements of the chosen major. This shows students where they would be in the program if they were to switch majors.

2.1.1.4 Transcripts

This interface allows students to access their campus transcripts by semester and by department. It also allows transfer students to access their transfer transcripts by semester and by institution.

2.1.1.5 Scholarships

This interface allows students to find scholarships by either using a keyword search or by selecting the "My Best Fit Scholarship" tab, which presumably gathers student academic data and compares it with scholarship data to find matches.

2.1.2 MyEdu

The MyEdu website states that it aims to help students succeed in college, tell their stories, and get jobs and internships. It is free to sign up, and the website reports that "twice as many MyEdu users graduate on time, compared to the national average." There are seven main capabilities of this website: GPA Calculator, Schedule Planner, Profiles, Internships/Jobs, Professor Recommendations, Course Grades, and Degree Timeline.

2.1.2.1 GPA Calculator

Students can input grades and course information to calculate their course GPA, semester GPA, and overall GPA. The calculator allows students to define grading styles and scales for each course, and set grade totals as well, which can assist students in figuring out minimum grades needed for desired final grades. The GPA calculator also comes with an Assignment Tracker, which allows students to input their assignments, due dates, and outcomes. This feature can also email automatic reminders to students regarding due dates. Finally, there is also a questions & answers section which allows students to interact with other students in the same major.

2.1.2.2 Schedule Planner

Students can create class schedules based on professor recommendations, grade distribution, and the time of the day. Schedules can be easily shared among classmates and study groups. There are also class schedule generator features, which includes an auto scheduler that automatically plans a

student's schedule given professor recommendations, overall GPA, preferred days of the week, and preferred times of day. When testing out this feature, not all ICS classes were listed, and I was only allowed to choose the ones listed. After submitted one class, I got an nondescript error and was not allowed to proceed.

2.1.2.3 Profiles

Students can create a personalized profile which showcases accomplishments, projects, volunteerships, internships, and work experiences. These profiles are public to other members, encouraging students to make their profile stand out from the crowd. Student information is displayed in a Windows 8-esque type of block format.

2.1.2.4 Internships/Jobs

MyEdu includes a job search engine boasting "over 2,000,000 entry level job listings." Users can search through the database using location, keywords, and job type. Users can save jobs to review later and save jobs they plan to apply for to keep their job search organized.

2.1.2.5 Professor Recommendations

Professor recommendations are integrated within other MyEdu applications. These recommendations include study tips and exam types, lecture and attendance policy, teaching style and effectiveness, and official school evaluations. MyEdu prides their recommendation system on being superior to other popular recommendation systems (i.e. RateMyProfessor) due to including more relevant rating categories, as opposed to purportedly less relevant categories such as "hotness".

2.1.2.6 Course Grades

MyEdu works with universities to incorporate official course grade records. However, instead of just showing the students their personal records, MyEdu takes it up a notch by also displaying all encompassing statistics, such as class graduate distribution, average course GPAs, and average drop rates. These types of data can assist students in making more educated decisions in the future when they sign up for courses. Similar to my experience with the Schedule Planner, when testing out this feature, not all ICS classes were listed, and I was only allowed to choose the ones listed. After submitted one class, I got a server error and was not allowed to proceed.

2.1.2.7 Degree Timeline

This feature shows an overall view of the student's progress in graphical form. Similar to STAR's academic essentials, it displays course totals, credit totals, and graduation progress percentages. MyEdu stresses that this feature allows students to avoid the "senior surprise."

2.1.3 Starfish by Hobsons

The slogan for Hobsons is "Education Advances: Imagine a world where all students find their best fit." Hobsons offers a wide range of educational solutions, ranging from students K-12 to college students. Starfish by Hobsons is one of their platforms which focuses on success, support, and retention initiatives, and engaging students more effectively with the campus community. There are three main parts of the Starfish Enterprise Success System: Early Alert, Connect, and Degree Planner.

2.1.3.1 Early Alert

Early Alert is a early warning and student tracking model which mines student performance data from existing technologies at the particular institution to detect at-risk students. These students are detected early enough, such as at the first sign of a problem, so that there is enough time to make a difference. There is a type of reward system called Kudo (a positive feedback note), which is used to encourage students and reward them for improvement or good work.

