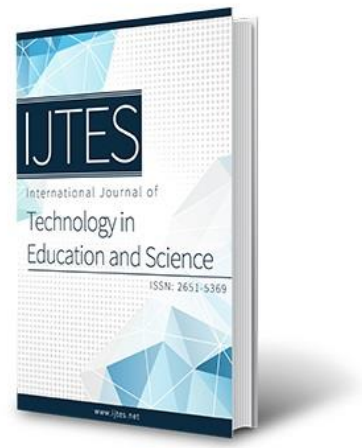

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Is GPA Enough? A Platform for Promoting Computer Science Undergraduates' Pursuit of Career Related Extracurricular Activities

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Is GPA Enough? A Platform for Promoting Computer Science Undergraduates' Pursuit of Career Related Extracurricular Activities

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Abstract

Despite the perceived value of extracurricular experience, higher education relies heavily on Grade Point Average (GPA) as a measure of undergraduates' academic success. When used as a singular standard assessment, GPA, which is based on student progress and completion of coursework, may inadvertently steer undergraduates away from valuable out-of-class experiences that might enhance their employability after graduation. With this premise in mind, the current study proposes to supplement GPA scores in an undergraduate Computer Science program with a wholistic assessment known as an Innovation, Competency, and Experience (ICE) score. The ICE score is a point system for documenting and rewarding students' extracurricular activities, in addition to their GPA scores. We designed and developed a web-based technology platform called RadGrad to implement ICE scores and promote student engagement and participation in extracurricular activities. Preliminary data shows that over 36% of students started to use RadGrad, even though its use was completely voluntary. More than half of those students planned and participated in various extracurricular activities, ultimately earning ICE points. Importantly, the ICE score deployed through RadGrad demonstrates the potential value of a supplemental assessment to GPA, which can promote extracurricular experiences relevant to students' future careers beyond coursework.

Introduction

While once seen as a place for adolescents to explore different courses and majors before settling on a career path, in more recent years the purpose of college has shifted from that idyllic vision to all about getting a job (Selingo, 2015). As a result, when discussing ways to improve undergraduate education, the topic of how to prepare 21st Century students for jobs of the future inevitably arises. While there have been many studies proposing different approaches to addressing this challenge, one point of consensus has formed around the idea that the student undergraduate experience should be about more than completing coursework. Indeed, studies have shown how important it is to have experiences outside of classrooms such as doing internships, participating in social and networking events, and gaining research experience (National Academies of Sciences, Engineering, and Medicine, 2017; Tenenbaum, et al. 2014, Wan, et al. 2013). Despite the perceived value of these extracurricular activities and experiences, the current undergraduate system has been limited in its ability to emphasize and officially acknowledge their importance. One of the main reasons is due to an overemphasis on GPA as a measure of undergraduates‘ academic success. In other words, having only one standard assessment, GPA, which is based on progress and completion of coursework, may be inadvertently steering students away from experiences other than coursework. With this premise in mind, the current study aimed to explore a more wholistic way of assessing students‘ experiences in a Computer Science (CS) undergraduate program. The overarching goal of this initiative was to better prepare undergraduates for their careers while developing a more comprehensive assessment system that acknowledges and rewards valuable out-of-class experiences.

Background

Challenges in CS Undergraduate Education

Over ten years ago, the statement that ―65% of children entering primary school today will ultimately end up working in completely new job types that don‘t yet exist” shocked many of us. While it is not clear exactly where this statistic came from (it‘s been cited widely in multiple publications), it underscores how fast the labor market is changing around us. As an example, the World Economic Forum (2016) reported that today‘s ―most in-demand occupations or specialties did not exist ten or even five years ago, and the pace of change is set to accelerate (p. 3)”.

Among these new jobs and careers, it is noticeable that many of them are related to the field of CS. According to the U.S Bureau of Labor Statistics (2020), employment in computer and information technology-related occupations is projected to grow 12 percent from 2018 to 2028, a rate that is much faster than the average for all occupations. Computer science related jobs are projected to add about 546,200 new jobs. This number is not surprising considering how fast technology is being developed and how many careers involving technology are relevant to the field of CS. Importantly, what these new jobs require in terms of knowledge and skills are often new and/or changing quickly. Thus, how to prepare our students in the field of CS to be ready and prepared for such a fast-changing and diverse set of careers has become a critical task for undergraduate educators.

