Using Assignment Choice in Engineering Service Courses

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Students taking an introductory engineering class, especially those required to take a "coding class" for their non-computer science major, can be very intimidated. This paper explores the implementation of assignment choice in an undergraduate CS-1 course, inspired by the Self-Determination Theory, to alleviate intimidation and enhance student motivation, especially for non-computer science majors. By allowing students to select assignments aligned with course objectives, we cater to diverse interests and learning goals. Preliminary results indicate a decrease in the students that earn a D, F, or withdraw from the course (DFQ rate), with assignment choice compared to traditional delivery methods, in which all students follow a prescribed path. Each assignment is part of their overall grade. We intend to refine this approach and explore its applicability in other engineering service courses. Our goal is to provide instructors with a framework that ensures students learn course objectives while retaining autonomy in their learning journey, thus facilitating continued success in their chosen field of study.

Keywords: engineering education, CS-1, assignment choice

INTRODUCTION

In recent years, the field of Computer Science (CS) has experienced a surge in the enrollment of non-computer science students, reflecting the growing acknowledgment of the applicability and prevalence of computer science principles across various academic domains and industries. However, this influx of students from diverse backgrounds presents a distinct set of challenges, particularly concerning their familiarity with CS concepts and ability to navigate CS assignments.

To address the needs of these non-computer science students in CS courses, it becomes imperative to explore methodologies that render assignments more accessible and attuned to their interests and proficiencies (Hobbs, 2021). The provision of assignment choice is among the strategies showing promise

in enhancing student engagement and motivation (Brooks, 2011). By allowing students to select assignments from a spectrum of options, instructors can empower them to choose tasks that align with their strengths, interests, and learning preferences.

This paper extends beyond the initial exploration presented in our previous work to comprehensively examine the Assignment Choice framework implemented in our CS-1 course (CSCE 111). Initially introduced as a work-in-progress concept, the Assignment Choice model has now been fully developed and integrated into the course curriculum. Through rigorous observations conducted over multiple semesters, we have evaluated the impact of this framework on student performance, satisfaction, and course completion rates.

Our findings demonstrate a discernible improvement in grades and course completion among students engaged with the Assignment Choice model. By allowing students to select assignments that resonate with their interests and capabilities, we have cultivated a learning environment that encourages active participation and ownership of the learning process. The flexibility inherent in the Assignment Choice framework ensures that students are meeting the course objectives and pursuing areas of personal interest within the CS domain.

To further enhance the understanding of the underlying mechanisms driving student engagement and motivation within the context of assignment choice, we employ Self-Determination Theory (SDT) as a theoretical framework. By integrating various mini-theories within SDT, we delve into the cognitive, motivational, and relational aspects that influence student behavior and learning outcomes.

SDT comprises six mini-theories that we will use at varying levels in this research. These are:

1. Cognitive evaluation mini-theory: Rewards for previously enjoyable tasks can create diminished desire in individuals.
2. Causality orientations mini-theory: Autonomy is a part of development and maturity, and is not supported by a task.
3. Organismic integration mini-theory: There is a relative autonomy continuum. Tasks may be performed resentfully, willingly, or somewhere in between.
4. Basic needs mini-theory: Beyond every one's need to be autonomous, there are other needs, e.g. to be competent, effective, and masterful.
5. Goal contents mini-theory: Deals with the "what" of behavior. What are they getting or giving for this activity?
6. Relational motivation mini-theory: Focuses on the need for relatedness, usually in relationships, but can apply to actions that promote relationships.

Moreover, we use a Competency-Based grading scheme to complement the Assignment Choice framework, providing a structured approach to assess student mastery of course competencies. This grading scheme reinforces the principles of autonomy and self-directed learning and ensures that students are adequately evaluated based on their demonstrated competencies rather than a one-size-fits-all assessment approach.

In the Competency-Based grading scheme, we prioritize a student's mastery of course competencies over a traditional one-size-fits-all grading approach. One of the key tenets of this scheme is to alleviate the fear of a single poor grade adversely affecting a student's overall point total. To achieve this, we introduce several categories of assignments that allow students to replace lost points from previous work, allowing them to demonstrate their learning and improvement over time.

For instance, consider the scenario in a typical CS-1 class where weekly coding assignments constitute a significant portion of a student's grade. In our scheme, if a student falls short of earning 70% of the points available for these coding assignments, they risk a downgrade in their overall grade. To address this, we offer supplementary coding puzzles that provide students with additional practice and time to grasp the fundamentals of problem-solving.

By engaging with these supplementary assignments, students not only fulfill the course's learning objectives in coding, as envisioned by the instructor but also regain the points lost from previous assignments, aligning with their academic goals. This approach encourages students to persevere and improve and reinforces the notion that learning is a continuous journey marked by growth and development.