2.1.3.2 Connect

Connect is an online appointment scheduling and case management system. This system promotes communication between students and their advisers, instructors, and tutors by means of in person meetings, phone calls, or virtual meetings. Connect includes a kiosk to allow easily scheduled walk-in meetings. These kiosks can help staff to manage a student queue and also allows students to check wait times remotely, which can save a lot of time and frustration. Connect also includes a road map for each student, which documents the steps a student must take to achieve his or her goals. This map is created by an adviser and is visible to all members of the student's support network.

2.1.3.3 Degree Planner

Degree Planner provides academic templates which advisers can use to easily edit to adjust to a particular student's needs. It also focuses on students' constantly changing goals and ability to adjust the student's plan to accommodate these goals. When a student deviates from their given plan, the student's adviser is notified so that they can plan a meeting with the student to check on their status and re-identify their goals.

2.1.4 College Scheduler

The College Scheduler company has two products: Schedule Planner and Pathway Planner. The Schedule Planner focuses on optimizing the way students can plan their schedules, and the Pathway Planner focuses on optimizing the way students progress towards graduation.

2.1.4.1 Schedule Planner

Schedule Planner allows students to easily schedule (or automatically generate) their classes around outside obligations. It also helps students to maximize their credit hours and graduate on time. Schedule Planner also analyzes student preference data to predict the optimal number of course sections to offer and helps to evenly distribute class fill rates. It enables advisers to create course schedules for groups of students at a time. One of their main goals is to allow students to focus on which courses to take rather than worrying about when they are being offered.

2.1.4.2 Pathway Planner

The Pathway Planner allows students to plan their schedules in a multi-year format to encourage seeing the bigger picture and to plan ahead. It provides visuals to show students how their predicted course loads will affect their graduation date. Administrators can also see the courses that students plan on taking before registration. This allows for the addition and elimination of courses to best fit student needs.

2.1.5 Coursicle

The slogan of Coursicle is "Course registration sucks but Coursicle makes it better." The features of Coursicle are: students can receive text or email notifications when a seat opens up in class, students can schedule their courses using an attractive schedule planner, students can search through courses more easily with a variety of filters, students can create schedules with all prospective classes and then narrow them down to one workable schedule, students can easily compare textbook prices online through Coursicle, and students can view what classes their classmates are signed up for via Facebook.

2.1.6 Individual Student Software

There are other types of download-able software currently available for students to use individually. These systems are for individual use, and are not tailored for institutional implementation. To use these systems, students input information about their education, such as classes, credits, and requirements. This data is then used to create organized visualizations to help students to better see their goals and pathway. A popular generic system is the Microsoft Office College Credit Planner Template. Many individual colleges and universities have their own custom download-able course planning spreadsheets as well.

2.2 Social Network

2.2.1 LinkedIn

LinkedIn is widely known for being the world's largest professional network. It sets itself apart from other popular social media sites by being focused solely on building professional identities and forging professional relationships. There are six major components to LinkedIn: Home, Profile, My Network, Learning, Jobs, and Interests.

2.2.1.1 Home

A user's homepage is arranged in a feed type format, with quick information about your profile, profile views, and incoming messages. The feed section contains recent updates from connections and companies related to your interests. There are also sections that encourage engagement–for instance, quick ways to "share an update", "upload a photo", or "write and article" and suggestions to "reconnect with your colleagues" and to add someone you may know.

2.2.1.2 Profile

A user's profile page is available for other LinkedIn users to see. Users can decide what information they would like to share about themselves, but it is all limited to professional related categories such as education, work experience, volunteer work, and skills and endorsements.

2.2.1.3 My Network

A user's network includes current connections, recommended connections, connections added through outside contact information, and contacts added through an alumni network.

2.2.1.4 Learning

LinkedIn offers online courses on professional development topics such as leadership, storytelling, creating alliances with employees, and winning back a lost customer. There are also field-related courses, such as online code courses. These courses are often in the form of videos, and can be accessed by premium LinkedIn members.