Making sure students have the skills and knowledge necessary for their jobs may sound simple. However, it becomes challenging for university departments to keep up with changing academic curricula, ―a formal academic plan for the learning experiences of students in pursuit of a college degree” (Dezure, et al. 2010, para. 2). For that reason, CS students sometimes have to seek information and different learning resources outside of their current programs, such as Massive Online Open Courses (MOOC), workshops, free tutorials, and professional conferences. The demands for these ―extra” learning resources are clearly shown in how many CS courses are available on MOOC platforms. For example, among approximately 3,000 MOOC courses available in over 30 different subjects from one of the well-known MOOC providers (edX), over 800 courses are in the area of CS. Also, according to Chojecki (2020), the top 10 most popular courses in Coursera, a world-wide online learning platform, (e.g., Google IT Automation with Python, Machine Learning, IBM Data Science) are related to CS. As these educational resources are available for CS students, what makes it challenging for CS students to take advantage of these learning opportunities is that they have to participate in them in addition to their coursework within their academic department, and there is no system that allows students to earn credit for engaging in these experiences.

Assessments in Undergraduate Education

Assessments of undergraduate student learning typically focus on academic aspects of their experience (Kuh, 1993) and the grade point average (GPA), “a linear combination of grades assigned in different courses” (Lei, et al., 2001, p. 6), is often used as measure of academic achievement (Imose & Barber, 2015). Accordingly, GPA is the most common measure studied in education and educational psychology (Kuncel et al., 2005). GPA has been found to be an important predictor of performance at other levels of education. For example, evidence suggests high school GPA is an effective predictor of college grades and college success (Burton & Ramist, 2001; Hoffman, 2002; Hoffman & Lowitzki, 2005; Kirby et al., 2007; Radunzel & Noble, 2012). It has also been shown to be a valid predictor of performance in graduate school (Burton & Wang, 2005; Kuncel et al., 2007; Kuncel et al., 2001).

Historically, many prospective employers rely heavily on GPA scores (using a minimum GPA cutoff) when making hiring decisions about new graduates (Adams, 2015, Albrecht et al., 1994, Ramalheira, 2015). Studies have shown college GPA can be a predictor of job performance (Roth et al., 1996, Spurk & Abele, 2011) and salary (Roth & Clarke, 1998, Singh, 2017, Waldman & Korbar, 2004). However, some studies have raised concerns about the use of GPA as a indicator for student learning. For instance, Soh (2010) described several issues related to GPA, pointing out that quantified GPAs can misrepresent the quality of student work and therefore cannot demonstrate performance properly. Huang et al. (2006) showed students chose GPA as the least important factor for job hunting compared to other indicators (e.g., communication skills, internships). Volwerk and Tindal (2012) explained that the way points are assigned to letter grades and subsequently averaged results in “GPA being an unreliable, unfair, and imprecise tool for documenting overall student performance” (p. 23).

Yet, it is true that GPA is still used widely in the hiring selection process. Employers, however, have been including other criteria to evaluate job candidates (Imose & Barber, 2015). One of the examples is participation in extracurricular activities. Engagement in extracurricular activities has been used increasingly to screen new hires (Tomlinson, 2008, 2012). This way of screening potential hires has increased because participation in extracurricular activities has been connected to developing relational “soft skills” such as social, interpersonal, critical thinking, and leadership skills (Pinto & Ramalheira, 2017; Tieu et al., 2010). Accordingly, Merino (2007) argued that student engagement in extracurricular activities is due primarily to increasing employability concerns, while students participate in extracurricular activities for both intrinsic (e.g. personal interests) and extrinsic reasons (e.g., getting practical experience, distinguishing themselves from peers) (Roulin & Bangerter, 2013).

The Current Study and Method

With these challenges in mind, this project proposes a wholistic assessment known as an Innovation, Competency, and Experience (ICE) score, which can be used to supplement GPA scores at the undergraduate level. The ICE score is a point system that can be used for documenting and rewarding students' extracurricular activities. For example, when a student volunteers at a meetup for local application developers, they might receive points for the Experience component. Alternatively, if a student participates in a research project investigating solutions for various computational problems, they might receive points for Innovation. Typically, a student earns Competency points for completing courses. The ICE score was designed as a way to encourage CS students to participate in extracurricular activities. In order for students to record their accomplishments and monitor their ICE score, the project team, composed of the faculty members from the fields of CS and Education, designed and developed a web-based technology platform called RadGrad.