Assignment choice is added to the traditional, one-assignment-one-grade delivery method. This give the diverse set of majors in this class the ability to find those assignments that they find most appealing. There are core assignments that all students must complete to meet the minimum learning objectives of the class; meeting these will earn a student a C in the class. The remaining assignments are for the students to choose from and can boost their total points to a B or A. To prevent cherry-picking the easy assignments, students must earn 70% of the points available for that assignment or group of assignments to receive credit.

The observations presented in this paper highlight the importance of offering assignment choice to non-computer science students in CS courses. The findings underscore the potential of assignment choice in fostering student success, engagement, and satisfaction. It is hoped that these insights will encourage further exploration and investigation in this area and inspire instructors to consider the benefits of implementing assignment choice strategies in their courses.

Our research underscores the significance of assignment choice in promoting the success and satisfaction of non-computer science students in CS courses. By embracing flexibility and catering to individual student needs, instructors can foster a learning environment that nurtures engagement, motivation, and academic growth. We advocate for the widespread adoption of assignment choice strategies in CS education, to create inclusive and empowering learning experiences for students across diverse academic backgrounds.

STRATEGY FOR PROVIDING CHOICE

We used CSCE 111, a CS-1 service course as the course we observed. Initially, a concise set of assignments needed to be completed with a standard grading policy of 90% or greater for an A, 80% a B, etc. Many students were making the maximum grade of 100% and even taking any bonus opportunities to exceed this grade. Other students found it frustrating to complete this work when it was not their major. They struggled to see the relevance of the topics.

While looking for ways to improve Academic Integrity in early CS courses, an entirely different topic, we found an approach to help prevent cheating by offering some choice in the assignments students must complete (Lang, 2013) throughout a course. Offering a variety of assignments for the completion of the course seemed like a viable solution. Switching the course grading from an average to a total points scheme allowed students to choose assignments until their cumulative grade total met their desired point total. After examining the various paths students could take to earn the desired points, it seemed the students needed more guidance (Bye, 2018) to prevent cherry-picking assignments and taking the easy route.

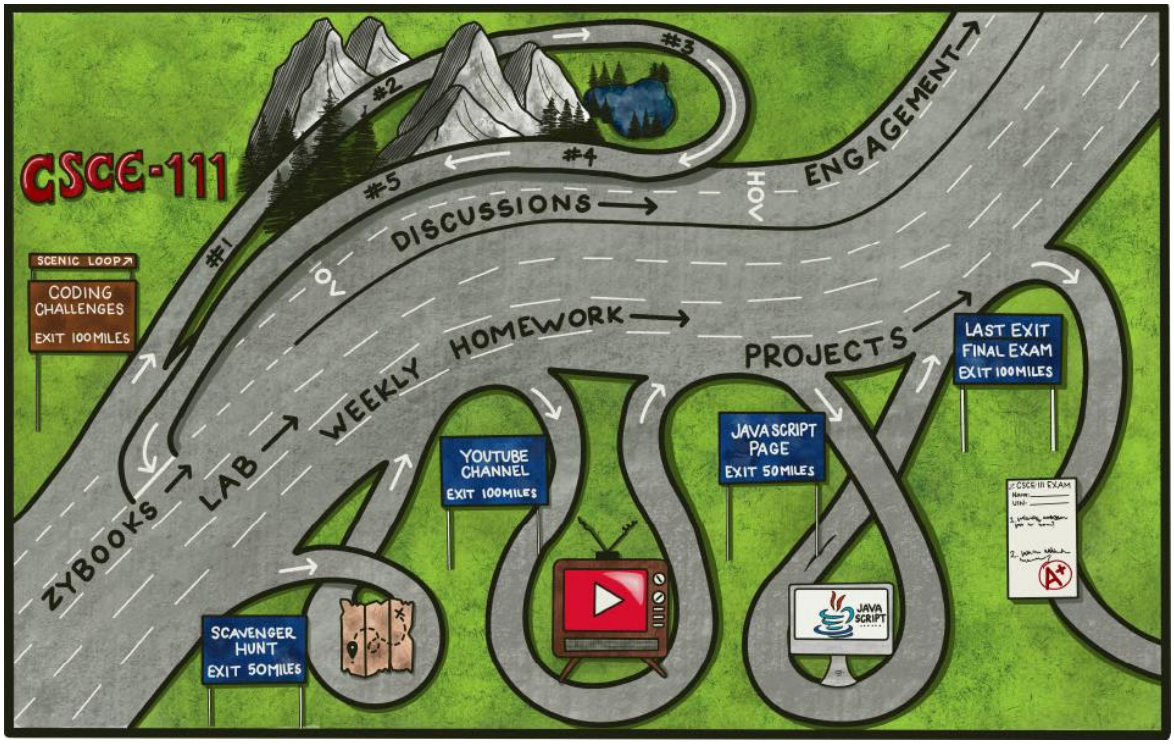
The Course Map

This strategy still had issues with the core assignments being able to be passed over for more fun or less challenging assignments. Observing that a large percentage of the students were getting high grades while the rest were doing poorly, we added two more requirements to the assignment choice concept to give students a better chance at succeeding while also raising the overall learning objectives of the course. The first requirement was accomplished by dividing the assignments into core (required) and optional assignments. Competency-based grading ensures that a minimum level of knowledge must be reached to pass the class. The core assignments must be met with 70% of the points earned to receive a C or passing grade in the class. For the remaining, or optional assignments, the points earned are added to the total, allowing students to continue to work to gain and show mastery in the course work. Again, to prevent just taking the easy route, students must earn 70% of the total value of the chosen path or core assignment category for any points to be awarded. The justification is that most students could earn 20% of a grade value with little effort or learning. The other benefit to students is that doing poorly on an assignment does not bring down their grade, it simply does not increase it.