2.2.1.5 Jobs

Jobs on LinkedIn automatically suggest jobs for users based off the information on their profile. Jobs can also be searched for using keywords such as job title, company, and location. Users can set preferences to refine their automatic suggestions.

2.2.1.6 Interests

In the Interests section, users can follow companies and groups based off their personal interests. There are also links to SlideShare and ProFinder, which offer services for creating professional presentations and hiring local freelancers, respectively.

2.2.2 TechHui

The TechHui page describes itself as being "Hawaii's Technology Community." The TechHui site has ten main sections: Profile, Members, Events, Forum, Groups, Photos, Videos, Blogs, Directory, and Coders.

2.2.2.1 Profile

Each user has a profile page which contains information such as a name, profile picture, occupation, areas of interest, software language proficiency and interests, and recent activity.

2.2.2.2 Members

The members page lists all members, including a section at the top for featured members. Each member is listed by their name, with their profile picture and location. Through this page, users can communicate with other users by commenting on other user's profile pages.

2.2.2.3 Events

The events page lists upcoming events and featured events. The event snippets include an imagine, a name, a time and date, a location, the name of the organizer, the type of event, and a brief description of the event. Users can click on these snippets to go to an event page, which includes more detailed information and allows users to respond to events with "will attend", "might attend" and "will not attend."

2.2.2.4 Forum

The forum page includes a list of technology related categories, which can be clicked on to access a list of related forums. It also includes some featured forums at the top. Some of these categories include "General Software Development", "Java Software Development", "Funding Technology Startups", "Software Design Patterns", "Tech Jobs", "Tech Resumes", "Web Design", "Tech Humor" and more. Users can both start discussion forums and respond to other users' forums.

2.2.2.5 Groups

There are many different groups listed on this page, including some featured groups. Each group snippet has an image, a name, the amount of members in the group, the date of the group's latest activity, and a brief description of the group. Users can click on these snippets to learn more about the group and to join the group as well. Once in the group, users can participate in commenting on the group wall and creating and responding to group discussion forums.

2.2.2.6 Photos

On the Photos page, users can easily view all public photos uploaded by users (including profile pictures). Featured photos are included as well. Users can view these photos and comment on them as well.

2.2.2.7 Videos

On the Videos page, users can easily view all public videos uploaded by users. Featured videos are included as well. Users can view these videos and comment on them as well.

2.2.2.8 Blogs

This page displays a feed of all users' blog posts. Posts are also organized by featured posts, latest posts, most popular posts, and monthly archives. Users can click on these blog posts to read them in their entirety and can comment on them as well.

2.2.2.9 Directory

This page includes a listing of technology related jobs in Hawaii, organized into 21 subcategories. Users can click on these listings to view more details about the jobs, and also to access external websites.

2.2.2.10 Coders

This page lists web startups that are writing code in Hawaii. The list contains just the names of the startups, which can be clicked on to learn more at the startup website.

2.2.3 Rate My Professors

Rate My Professors allows users to communicate and share content with each other by posting reviews of colleges and professors. Although users can create accounts, the reviews are listed as anonymous. Other users can provide feedback on reviews with either a thumbs up (user found

this to be useful) or thumbs down (user did not find this to be useful). The site also contains site-generated blog posts and videos, but users cannot directly interact with these.

2.2.4 Other Popular Social Networks

Social networks have become extremely popular and there are too many of them to describe in detail here. The top fifteen most popular social networks as of September 2016 are Facebook, Instagram, YouTube, Twitter, LinkedIn, Pinterest, Google+, Tumblr, Reddit, VK, Flickr, Vine, Meetup, Ask.fm, and ClassMates. While most of these are not academically focused, they could potentially host an academic environment. Additionally, while RadGrad could be integrated directly into one of these existing social networks (i.e. become a Facebook application), creating a standalone application does not exclude members who do not have a Facebook or are not active on Facebook, it does not depend on the continuing popularity of Facebook, and I believe it may develop a stronger sense of brand.