We recognize that many students often take CS courses to try out CS as a possible major, but are not yet sure if it is a good fit for them. It is these students we hope might use RadGrad as a means of learning about the spectrum of CS disciplinary interests and career goals, helping them understand curricular and extracurricular aspects of the major. For new students, RadGrad can help them explore interests and career goals through ―low investment" activities, such as joining clubs or attending one day or weekend events like hackathons. This exploratory phase can help students discover appealing career goals, disciplinary interests, and like-minded communities of practice, which the literature suggests will improve engagement and retention for females and under-represented minorities.

As they discover the interests and career goals that appeal to them, RadGrad can help those students become aware of extracurricular activities that require a greater investment of time and energy, such as research projects and internships. We hope that students who transition to high investment extracurricular activities are very likely to complete the undergraduate degree program. Accordingly, the current study introduces RadGrad in detail and reports the implementation of RadGrad in the department of CS undergraduate program at a University located in the Pacific region of the United States as the first step to examine the potential of ICE as a supplemental assessment tools to promote CS students' extracurricular activities.

The following section describes the conceptual framework for the development of the RadGrad platform. It also introduces how RadGrad was designed to guide undergraduate students to participate in various activities beyond their degree coursework. The section will end by explaining how ICE scores are implemented through RadGrad.

Degree Experience Plan

Undergraduate education is about more than completing the coursework. In addition, undergraduate education strives to offer students valuable experiences that can help them prepare for careers after they leave the university setting. With this idea in mind, the research team developed a conceptual framework called Degree Experience Plans (DEPs). DEPs are influenced by educational research theories known as Individualized Learning Plans (ILPs).

Individualized Learning Plans

In recent years, Individualized Learning Plans (ILPs) have been implemented in high schools in the United States. ILPs are an effective strategy (Hackmann, et al., 2019) as they provide strategic planning tools, designed to help students align course plans with career aspirations. That is, through ILPs, students define their career goals, plans for taking courses aligning with the goals, and document a process of developing knowledge and skills. Further, ILPs assist in documenting any leaning experiences that occur inside and outside of school that may be helpful and relevant for students as they explore and plan their career development (National Collaboration on Workforce and Disability, n.d). Accordingly, although there is great deal of variation, the typical components of an ILP include an academic plan, identified academic, personal, and career goals, learning style assessments, action plans, service learning, and career exploration opportunities (National Association for College Admission Counseling, 2015).

Researchers, practitioners and policymakers argue ILPs offer various benefits for learners (Fox, 2013). For example, ILPs have been shown to help increase adult students' motivation for completing their high school diploma (Arizona Department of Education, 2018; Kinsel, 2004; Phelps, et al., 2011; Solberg et al., 2018). Further, ILPs can lead students toward selecting more rigorous courses and building stronger relationships between teachers, other students, and even parents (Solberg et al., 2012). The opportunities provided by ILPs for students to explore their own career allow them to become more motivated and confident learners (Solberg et al, 2014). It is also noted that ILPs can help students understand their own abilities, while creating opportunities to improve their communication and planning skills (Bullock & Wikeley, 1999).

While the potential benefits of ILPs are often researched at the secondary level, ILPs haven't been explored in undergraduate education. In other words, there hasn't been a system that can continue to support students' career goals, planning and preparation *after* high school. With that in mind, the research team designed and developed a system for individualized learning plans at the undergraduate level. The purpose of these ILPs was to allow students to plan their degree experiences and prepare for their career goals.

RadGrad

RadGrad is a supporting technology platform for the Degree Experience. RadGrad implements many of the features of ILPs (academic planner, career explorer, and action plan) in a manner more suitable to the undergraduate student demographic. Unlike ILPs, each DEP/RadGrad instance focuses on interests, career goals, and academic plans specific to a single disciplinary area. In addition, DEP/RadGrad implements features to elevate extracurricular activities to first class status within the degree experience. Accordingly, RadGrad consists of seven entities: Interests, Career Goals, Courses, Opportunities, Degree Plan, ICE, and Levels.

RadGrad for CS Discipline Introduction

The first four entities focus on introducing the field of CS and providing undergraduate students' information about various career possibilities, relevant courses, and events and activities that students might want to participate in.

Interests. Interests present a set of discipline-specific topics relevant to the degree experience. In CS, examples of Interests might include blockchain, big data, data mining, machine learning, and programming languages (e.g. Java, Ruby).