The total points available in this course before assignment choice was 1000, so, 900+ were needed for an A, 800+ for a B, etc. When we added the assignment choice, new assignments were added to the course curriculum, so 1500 points were now available. To receive an A, students must earn 1050 points or the equivalent of a previous student making a 105% in the non-choice version of the class, increasing the overall

learning goals. Adding additional assignments allowed students to find pathways that interested them and bypass other paths of assignments they did not need or prefer. The Course Map in Figure 1 was introduced to the students in the first week of the course.

FIGURE 1
CSCE 111 COURSE MAP



The highway, specifically the right four lanes, represents the core requirements to pass the course. Completing only these four lanes results in a C in the course. Students are then given a web-based calculator that helps them pick a set of assignments that will result in their desired grade. One example given is that if all the lanes of the highway are chosen, including the HOV lanes, they can earn points for an A. However, if classroom engagement or discussions are not something a student enjoys, they can pick from any of the side trips or optional assignments. These optional assignments may include coding challenges, a five-week adventure into solving coding puzzles, or a technology scavenger hunt (identifying specific types of technology not previously thought of as using computers). Alternatively, students may reteach concepts we have learned by creating a YouTube channel. Successfully adding JavaScript to a webpage assignment will get them more points. Finally, an optional final allows them to show they learned more than they feel their grade represents.

The Grade Calculator

The grade calculator is web-based and designed to support the assignment choice system. It provides a list of all assignment categories, total points earned, points needed to achieve their desired grade, and information about grades that do not meet the criteria for being counted. We introduce students to the course calculator in the first week of the course, and they are required to take a screenshot of the initial path of assignments they choose and the resulting grade they would earn.

Midway through the semester, we have students look at their grades in Canvas, our Learning Management System, and transfer them to the course calculator. Students can see the effect of choosing a core or required assignment and one or more additional assignments available.

Initial Observations

A final survey was provided to the students at the end of the semester. We let them know we did new things with grading and assignment choice. We asked them what worked and did not work for them and what could improve it. Overwhelmingly, the opinion was that students appreciated assignment choice and were glad they could skip some assignments. The idea that doing well on an assignment helped their grade and doing poorly did not hurt them, was also a positive. Only a few students seemed to feel they should receive the total points when an assignment did not meet the minimum 70% to be added to their score. For example, if a student's effort was minimal and they received 20/100, these few students still felt they should get credit.

We found that allowing students to choose their own assignments for college courses can have several benefits compared to a strict assignment set.

First, allowing students to choose their assignments can increase their engagement and intrinsic motivation in the course. When students can choose assignments that align with their interests and goals, they are more likely to be invested in the work and motivated to complete it. This can lead to better learning outcomes and higher grades (Williams-Pierce, 2011).

Second, giving students the freedom to choose their own assignments fosters creativity and critical thinking skills (Ghareb, 2015). By allowing students to explore their interests and develop their own ideas for assignments, they can develop their own unique perspectives and approaches to the material. This can lead to more innovative and creative work.

Third, providing choice in assignments can also help to foster a sense of ownership and responsibility among students. When students can choose their own assignments, they are taking on more control over their learning, which can help them develop a stronger sense of ownership and responsibility for their work (Thibodeaux, 2019).