2.3 Gamification

Since it would be ineffective and senseless to discuss every existing video game, I conducted a brief informal survey of some current ICS undergraduates regarding their current favorite video game. They listed the following games: League of Legends, Monster Hunter, sports games (i.e. NBA2k7), Hearthstone, RimWorld, Geometry Dash, Overwatch and Kerbal Space Program. In this section I will discuss my current favorite video game and three of the popular video games according to the ICS students.

2.3.1 Summoners War

Summoners War is a mobile fantasy RPG with over 60 million players worldwide. It is based off a freemium model, with many players playing for free, and many other players playing with in-application purchases. Based off the iTunes Summoners War page, the basic premise of Summoners War is as follows: "Jump into the Sky Arena, a world under battle over the vital resource: Mana Crystals! Summon over 900 different types of monsters to compete for victory in the Sky Arena! Assemble the greatest team of monsters for strategic victories!" As with many games, one of the interesting things about it is it's ability to motivate users into completing several, often tedious and unenjoyable actions, in order to achieve a virtual reward. One of the examples of this is the weekly Arena Rank. The Arena is where players can battle against other players, in an attempt to reach as high a rank as possible. There are different ranks based off the amount of victories and defeats the player has had: Beginner, Challenger, Fighter, Conqueror, Guardian, and Legend. The Arena is often very difficult, and in order to achieve a certain standing, the player must constantly battle others, and set up a solid defense that cannot be defeated by other players. In order to

improve one's defense and offense team, a player must spend hours doing grueling tasks, such as gathering magical essences, gaining EXP points to level monsters, and collect "runes" which can be strategically placed on each monster to improve certain stats. Doing these tasks can take up a significant amount of time and energy. Each week, a player is awarded a certain rank based off their performance in the Arena that previous week. This rank is manifested in the form of a small icon next to the player's name. When players see other players' icons, they are immediately informed of that person's standing in the game, and the player him/herself will be rewarded with feelings of pride and satisfaction.

2.3.2 League Of Legends

League of Legends is a multiplayer online battle arena (MOBA) type of video game and also follows a freemium business model. In this game, the player assumes the character of a summoner who controls a champion with unique abilities, and they battle with a team of other champions against another team of champions (either other live players or computer controlled). The main goal of the game is to destroy the opposing team's nexus, which is a structure at the middle of the team's base and is protected by defensive structures. At the start of each match, all champions start off weak, but they can increase in strength throughout the game by accumulating items and experience. Each match typically lasts from 20-60 minutes. There are three different game modes: Summoner's Rift, Twisted Treeline, and Howling Abyss. Each game mode is similar in that a team of players must work together to accomplish a terminal objective and a victory condition. Each mode also includes smaller intermediate objectives that can help teams to get closer to victory. Opposed to Summoner's War, gold gathered during the match and items purchased with that gold only last for that match, and do not carry over to future matches. Each match begins with each player being more or less equal in terms of advantage, regardless of how much time or effort the player has put in beforehand. However, the game does include other incentives to continue to win games and see personal development. Players get player experiences from playing matches on a single account. As their experience increases, they can ascend from level 1 to 30. Higher level players are given access to different maps, game modes, and additional abilities and features which give players a small boost in battle.

2.3.3 Hearthstone

Hearthstone is a free to play online collectible card video game. It is turn based between two opponents, who use constructed decks of thirty cards, and a selected hero with a unique power. Players can attack the opponent using mana points. The main goal is to reduce the opponent's health to zero. If the player wins, they can earn in-game gold, new cards, or other in-game prizes. Players can use the gold or microtransactions to purchase new cards to improve their decks. There are several different game modes: casual and ranked matches, daily quests, and weekly challenges.

Unlike many other popular collectible card games, Hearthstone does not allow players to trade cards. Instead, players can disenchant their unwanted cards into arcane dust, which can then be used to craft new cards of the player's choice.