Career Goals. Career Goals introduce possible careers that a student can pursue through the degree experience. For example, Data Scientist, Robotics Engineer, Augmented Reality Engineer, Game Developer, Security Analyst are listed as possible careers.

Courses. Courses represent the curricular activities associated with the undergraduate academic department. Approximately 100 courses (e.g., Intro to CS, HCI, AI for Games, Analysis of Algorithms, etc.) from the CS department at the University, where RadGrad is implemented, are listed in RadGrad.

Opportunities. Opportunities provide information about extra-curricular activities that help a student progress toward one or more Career Goals and/or learn more about a specific Interest. Example opportunities include participating in a local ―hackathon”, attending a career fair, pursuing a summer internship, participating in local CS community events, or working on a faculty member‘s research project. Opportunities can also include online courses available through platforms like Coursera or edX. The set of Opportunities available for a student to add to their DEP are ―curated” by faculty members to ensure quality and relevance.

RadGrad for Degree Planning and Assessment

The remaining three entities (Degree Plan, ICE, and Level) focus on guiding students to plan their overall degree experience including both their academic curriculum and their extracurricular activities. These entities provide indicators of student progress and achievement. In particular, the ICE and Level are specifically designed as supplemental assessment tools in addition to GPA to emphasize the importance of student participation and experience in the field. It is a way to reinforce the importance of experience beyond coursework and how such experience helps prepare students for their careers.

Degree Plan. Degree Plan illustrates the set of courses and extracurricular activities that a student has completed previously, is currently taking or doing, or plans to complete in upcoming semesters. By explicitly representing and planning out curricular and extracurricular activities, DEPs provide a more wholistic view of the student‘s disciplinary experience, not just their classroom activities.

ICE. ICE is a three component (Innovation, Competency, and Experience) measure to track progress and success within the degree program. The measure includes both curricular and extracurricular activities. According to RadGrad platform, students must earn 100 points in each of the three measures by the end of their degree program to be a well-prepared CS graduate. RadGrad admins are responsible for assigning the number of points earned for a given Course or Opportunity. For example, in the RadGrad deployment for the CS department used inthsi study, a student earns six points for a B in a Course, and ten points for an A. For Opportunities, students can earn 15 Innovation points for a weekend hackathon, and up to 25 points for a summer-long internship. Figure 1 shows how the ICE scores entity is presented to students in RadGrad.