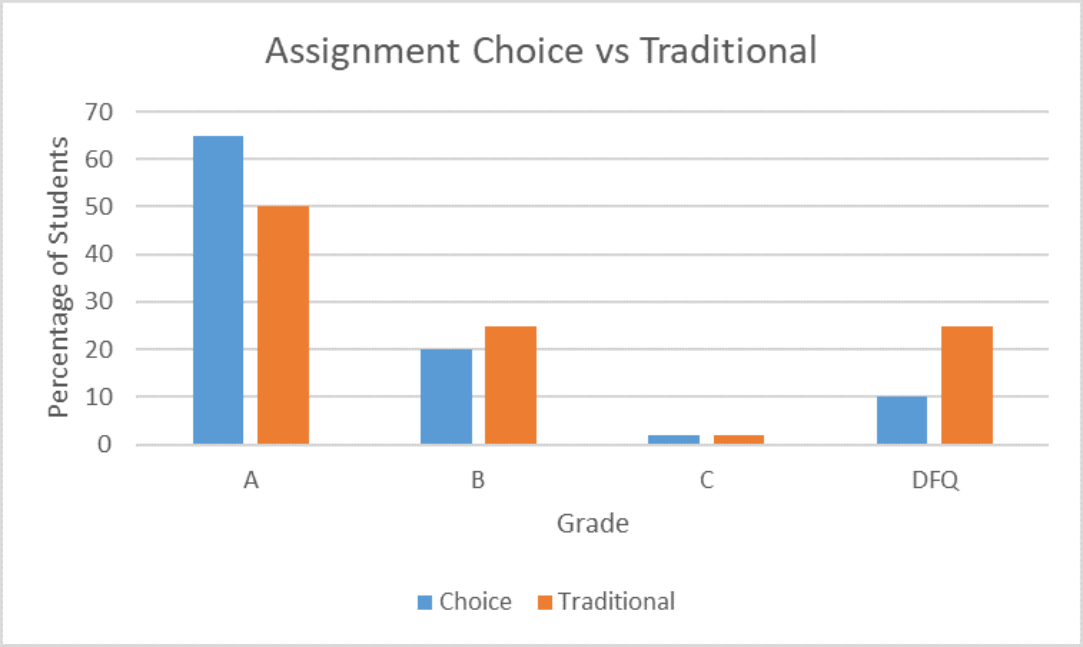
The retention in the course increased from previous semesters. With more students staying in the course to completion, there was a higher overall class grade average. Students had access to the course calculator all semester and were asked to regularly check to see how they were doing. Students seemed to "own" their path to learning, resulting in increased student engagement.

At this point in the study, the researchers shifted to examine the impact of implementing assignment choice and competency-based grading methods compared to classes taught in a more traditional manner by a different professor. The following results were observed:

- Decreased D, F, and Q Rate: The implementation of assignment choice and competency-based grading led to a significant 50% decrease in the rate of students receiving D, F, or Q grades (DFQ rate). This indicates that students were more successful in their academic performance and experienced a reduced likelihood of failing or performing poorly in the course. See Figure 2.
- Increased Learning Objectives Mastery: The study found a notable 20% increase in the mastery of learning objectives among students who were exposed to the assignment choice and competency-based grading approach. This suggests that the proposed teaching methods were effective in enhancing students' understanding and comprehension of the subject matter.
- Reduced Failure/Drop Rate: Prior to the intervention, the DFQ rate stood at 21%. However, with the implementation of assignment choice and competency-based grading, this rate significantly decreased to 10%. This outcome highlights a substantial improvement in student retention, as fewer students opted to withdraw from or fail the course.

Notably, these results were obtained from a study involving 500 students, indicating a robust sample size, enhancing the reliability of the findings. Overall, the study suggests that the assignment choice and competency-based grading methods proposed in this paper can positively impact student outcomes, leading to higher success rates, increased mastery of learning objectives, and improved student retention compared to more traditional teaching approaches. These results were obtained from one of the three service courses taught by the department.

FIGURE 2
GRADE DISTRIBUTIONS – CHOICE VS. TRADITIONAL



Next Steps

We wanted to determine if grade distributions were historically lower with traditional methods, so our next investigation extends beyond a single CS-1 course, delving into the past five years of teaching three distinct service courses. With a dataset encompassing over 4000 students and five different professors, we considered whether any combination of course offerings or instructor dynamics correlates with enhanced grade distributions. The analysis examines traditional versus assignment choice classes, with a box plot visualization, as seen in Figure 3, to illuminate the overall distribution trends. This shows that the Grade Point Average (GPA) for the assignment choice class was tightly centered just above 3.75 while the traditional methods had a wider range and a GPA around 3.4. While this gives more evidence that grades can be improved with our method, it does not consider the differences in professors. We also considered each course to see if one course in particular, using traditional teaching methods, was achieving grades close to the course offerings of assignment choice. As seen in Figure 4, the three individual courses, on average, are substantially lower than the assignment choice offering of Figure 3.

Our examination looks at whether specific professors contributed to higher-grade distributions. Analyzing grade distributions across all three service courses taught by each professor, we sought to identify individuals whose results in the traditional classroom paralleled those of the course offerings of the assignment choice. Figure 5 illustrates that even the highest-performing professor, Professor E, fell short of the average attained by the assignment choice course offering. Intriguingly, Professor D taught traditional and assignment choice versions of the service course, with superior grade distribution outcomes observed in the choice offering. This observation underscores the potential impact of the instructional approach on student performance, highlighting the efficacy of assignment choice in fostering improved academic outcomes across varying professorial contexts.