2.3.4 Overwatch

Overwatch is a team based multiplayer first person shooter (FPS). Each team has six players, and each player may select one predefined hero character. There are four classes of heroes: Offense, Defense, Tank, and Support. Each hero character has unique movements, attributes, and skills. As the team is being set up, the game will provide advice if the team is unbalanced. However, once the game starts, players can still switch characters after a death or after returning to their home base. The team of heroes work together to secure and defend certain control points and/or escort a payload across the map in a certain amount of point. As players continue to play matches, they can gain rewards that do not affect gameplay, such as character skins and poses. At the end of each match, a server-determined Play of the Game (PotG) is replayed for all players. This play is based off certain factors such as a high scoring moves or effective use of a skill. Up to four individual achievements per team are highlighted, and afterwards players can vote for one to promote. The player who wins the most votes get a reward of experience points. As players gain experience points, they can earn a loot box, which provides certain in-game prizes and in-game currency. If players do not have enough experience points for a loot box, they also have the option to obtain one through a microtransaction. The game supports several different gameplays such as tutorial and practice modes, casual matchmaking, weekly brawls, custom games, and competitive play. Casual matchmaking allows players to play alone or with friends, and are randomly matched against others with similar skill levels. The weekly brawl gameplay was inspired by Hearthstone, and features matches with unique rules, which change weekly. Custom games allow users to have private or public games and can edit different options for that specific match. Competitive mode allows players within a certain region and on a certain platform, to become ranked. This mode is run in 2.5 month seasons. Only players at level 25 or above can participate. Participants also much first play ten preliminary matches which will assign the player a skill rating from 1 to 5000, which is used to create ideal matches. Similarly to the arena battles in Summoners War, there are seven skill ranking tiers: Bronze, Silver, Gold, Platinum, Diamond, Master, and Grandmaster. Players can be demoted to a lower tier or promoted to a higher tier based on their performance. Each competitive win awards a player with in-game currency. Players will also get an additional award based on their final ranking at the end of the season.

CHAPTER 3
DESCRIPTION

There are seventeen basic capabilities of RadGrad, described in greater detail at radgrad.org. These capabilities can be categorized into the three main categories: degree planner, social network, and gamification. Brief descriptions of the relevance of each are below.

3.1 Degree Planner

3.1.1 Degree Plan

Each student in RadGrad will have a degree plan, which displays the student's courses, extracurricular activities, and outside work on a semester-by-semester basis. This plan contains future data as well as historical data. This allows students to easily view their progress and prepare for the future.

3.1.2 Degree Goal

Although each student is aiming for a bachelor's degree in ICS, a more specific goal is beneficial in helping the student find a focus for their education and career goals. Some of these specific goals include B.S./B.A/B.S Computer Engineering and Security/Ph.D. Prep/Silicon Valley Tech. By specifying these specific goals in a concrete way, students can feel less overwhelmed by the large expanse of ICS classes, more prepared for the future, and more easily form communities of interest with other like-minded students.

3.1.3 Dashboard

Each user has access to a personal dashboard, available upon login. This dashboard provides a quick look at some of the user's stats, such as current ICS GPA, current ICS credits awarded, summary of schedule, current degree goals, interest tags, user picture, suggested vignettes, stoplight, recommendations, currently active petitions, and predictions. This is a quick and easy way to provide students with a variety of information on their overall progress in their major.

3.1.4 Predictions

Each student will have a prediction model, which predicts post-graduation aspects based upon recent graduates, data from local tech organizations, recruiters, headhunters, etc., and data from the ICS faculty. This data is then combined with the student's individual degree plan and degree goals to produce a customized prediction. This feature will hopefully help students feel better prepared for their future after graduation.

3.1.5 Recommendations

Recommendations aim to help students understand how to change their current behavior to improve their ICS experience. These recommendations are based upon the student's current degree plan, degree goals, and professional interests. Some examples of possible recommendations are: relevant courses or extracurricular activities not already present in their degree plan, an estimate of ideal maximum work hours, predicted impact of their GPA, and relevant mentorship opportunities that are not being taken advantage of.

3.1.6 STAR Interface

RadGrad will request a relationship with the UH STAR website, which will provide students with their current and past courses and their resulting grades. This will allow students to see all of their relevant course information in the same place that they get all their other ICS information.