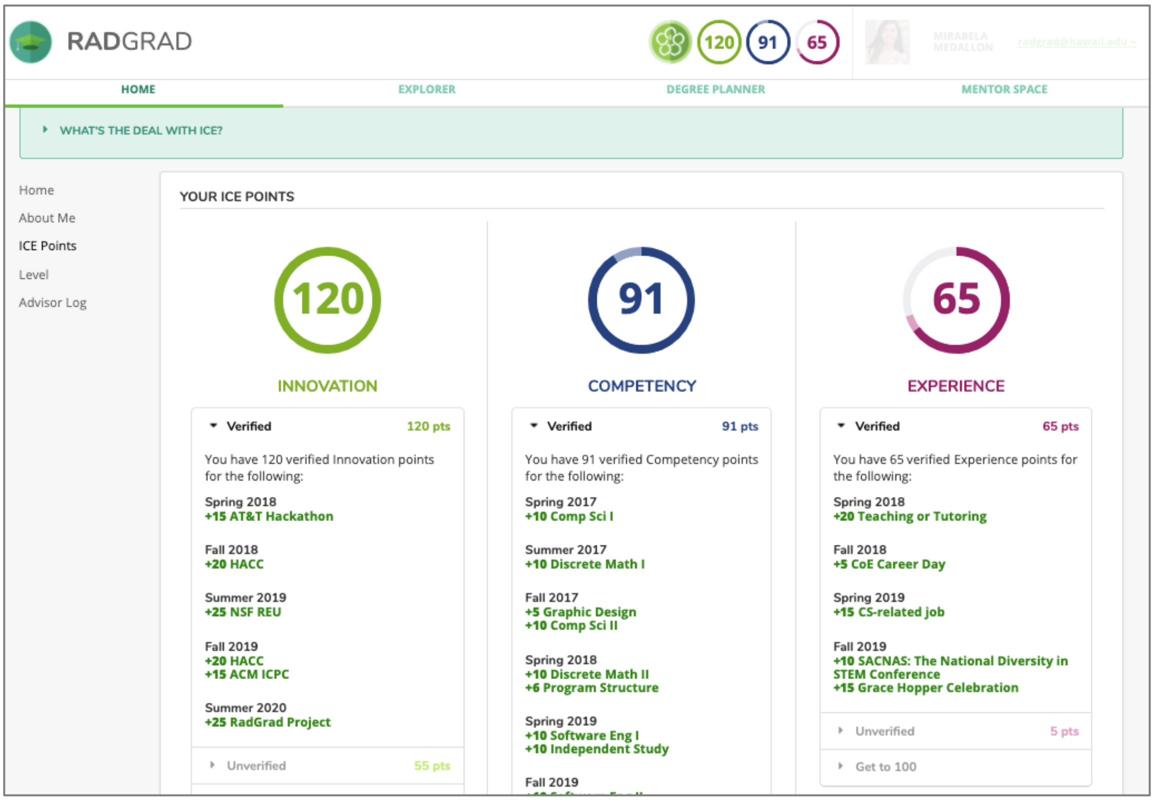

Figure 1. RadGrad Interface Showing a Student's ICE Scores

Level. Level indicates students' milestone achievements throughout their degree experience plan. That is, whenever students earn ICE scores and reach certain points, students also achieve levels. The Level, in addition to ICE scores, was designed borrowing ideas from the literature on gamification. Gamification is defined as the application of game design principles to change behavior in non-gaming contexts (Deterding et al., 2011; Robson et al. 2015; Xu et al., 2013). One of main purposes and benefits of using gamification is to increase involvement and engagement (Brigham, 2015). Accordingly, to motivate and increase student engagement in extracurricular activities, RadGrad deploys the Level entity. Interestingly, this idea also helped the research team to address the need for RadGrad participation to have a physical manifestation.

During pilot testing of the system, students wanted to know who else was using the system, and what progress they had made so far, without having to login to the system. After several rounds of design, the research team decided to use laptop stickers with a custom RadGrad design and a color scheme representing a six-stage progression from zero to 300 ICE points. Taken together, implementation of the Degree Plan, ICE and Level is our attempt to develop and validate assessments/metrics that can support and promote undergraduate students' experiences beyond completing coursework, and therefore, better prepare them for their careers after graduation. Figure 2 shows how the Level entity is presented to students in RadGrad.