FIGURE 3
5 YEAR AVERAGE

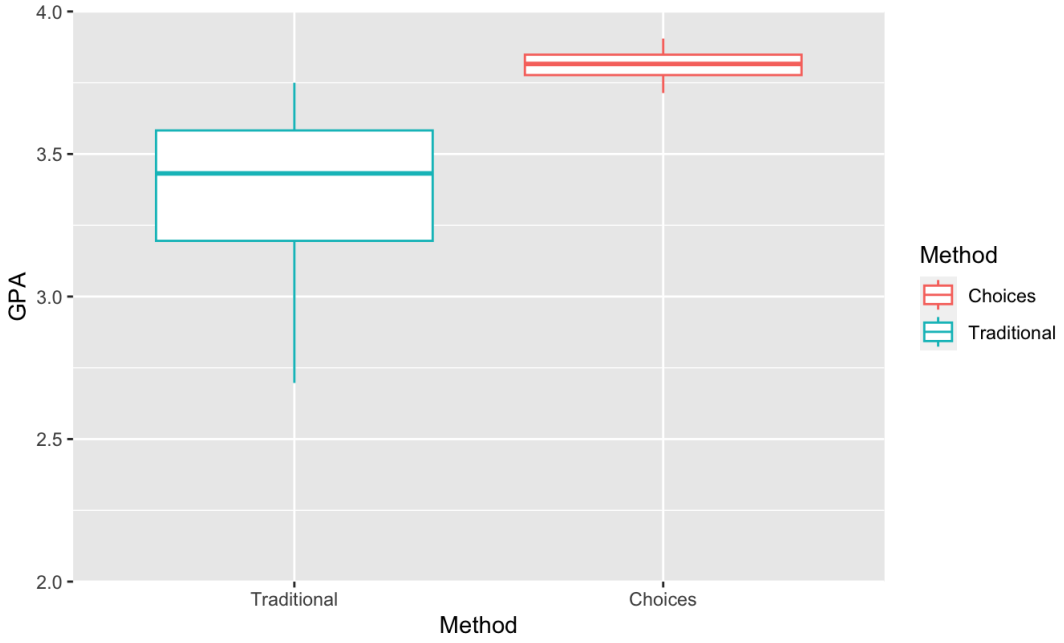


FIGURE 4
COMPARISON OF THREE SERVICE COURSES

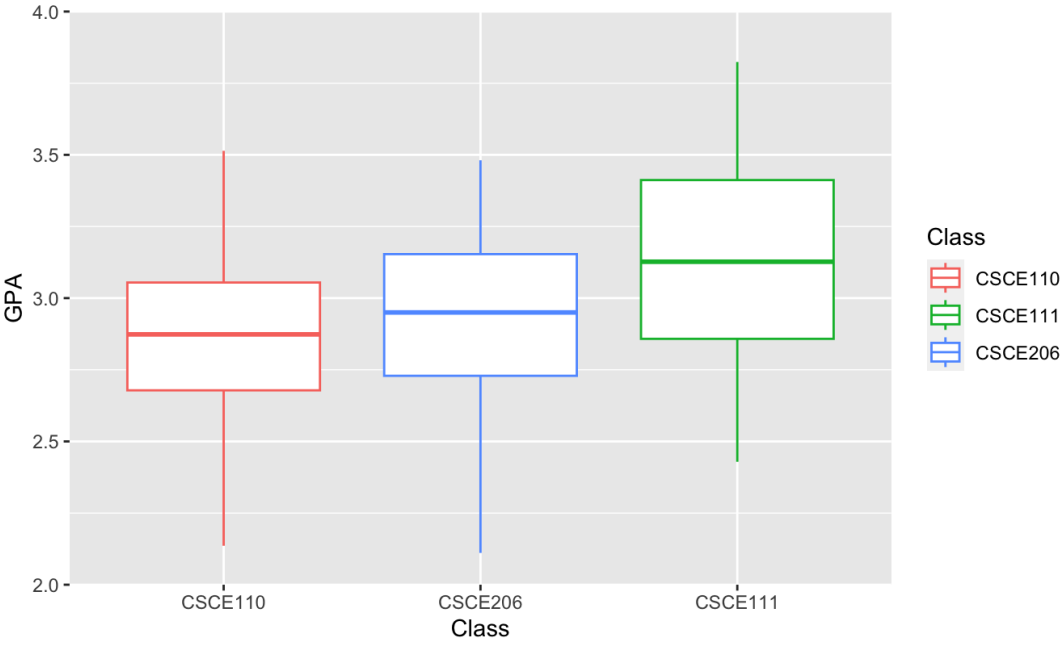
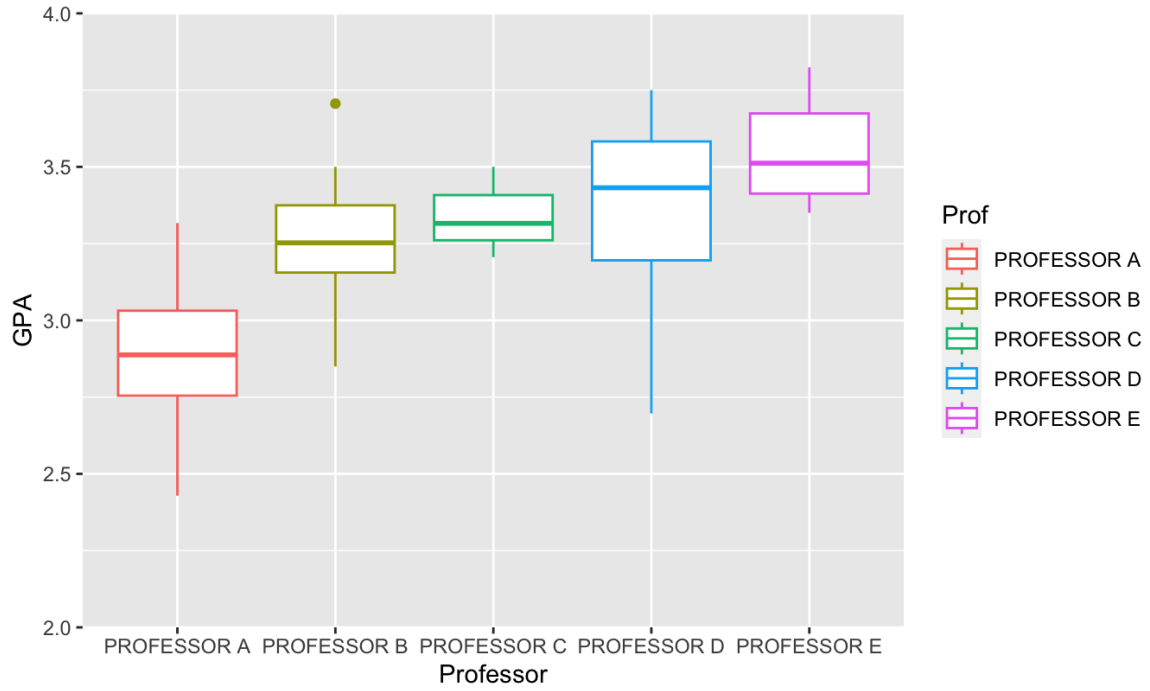