3.1.7 Workload Adviser

RadGrad will implement a virtual workload adviser, which will combine the student's course load, outside work hours, ICS grade data, and employer expectations to give the student advice on how much work they should be taking on at one time. It will offer suggestions, such as "If you drop 1 ICS course and reduce your work hours to 10 per week, the average ICS GPA is 3.4." This can help students to have a more realistic view of their goals, prevent students from getting burnt out, reduce stress levels, and encourage a healthier school-work balance.

3.2 Social Network

3.2.1 Profile

Students, faculty, graduates, and administrators will each have their own respective profiles. Student profiles will contain personal information including name, email, details about their degree, images, interests, projected graduation date, and professional recommendations based off their inputted information. Faculty profiles include name, email, image, professional interests, and descriptions of current projects they are working on. Graduate profiles will include details about their life after graduation such as place of employment and position description. All profiles will be publicly available so that the ICS community can view each others' profiles and find connections.

3.2.2 Mentorship

RadGrad users can be certified mentors if they are in ICS 390 or a TA. A student is working under a mentor if they are a ICS 499 student working under a professor or participating in a research group opportunity under a faculty sponsor. There can be other possible instances of mentorship,

and over time, a network of mentorships will form, which could possibly help foster more and better mentorships with future students.

3.2.3 Department Feedback

Any type of user can initiate department feedback by starting a petition. The petition will be public, and any other user can edit it as well. Once the editors of the petition reach a consensus and get at least 20 votes of confidence from other users, the user will become finalized and other users may sign the petition over a course of two weeks. The petition will then be discussed at a faculty meeting, eventually leading to the petition being implemented, not implemented, or deferred. By giving users a platform to easily collaborate with each other over a common cause, members of the ICS department will feel more empowered, more involved, and ideally more satisfied.

3.2.4 Course Feedback

As a supplement to the UH system's end-of-semester course feedback system, RadGrad offers a mid-semester public course evaluation system. This allows students to reach out and communicate with each other and professors to make the learning experience as ideal as possible for all parties, while there is still time left in the semester. Ideally this will improve the quality of courses, the satisfaction of the students, and the teaching abilities of the professors.

3.2.5 Degree Feedback

RadGrad will reach out to ICS alumni approximately six months after graduation. At this time, these ICS graduates will answer a number of questions regarding their life after graduation (i.e. graduate education, career prospects, retrospective thoughts about the ICS department, etc.). This feature will provide data that will help the ICS department improve their degree program, and also provide clear and convenient lines of communication between alumni and the ICS department.

3.2.6 Feedback and User Evaluation

RadGrad will provide a easy and convenient way for users to provide RadGrad feedback about the system. There will be links for immediate feedback, and there will also be yearly surveys to measure user satisfaction over time. By providing an easy stream of communication between users and RadGrad developers, RadGrad can be constantly growing along with the department in order to serve their evolving needs as best as possible.

3.2.7 Billboard

RadGrad can also provide some physical hardware (i.e. a large monitor) to be displayed in the ICS department. This display will show aspects of RadGrad (i.e. statistics gathered from RadGrad,

upcoming events, current petitions, etc.). This will further encourage engagement throughout the department, as it will be a constant reminder of the current status of the community, and will perhaps contribute to promoting an overall closer "community" feel.

3.3 Gamification

3.3.1 Stoplight

The stoplight is a UI widget embedded in the dashboard, which takes on the appearance of a traffic stoplight, and uses the red/yellow/green colors to indicate the extent of that student's ICS activity. The light is green if the student is taking excellent advantage of what the department has to offer. The light is yellow if the student is taking sufficient advantage of what the department has to offer, and the light is red if the student is not taking enough advantage of what the department has to offer. To determine this, the stoplight takes into account the student's professional interests and goals, their GPA, available opportunities, the opportunities they have taken advantage of, the available courses, and the courses that the student has taken. By being encouraged by the changing colors of this stoplight, fueled solely by the student's actions, students may take this as a personal challenge, or game, to keep the stoplight at a certain color as much as possible. This is a simple way for students to track their progress throughout their ICS journey.

3.3.2 Leaderboard

A public leaderboard will be available for students to actively compare themselves against others in the department in terms of ICS GPA, velocity (a calculated value indicating a student's progress through the program), and professional preparation (a calculated value combining coursework and extracurricular activities). An award ceremony type of tradition could be started out of this, which awards high ranking students. This type of active and constant comparison could help foster healthy competition and higher engagement among students.