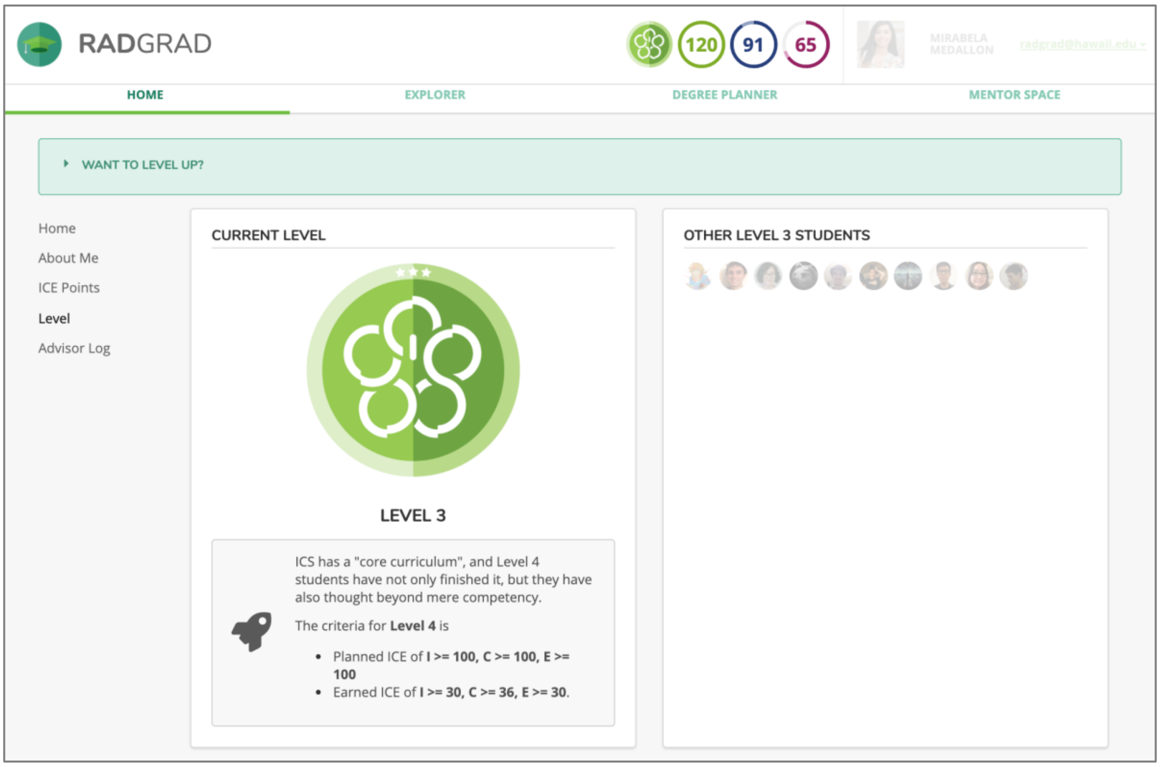

Figure 2. RadGrad Interface Showing a Student's Level

Once RadGrad was developed, the project team implemented RadGrad in the department of CS at a University located in the Pacific region of the United States. For the implementation, RadGrad was introduced to students throughout several courses that were required for CS students. As a part of the introduction, the purpose of the RadGrad was clearly explained, faculty members from the project team introduced the interface of RadGrad and demonstrated how to use the platform. After introducing RadGrad, students were invited to use RadGrad on a completely voluntary basis.

Results and Discussion

Having a three-year implementation plan, the project is currently in the process of completing its second year. Thus, this paper reports preliminary findings from existing data while data collection and analysis are still ongoing. These findings are mostly descriptive data such as frequency and averages, which provides an overview of how students' have used RadGrad so far and how the system has tracked students' ICE scores. It should be noted that due to the world-wide COVID-19 pandemic, there were limitations and restrictions on students' ability to participate in face-to-face extracurricular activities.

Students' RadGrad Uses

At the end of the second year of implementation, there are 503 registered students, which means there are approximately 500 students officially enrolled in CS courses. Out of 508, 180 students (36%) used RadGrad. These are the students who used RadGrad and earned ICE scores. While this number might not look high, it is important to note that using RadGrad was introduced on a completely voluntary basis; therefore, it is encouraging to see a number of students felt curious enough to try RadGrad at least once after the introductory presentation.

The next step in the analysis was to look at the entities within RadGrad that students visited. The analysis revealed that the Degree Planner was the entity that students visited the most totaling 1,259 visits. This suggests students visited the Degree Planner pages in order to plan their course work and possible extracurricular activities. Since the number of students using the system was 108, this means that students visited the Degree Planner several times. This is confirmed by the number of total visits to the Opportunities entity, which had the third most visits. In total, there were 857 visits, which shows the students visited the Opportunities entity multiple times. Under the Opportunities entity, there were many different activities/events presented, and the event that students visited the most was ACM-Manoa, which is a local chapter of a CS student organization. The other pages that were popularly visited were Google Summer of Code, generic internship, CS-Job pages.

The second most visited entity was the ICE. The ICE page was visited a total of 980 times. This finding confirms that students checked their ICE scores, possibly after planning or completing their coursework and/or extracurricular activities. Regardless of whether or not students actually completed their activities, the fact that students visited the ICE score page and checked their scores is a promising finding because it suggests that students cared, or at least, were curious about their scores. Besides these three entities, Degree Planner, ICE, and Opportunities, students also visited the pages for the rest of entities, Careers, Interests, Courses, and Level. See Figure 3.