FIGURE 5
COMPARISON OF INDIVIDUAL PROFESSORS



BUILDING THE FRAMEWORK

Our framework for this course centers around assignment choice, using a point system and competency-based grading. To allow choice, we created required core and optional categories. The four core categories contain assignments that students must complete with competence to achieve a passing grade of a C in the course. This ensures that students demonstrate a basic level of understanding and learning objectives of the course, with a requirement of scoring at least 70%. This also allowed us to raise the course's overall learning objectives. In the traditional delivery method, we observed that many students were able to complete the course with a 100% average. Because of this phenomenon, we set the total points from the traditional course to be 90% of the required point total for an A in the Assignment choice course. This allowed us to raise the overall learning objectives of the course.

The four core categories include textbook readings, quizzes, labs, homework assignments, and projects. Students must complete weekly textbook readings that provide background knowledge before attending lectures and then complete quizzes to reinforce learning. Students in the course also attend labs twice a week to collaborate with peers, engage in practical scenarios, and apply learned concepts. This environment is low-stakes and exists to improve comprehension of the concepts. Outside the classroom, weekly homework assignments are required of the students, demanding a deep understanding of the course material. The assignments were designed in such a way that allowed students to see the applications of what they learned and allowed students to show mastery of the topics for that week. Finally, team projects during the second half of the semester allow students to integrate knowledge and work together on complex tasks.

With the incorporation of assignment choice, completion of these core categories alone only allows one to earn a C grade. Students must engage in some of the additional assignments or pathways to build their grade. This grading style encourages students to obtain a deeper understanding of the content, allowing them to take ownership of their learning, appealing to diverse learning styles and preferences. Seven additional pathways are available, each requiring a minimum competency level of 70% for the category to count.

One of these additional categories is engagement and participation. This category is for students to show their active engagement and participation in class. Attending class and paying attention is one of the main ways to learn new concepts. The activities done in class reinforce key concepts discussed during the lectures. Thus, students who can follow along and complete in-class activities show that they have the competency of what we taught in class.

Another category created is problem-solving puzzles. This category is for students who feel comfortable with their problem-solving skills. Some students may have a stronger inclination towards completing and solving these problems. For example, our class had a 5-week challenge for students to complete coding puzzles similar to the lab assignments, but they needed to complete these independently.

The next category is weekly discussions over various topics related to the course. These discussions take the span of 13 weeks. Every week, students research broader topics related to the course, write about their findings, and respond to their peers' findings. Topics include cybercrimes, artificial intelligence, and other relevant subjects. Since this is an engineering service course, these topics are a good way to introduce various computer science topics to students. These assignments appeal to students who enjoy writing and finding information themselves.

A less traditional pathway we developed is to have students reteach the topics they have learned in this course. Being able to teach material is regarded as a strong measure of understanding. For example, in this class students made videos of themselves teaching previous course topics and uploaded them to their college YouTube account. This assignment appeals to students interested in teaching or those who like to create content.