3.3.3 ICE

ICE is an acronym for Innovation (i.e. a student's involvement in research or other innovative activity), Competency (i.e. a student's grades in ICS courses), and Experience (i.e. a student's involvement in high tech environments through internships or other professional activities). ICE is a measurement of these aspects, calculated using the information provided on the student's profile. This balances the three aspects to emphasize the importance of all three in an ideal ICS experience. Details on how these aspects are measured can be found at www.radgrad.org. These clear measurements of "success" can be eye opening for students. It can be easy to get caught up in the minor details of a major and lose track of the bigger picture. ICE helps students to remind

themselves to balance their ICS experiences out, in order to become as attractive as possible for future employers. This feature can also be physically manifested in terms of badges or stickers, as a symbol of rank. This can encourage students to become more competitive and therefore less lazy and more productive. (It helps that a lot of ICS students enjoy the incentives provided by video games.)

CHAPTER 4
DESIGN

The experimental design of RadGrad includes three steps: a preliminary assessment, a post-deployment assessment, and a final comparison between the two. These assessments will be given to current undergraduate ICS students and prospective ICS students. It will be deployed electronically via Google Forms and prospective ICS students will be given the assessment during their initial advising session. Current ICS students will be given the assessment during any voluntary advising session and also voluntarily through their ICS courses. Ideally, at least 50 responses will be gathered for both assessments.

4.1 Preliminary Assessment

A draft preliminary assessment contains the following questions:

4.1.1 Basic Information

1. What is your gender? Goal: Since the ICS program currently has significantly more male students than female students, what are are the differences between the experiences of the two genders? Could this give any insight into why there are so little female students? Is this something RadGrad could address? After implementing RadGrad, have there been any differences in the gender ratio or the disparity between the experiences of the two genders? Ideally, both genders should have equally positive experiences in the ICS program.

2. How far advanced are you in the ICS degree program? Goal: How do student experiences evolve as they progress through the ICS degree program? Are there any patterns? Does RadGrad have any effect on this? Ideally, students from all levels should have equally positive experiences in the ICS program.

4.1.2 Prospective ICS Students

1. Approximately how many hours do you realistically plan to spend on ICS homework outside of class per week? Goal: Compare this value to the actual amount of hours spent on ICS homework, provided by current ICS students (Section 4, Question 4). Many past students have indicated that they were taken aback and negatively affected when they realized how much time they ended up needing to dedicate to their ICS degree (source: techhui.com). After implementing RadGrad, do prospective students have a more realistic idea of the amount of time that they will need to dedicate to their ICS degree? Ideally, RadGrad will better

prepare prospective students for their ICS degree journey due to easy access to comprehensive information and peer/alumni feedback and support.

4.1.3 Prospective ICS Students: Feelings

1. How EXCITED are you about entering the ICS program? Rank from 1-5. Goal: Compare this answer to the same question on the post-deployment assessment. This will provide information regarding how students view the ICS department, based solely on outside information and before their own experiences. Ideally, RadGrad will create more excitement among prospective students due to better presentation and the appearance of a strong, supportive community and satisfied alumni.

2. How INTIMIDATED do you feel about entering the ICS program? Rank from 1-5. Goal: Compare this answer to the same question on the post-deployment assessment. This will provide information regarding how students view the ICS department, based solely on outside information and before their own experiences. Ideally, RadGrad will create less intimidation among prospective students due to the appearance of a strong, supportive, and diverse community and satisfied alumni.

4.1.4 Current ICS Students

1. We are trying to ensure that our students are getting the best and most well-rounded preparation for their future. Which of the following, if any, pertains to you? Goal: Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will increase the amount of student involvement in outside ICS-related activities due to providing students with stronger connections to the ICS community.

2. We are trying to ensure that students are provided with all the information they need to graduate as smoothly as possible. What do you do first when you have a question regarding ICS degree requirements? Goal: Compare this answer to the same question (with RadGrad as an additional choice) on the post-deployment assessment. Ideally, RadGrad will provide a number one, easy, one-stop resource for students to get basic information about their graduation journey. In this case, other sources will be able to focus on more complicated issues that RadGrad does not address.

