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Exploring the Motivation and Impact of an Alternative Grading Redesign in a Four-Semester Design Sequence

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Introduction

Design experiences are an integral part of engineering education to prepare students to become working engineers [1]. However, it can be difficult to fully capture, assess, and provide feedback to students on design learning because of the varieties of way design instruction and implementation can happen (e.g., design courses, capstone projects, industry projects, co-ops, etc.). Iron Range Engineering – a program through Minnesota State University, Mankato – offers students a unique four-semester design sequence where they work full-time in engineering internships and co-ops while enrolled full-time in technical, design, and professionalism learning credits. This theory-to-practice paper describes relevant evidence-based practices in alternative grading and how they can be applied to design learning experiences. It is part of a sequence of papers published by Iron Range Engineering that explore the use of alternative grading in technical, design, and professional learning experiences. Although this paper specifically applies these practices to a unique multi-semester design sequence that involves students working in internships and co-ops, the work can be applied to design experiences more broadly as well.

Previous iterations of this four-semester design sequence used a grading scheme where students earned numeric scores on assignments that were weighted into a final grade. Following the redesign, an alternative grading strategy was implemented where students earn "tokens" for meeting learning objectives or turning in acceptable deliverables. This approach combines the alternative grading approaches of standards-based grading and specifications-based grading – allowing the instructors to identify both required learning outcomes to be met (standards-based), as well as learning experiences that they should participate in (specifications-based).

To explore the impact of this change, rates of tokens earned and final grades were compared for individual students before and after the change to token grading. These results give insight into how students experience and prioritize design learning – especially in work-based models. Demographic data offers further insight into how this change impacted various identity groups.

Background

Programmatic Context

Iron Range Engineering (IRE) is an ABET-accredited upper-division engineering program of Minnesota State University, Mankato that started in 2009. It is an Integrated Engineering program in which student engineers complete five semesters in the program, culminating in a Bachelor's Degree in Engineering. Students transfer in from community colleges after completing two years of pre-engineering courses. The first upper-division semester, called the

Bell Academy, is a preparatory semester of intensive design, professionalism, and technical engineering learning, including an industry-sourced design project [2]. The following four semesters (i.e., Junior 1 [J1], Junior 2 [J2], Senior 1 [S1], Senior 2 [S2] Semesters) are primarily co-op based learning in which students find engineering co-op placements, work in a variety of engineering roles across the country, and engage with faculty and facilitators/learning coaches to continue their design, technical, and professionalism learning. They take technical engineering courses in the evenings and in the summer, attend live seminars over Zoom regularly, and are supported by weekly check-in calls with their Learning Coach, a staff member within the program who helps the students liaison between academia and industry [3]. Evaluators focus on providing significant qualitative feedback to support individual growth and learning, in addition to quantitative grading. The goal is to support students' development in Design, Professionalism, and technical learning holistically, not with just a passing letter grade.

IRE has long utilized a 5-point grading scale to move away from simply giving a numeric score and instead focus on giving accurate scores accompanied by qualitative feedback [4]. The goal of this scale was to help students connect with learning outcomes instead of letter grades, which can impact student motivation as well [5]. However, the IRE faculty and staff saw potential to move even further from having numeric points and scores with the goal of placing even more emphasis on learning through other alternative grading approaches. This paper is part of a series of three papers exploring how token grading is experienced by students in technical [6], design (this paper), and professionalism learning [7].

Alternative Grading in Design Learning

Because of the complex nature of engineering design, there have long been challenges in assessing and grading design-based courses. Every project brings with it different challenges, considerations, and learning experiences, making it difficult to provide fair, robust grading and assessment. A variety of alternative grading methods have been implemented in engineering design courses to try to overcome some of these challenges.

For example, Mahajan and Bansal created performance metrics and rubrics to assess student outcomes in design courses. These rubrics were learner centric, action oriented, and measurable ways to assess ABET outcomes [8]. This work is impactful because it offers a consistent approach to assessment while still being learner-focused and geared towards activities that are "learning by doing" rather than more traditional classroom assignments. Similarly, Chowdhury et al. also created rubrics aligned directly with ABET Outcomes 1-7 for a senior capstone course, allowing for consistent assessment of student outcomes [9]. Finally, Atwood et al. created a standards-based grading system for their design course where students were given scores on the five learning outcomes from the course: design process, modeling, testing and validation, communication, and professional behavior. They found that students believed this grading approach had higher value than cost, and overall led to a focus on learning and growth [10].