There is also a category where students can build on a previous homework assignment to add complexity. Adding new elements to previous assignments encourages students to revisit and reinforce concepts they had learned previously. For example, in this course, students can add a JavaScript element to their HTML website. This assignment can appeal to students who are more creative and curious in nature. For students who may find the standard assignment too easy, they can add more difficulty to challenge themselves. Additionally, students who are particularly interested in a certain course content topic can explore it further through optional or extended assignments. This allows students to align their learning experience with their specific interests.

The next pathway we created allows students to explore the course concepts in the real world. For example, in this course, students identify, take pictures, and write short descriptions of 25 different areas in their life where computer science exists in items that are not typically considered a computer. The purpose is for students to identify where they can apply what they are learning out in the real world. This can appeal to the students who want to know more about the importance of each course concept.

The last pathway is an optional final exam. This is for students who need one last chance to show what they have learned. This can appeal to students who perform well on tests or to make up for some things that might not have gone as planned. This is a comprehensive test that students can take if their grade does not reflect what they have mastered. For the instructor, it can also validate that a student has not actually learned what they claim.

Each pathway offers different point values, contributing to 1500 points available throughout the semester. In a typical grading system, 90% of the total assignments, or 1350 points, would be required to earn an A in the course. With our framework, a student will only need to earn 1050 points to earn an A, and they will earn a letter grade lower for each fewer than 100 points. This allows the students to complete the core assignments and only a portion of the additional categories to earn their grades. See Figure 6 for a breakdown of the points available. Some categories appeal to many different learning styles. Students are given flexibility in choosing assignments based on individual interests and strengths. The grading scale ranges from A to F based on accumulated points. Completing the four main categories is essential for passing the course, with a minimum requirement of 70% in each. Students can choose their own learning experience and achieve their desired grade level by selecting additional assignments or pathways.

FIGURE 6
COURSE FRAMEWORK

Service Course	
Assignment Choice	
Framework	
Core	
Reading/Quizzes	100
Exercises/Labs	100
Homework	500
Projects	200
Choice	
Engagement	100
Discussions	100
Concepts in the Field	50
Advanced Exercises	100
Deeper Dive, Homework	50
Comprensive Final	100
Total	

Grade Breakdown	
Points	Letter Grade
1050-1500	A
950-1049	B
850-949	C
750-849	D
0-749	F

LIMITATIONS

In researching assignment choice combined with competency-based grading, we encountered a limitation in the available literature. Most existing works on competency-based grading tend to overlook the role of retention as a critical component of the learning process. Instead, the emphasis is primarily on the specific tasks or competencies students must master. While this body of research provides valuable insights into assessing skills and knowledge acquisition, it does not fully address the diverse pathways students may take to achieve mastery. In our study, we explored and identified multiple ways students can reach a level of mastery, acknowledging that these approaches may not be identical for every individual.

The scarcity of literature exploring various paths to mastery with the freedom of student choice represents a notable gap in the current research landscape. Consequently, it limits the comprehensive understanding of how competency-based grading can best accommodate individual learning styles, preferences, and strengths. However, this gap also presents an opportunity for our research to contribute significantly to the field by shedding light on the importance of allowing students to personalize their learning journeys within the competency-based framework. By investigating the diverse methods students employ to achieve mastery, our study can pave the way for more inclusive and effective educational practices that cater to the unique needs of learners, thereby enhancing the overall efficacy of competency-based grading systems.

While investigating student satisfaction in the context of competency-based grading with the inclusion of student choice, we must acknowledge the potential for bias in the data collected through self-reported opinions (Van de Mortel, 2008). When students are aware that their feedback may influence the course structure or grading approach, there is a possibility that some may provide responses that align with what they believe the researchers or instructors want to hear. This social desirability bias could lead to overestimating overall satisfaction levels and positive perceptions of the benefits of having choice in mastering competencies. To mitigate this bias, we will employ a mixed-methods approach, triangulating self-reported opinions with objective measures of student performance, retention rates, and academic outcomes (DFQ rates explained above). By corroborating subjective feedback with concrete data, we aim

to ensure a more comprehensive and accurate assessment of the impact of choice in competency mastery on student satisfaction and success in the course. Additionally, we will adopt a neutral and non-judgmental stance during data collection to encourage candid responses from students, fostering an environment where they feel comfortable expressing their genuine experiences and perspectives.

FUTURE WORK

The observations conducted in this study have provided valuable insights into the benefits of assignment choice and competency-based grading in supporting the success and engagement of non-computer science students in CS courses. Building upon these initial findings, there are several avenues for future work and research. More research can further advance our understanding of this teaching approach and its impact on student outcomes.

Foremost, it is essential to establish a more formal study that delves deeper into the effects of assignment choice and competency-based grading. By conducting a comprehensive investigation, researchers can gather a more extensive dataset, analyze it rigorously, and draw robust conclusions regarding the efficacy of these approaches. The future study will encompass a larger sample size, including experimental and control groups to facilitate a more comprehensive comparison of outcomes.