3. How many hours do you typically spend on ICS homework outside of class per week? Goal: Compare this value to the predicted amount of hours spent on ICS homework, provided by prospective ICS students (Section 2, Question 1). Many past students have indicated that they were taken aback and negatively affected when they realized how much time they ended up needing to dedicate to their ICS degree (source: techhui.com). After implementing

RadGrad, do prospective students have a more realistic idea of the amount of time that they will need to dedicate to their ICS degree? Ideally, RadGrad will better prepare prospective students for their ICS degree journey due to easy access to comprehensive information and peer/alumni feedback and support.

4. Do you feel that you get enough support from others in the ICS department? Check all that apply. Goal: Are students lacking support in certain areas? How can RadGrad help to address this? Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will provide a way to give more students the support they desire from others in the department.

5. As a student, do you feel like you have a voice to make changes within the department? Goal: If most students indicate that they do not feel like they have a voice within the department, what can RadGrad do to address this problem? Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will cause more students to feel like they do have a voice to make changes in the department.

6. What makes you proud to be a part of the ICS department? Check all, if any, that apply. Goal: This provides information about how current students view the department. A successful department should have a positive reputation among students, which can be manifested with a sense of pride. Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will cause positive changes in the ICS department's reputation, leading to a greater sense of pride among students, which may play a role in students' success

4.1.5 Current ICS Students: Influences

1. To what extent have ICS alumni influenced your development in the ICS program? Check all that apply. Goal: Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will facilitate more student-alumni interaction, and cause more students to be influenced in some way by an alumn in an ICS-related way.

2. To what extent have ICS peers influenced your development in the ICS program? Check all that apply. Goal: Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will facilitate more peer interaction, and cause more students to be influenced in some way by a peer in an ICS-related way.

3. To what extent have you influenced your ICS peers development in the ICS program? Check all that apply. Goal: Compare this answer to the same question on the post-deployment assessment. Ideally, RadGrad will facilitate more peer interaction, and cause more students play a role in influencing their peers in an ICS-related way.

4.1.6 Graduating ICS Students

1. What are your feelings towards graduation from the ICS program? Goal: If the ICS department is fulfilling its duty, most graduating students should feel at least adequately prepared (ideally well prepared) for the future. If most students indicate that they do not feel prepared, what can RadGrad do to address this problem? Ideally, after deploying RadGrad, a higher percentage of students will feel either adequately prepared or well prepared for the future.

2. If you answered above that you do NOT feel prepared to find a job after graduation, please explain why. Goal: Are there any common reasons for students not feeling prepared? If so, is there anything RadGrad can do to address this problem? Ideally, after deploying RadGrad, there will be a lower percentage of students who indicate the same problems as the preliminary questionnaire.

4.2 Post-Deployment Assessment

The post-deployment assessment has not yet been created, and will be created after deploying RadGrad. A section of the post-deployment assessment will contain the same questions as the preliminary assessment, with some additional choices where necessary to include RadGrad. Another section of the post-deployment assessment will contain questions specific to the student's reactions to using different aspects of RadGrad. In addition to the assessment, post-deployment analysis will include data from at least 10 interviews with RadGrad users to get more detailed information about the users' experiences.

4.3 Comparison

After all results of both assessments have been collected (ideally 50 each), they will be compared regarding student expectations versus reality, student satisfaction with the department, student engagement, and student feelings. The overall goal of RadGrad is to see suggestions of positive changes between the preliminary questionnaire and a post-deployment questionnaire that reflect less disparity between student expectations and reality, greater student satisfaction with the department, more student engagement, and more positive student feelings. These changes will support the hypothesis that RadGrad could cause several significant and positive changes with the students of the ICS department.

CHAPTER 5
IMPLEMENTATION

Coming soon!

CHAPTER 6
RESULTS

Coming soon!

CHAPTER 7
CONCLUSIONS

Coming soon!

APPENDIX A
TABLE OF NOTATIONS

Coming soon!

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