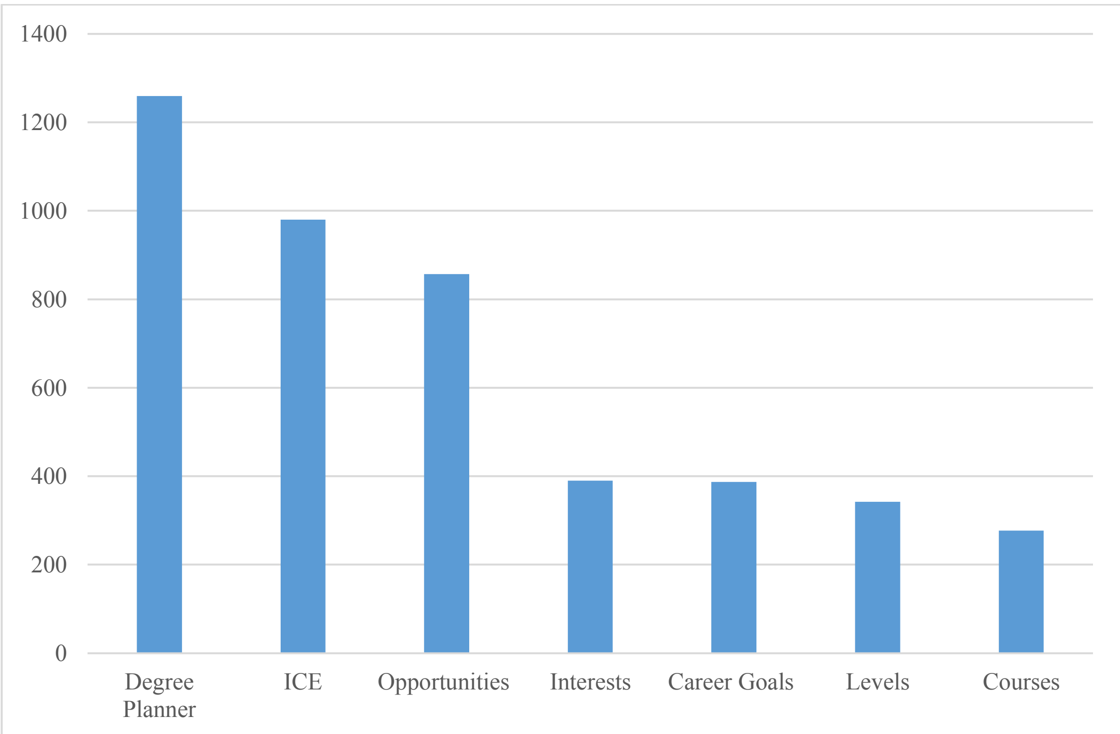

Figure 3. Number of Visits to Seven Entities Pages

Students' ICE Scores

Knowing that students used RadGrad, we also looked at students' ICE scores in more detail. As described above, by the end of their degree program, students must earn 100 points in each of the three measures, for a total of 300. After the second year of the implementation, the mean ICE score of the 180 students was 147.10 (*SD* = 130.09), which was slightly lower than half of 300. What was interesting was the range of ICE scores among students. The maximum ICE score was 833 and the minimum score was 10. This shows there was one student who quickly earned an ICE score that was considerably higher than the recommended target. In contrast, there were other students who earned minimum scores. When the maximum score was broken into three measures, the student‘s Innovation, Competency, and Experience points were 285, 228, and 320 respectively. Meanwhile the minimum ICE score, 10 points, was from Competency.

The next step in the analysis was to calculate the average score for each measure. As shown in Table 2, the highest mean score out of the three measures was 84.49 (*SD* = 44.53) for Competency, and the mean scores of Innovation (*M* = 31.47, *SD* = 54.72) and Experience (*M* = 31.14, *SD* = 48.33) were similar. By looking at each measure‘s score, it should be noted that there were several students who earned ICE scores only from Competency, which means they didn‘t participate in (or complete) any extracurricular activities, even though they might have learned about such activities through RadGrad. The range of ICE scores, which are equal to their Competency scores, was 10 to 188. Hence, we examined how many students participated in extracurricular activities and what were their ICE scores. The results of this descriptive analysis are shown in Table 1.

Table 1. Descriptive Statistics of ICE Score

	N	*Min.*	*Max.*	*M*	*SD*
ICE Total	104	52	833	211.35	135.96
Innovation Score	104	0	305	54.47	62.76
Competency Score	104	29	228	102.98	39.64
Experience Score	104	0	320	53.89	53.11

As shown, there were 104 students whose ICE scores were not only from Competency but also either or both Innovation and Experience. That is, these are the students who participated in any extracurricular activities for Innovation and/or Experience in addition to taking courses. When we looked at their ICE points, their overall mean score for ICE was 211.35 (*SD* = 135.96). Also, their mean scores for Innovation (*M* = 54.47, *SD* = 62.76), Competency (*M* = 102.98, *SD* = 39.64), and Experience (*M* = 53.89, *SD* = 53.11) suggested that approximately 100 students participated in extracurricular activities and earned points through RadGrad. Furthermore, considering the points for an activity in Innovation and Experience ranged from 5 to 25, but mostly 5 to 10, the average scores suggest that the students participated in more than one activity or event.