In future research, we intend to build upon the observations and outcomes from previous classes and advance our understanding of the effectiveness of competency-based grading with assignment choice. To achieve this, we propose a rigorous control group study in which two separate classes, each consisting of 100 students, will be conducted consecutively in the same semester by the same professor and teaching assistants. The 10:10 a.m. class will serve as the control group and follow traditional grading methods. The 11:30 a.m. class will be the experimental group and will implement the novel methodology of competency-based grading with assignment choice. By maintaining consistency in the instructional team and course content, we seek to minimize confounding variables and focus squarely on the impact of the new approach on student outcomes. Throughout the study, we will collect and analyze data related to student performance, retention rates, and satisfaction levels in both groups. The comparison of results between the control and experimental classes will provide valuable insights into the efficacy of competency-based grading with assignment choice, offering evidence-based guidance for future implementation and educational practices.

Our department teaches three different service courses for non-CS majors. By collecting data from these classes, it will be possible to examine the specific effects of the proposed course design and implementation, comparing them with the outcomes of assignment choice and competency-based grading. This comparative analysis can provide a clearer understanding of the benefits and advantages offered by the intervention.

Exploring the relationship between assignment choice and student retention should be a key focus in future research. While the initial observations revealed a significant improvement in retention rates, it is crucial to delve deeper into the factors contributing to this outcome. By collecting more data on retention, examining student behaviors, and identifying the elements of assignment choice that impact retention, researchers can gain a more nuanced understanding of how to design assignments that promote long-term engagement and persistence.

The incorporation of qualitative methods, such as interviews and surveys, can complement the quantitative data and provide deeper insights into students' experiences with assignment choice. The qualitative approaches can capture students' perspectives on their motivations, engagement levels, and the influence of assignment choice on their learning experiences. Such insights can enrich our understanding of the underlying mechanisms and psychological factors contributing to the observed outcomes.

Another important area for future work lies in analyzing the survey data and the assignments chosen by the students. By carefully coding the surveys and analyzing the data related to the assignments, researchers can develop a framework for assessing the impact of different assignment categories on student performance and satisfaction. This analysis can shed light on which categories significantly impact student outcomes and highlight areas where adjustments or improvements may be needed.

Continuing to investigate the relationship between assignment choice and specific learning objectives is crucial. By closely aligning the assignment categories with the desired learning outcomes, researchers can assess the grades earned, student participation levels, and satisfaction levels associated with each category. This data can provide actionable insights for designing assignments that effectively support students' mastery of learning objectives and contribute to higher levels of retention and satisfaction. It may also facilitate the identification of categories that require further refinement or alternative approaches to increase engagement and effectiveness.

Overall, future work should aim to bridge the gaps in existing research (Lightfoot, 2023) on assignment choice concerning satisfaction and retention in CS education. By conducting more comprehensive studies, incorporating qualitative methodologies, and refining the analysis of survey and assignment data, we can contribute to developing evidence-based practices that foster student success, engagement, and satisfaction. Ultimately, this line of research can support the creation of inclusive and effective learning environments that remove artificial roadblocks and enable students to thrive in their educational pursuits.

CONCLUSION

Our research on implementing assignment choice with competency-based grading methods in undergraduate courses has revealed numerous benefits for student engagement, learning outcomes, and overall academic success. Through surveys conducted at the end of the semester, students overwhelmingly expressed appreciation for the assignment choice model, citing increased motivation, the ability to tailor assignments to their interests, and a sense of ownership over their learning journey. Moreover, our analysis of grade distributions across multiple service courses and professors demonstrated the positive impact of assignment choice on student success, with lower rates of D, F, and Q grades and improved mastery of learning objectives observed in courses utilizing this approach.

The investigation into the historical grade distributions across various service courses and professors revealed trends, with assignment choice courses consistently outperforming traditional methods. Despite course content and instructional style variations, the assignment choice model repeatedly yielded higher grade distributions, highlighting its effectiveness in fostering improved academic outcomes across diverse contexts.

We developed an overall framework centered on assignment choice and competency-based grading. This framework empowers students to take control of their learning experience, catering to diverse learning styles and preferences while providing flexibility in achieving desired grade levels. By incorporating a variety of assignment pathways and ensuring mastery of core learning objectives, our framework offers a holistic approach to student assessment and promotes deeper engagement with course material. This also provided an opportunity to raise the overall learning objectives of the course.

Our research underscores the importance of student autonomy and choice in promoting academic success and engagement. By embracing innovative pedagogical approaches such as assignment choice and competency-based grading, educators can create more inclusive and effective learning environments that empower students to thrive academically and reach their full potential. Moving forward, further exploration and refinement of these methods are planned, with the ultimate goal of enhancing student learning experiences and promoting lifelong learning.

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