Conclusions

This project was initiated to address some of the challenges and limitations of undergraduate assessment, which often involves only GPA scores. In particular, this study discusses these challenges focusing on the field of CS. That is, as the CS field is growing and expanding quickly, it is challenging for academic departments to provide all the necessary knowledge and skills to prepare their students for their career through their curriculum alone. Related to this issue, GPA, which is an assessment of students' academic performance based only on their coursework does not provide a proper measure of student achievement and their readiness for the career of their choice.

Further, focusing only on GPA, may limit students from participating in real-world experiences through extracurricular activities, which may be as valuable—or even more valuable—then completing coursework. Thus, the research team proposed a supplemental assessment/metrics, ICE and developed the technology platform called RadGrad to implement ICE and promote student engagement and participation in extracurricular activities. After its development, RadGrad was implemented in the department of CS at a University. After completing the second year of implementation, the research team looked into the extent to which students were using RadGrad and earning ICE scores. By analyzing descriptive data focusing on the frequency of students' visits to each page of the system, for all seven entities and the student's ICE scores, this paper presents evidence that over 36% of the students started to use RadGrad, even though its use was completely voluntary.

In addition, over a half of those students planned and participated in various extracurricular activities, and therefore earned ICE points beyond completing coursework. Accordingly, the research team concludes that RadGrad can be used as a technology platform for promoting and supporting undergraduate students' career preparation by allowing them to explore their various interests, career goals, opportunities and courses, while planning to participate in both curricular and extracurricular activities. Importantly, the ICE score deployed through RadGrad shows the potential as a supplemental assessment/metrics to GPA, which can promote undergraduate students' experiences relevant to their future careers beyond the coursework. As this study is still ongoing, these findings are preliminary. They are, however, essential for the research team to move forward and continue its implementation and further investigation.

Limitations and Future Studies

While the findings of the current study are encouraging for the project team, we recognize that there are several limitations. First, the findings of the study focused on descriptive data analysis (e.g. frequency, means, range). The descriptive analysis did not allow us to predict or infer how use of RadGrad and ICE scores would actually impact on students' success in their degree program and also their future career. It would have been ideal if we could examine how use of RadGrad and all of the extracurricular activities have changed not only acquisition of necessary skills and knowledge for their future job, but also their perception for the readiness for their future careers. Yet, this type of investigation may require longitudinal data collection and also even require compulsory uses of RadGrad to students, which was beyond the scope of this project. By the nature of the project's purposes, which were to propose a new idea to improve the undergraduate assessment and to present a possible technical tool to deploy that idea, this study was exploratory rather than conclusive. It is our goal to continue and conduct research that focuses on the impact of RadGrad and ICE scores in various perspectives. Second, as much as we believe extracurricular activities are important and the faculty members review and verify the quality of those activities, the qualities of those activities and/or events that the students participated in varied. Also, the quantity of the work, how much effort students have to put into those activities, also varied. This means that even with the differentiated points for each activity, there is no fixed standard for a systematic point system. In other words, when there were two activities, A for 10 points and B for 20 points, it was not simply that A requires 10 hours work and B requires 20 hours. Also, it should be noted that sometimes 10 hours working experience involving application development may be more meaningful than 20 hours of working in a big tech company. The current implementation of ICE scores was used more as an indicator to encourage students to actively look for and participate in various opportunities. In the long term, however, before ICE can be used as a more rigorous measure that can supplement or even replace GPA in the degree program, a more standardized points system needs to be established.

Lastly, related to the future direction of this study, while RadGrad with ICE scores is implemented in a CS Department for this study, RadGrad and ICE scores can be applied to any other fields. CS is not the only discipline that needs to prepare students for careers. Nowadays all fields and disciplines are changing quickly and students should prepare themselves to be ready for careers in those disciplines. We believe having real world experiences in addition to completing academic curriculum can better prepare students to be ready for the real-world. RadGrad or any system like RadGrad can be beneficial for them, and ICE scores will emphasize and capture the importance of students' overall degree experiences beyond their course work. Accordingly, we plan to examine how RadGrad can be implemented in other disciplines, such as architecture, teacher education, social work, and medicine.

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Compliance with Ethical Standards

- Conflict of Interest: The authors declare that they have no conflict of interest.
- Research involving human participants and/or animals: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.
- Informed consent: Informed consent was obtained from all individual participants included in the study.

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