Feranandez et al. take a different approach and award grades based on satisfactory assignments completed in a design course. These assignments included a preliminary design document, peer review activities, a system concept document, etc., and each of these assignments had a checklist of expectations [11]. Rather than focusing on meeting specific design outcomes, this grading system focused on participating in activities and turning in satisfactory work.

Although these approaches both vary from traditional grading practices, they focus on different things. [8-10] align more with standards-based grading, whereas [11] aligns more with specifications grading. As summarized by Lewis [12], in standards-based grading, grades reflect student proficiency on standards, whereas in specifications grading, grades reflect completion of work that meets certain specifications. In standards-based grading, students earn scores related to how well they meet course outcomes; in specifications grading, students earn scores by completing assignments [12]. Although specifications grading has been published about less frequently in engineering [13], it may offer some insights about ways to balance the challenges of grading in design contexts.

In some ways, these two approaches can feel at odds with one another. If we assess standards, student grades are directly related to their ability to meet course outcomes, but we miss out on being able to encourage the *process* of learning and encouraging growth. If we assess specifications, student grades are tied to their output, but it may be unclear if they are meeting the overall goals of the course. However, the challenge of navigating these two contrasting approaches should not dissuade us from exploring alternative grading strategies; instead, we can find ways to embrace both.

The Move to Token Grading

When working on a curricular and assessment redesign, it became clear that there needed to be a balance between assessing *products* and assessing the *process*. We wanted to assess students' ability to meet standards, but we also wanted to assess the learning and growth to get there. Some assignments lend themselves better to standards-based grading; there are specific standards that all students need to meet (e.g. ABET outcomes). There are other cases that lend themselves better to specifications-based grading; student learning can lead to many different outcomes and can look many different ways, so the grade should be dependent on the amount of satisfactory assignments completed (e.g. watching videos about design concepts and reflecting). Token grading allowed for a hybrid between these two approaches; students earned tokens by either meeting standards on some assignments or completing satisfactory work on other assignments. The total number of tokens earned translated to a final grade.

Although this was a hybrid between multiple existing alternative grading structures, the motivation could still be anchored in the Four Pillars of Alternative Grading [14]:

- **Clear Standards** through standardizing format of instructions and expectations for each assignment, including what the expectation is for earning token(s) on each assignment
- **Helpful Feedback** through focusing less on numeric values on a scale and more on providing qualitative indicators of things that went well, things that didn't go so well, and things that could be extended in the deliverable
- **Marks Indicating Progress** through providing students a spreadsheet that updated live upon grading to show their progress in the course, allowing for planning future strategy and knowing past completion
- **Reassessment Opportunities** through providing revision after feedback of assignments that are required to pass or multiple iterations of similar deliverables to allow for implementation of feedback.

Design Curriculum at IRE

Under the above standards of alternative grading, the curriculum for Fall 2025 was formed. Some deliverables stayed similar from the traditional grading scheme, but many changed based on feedback from both students and faculty/staff. The main aim of this redesign of the curriculum was to more accurately capture the design experience students gain while working in engineering co-op positions. The assignment categories helped to give flexibility to students in documenting their design experiences. The categories were consistent through J1-S2, but a level of iteration between each semester happens through a connection to a design theme. The themes for each semester of their experience serve as a lens that students can frame their design experiences within. This deepens their understanding of the design process and design in engineering more broadly. The themes for each semester are listed below with more lengthy descriptions in Appendix A:

- **J1: Applying the Design Wheel in Industry**
- **J2: Deepening Design Practice**
- **S1: Leading Design in Complex Systems**
- **S2: Designing for Broader Impacts**

The following section will describe the overall framing of the assignment types from Fall 2025 as well as some notes of continuous improvement points that have been made for the token grading iteration in Spring 2026. The tokens associated with each of these assignment types for Fall 2025 and Spring 2026 are shown in Appendix B.

Assignment Types

Scoping Presentation/Design Proposal: Originally framed as a proposal for their final design presentation, students first had an expectations meeting with their supervisor to discuss personal goals for a given semester in their work position. They also discussed what the supervisor's goals and work expectations were with a scope of the project work that would be expected. Students then reflected how they would utilize their previous design experience to complete the proposed design work as well as how the work will further develop their skills. Explicit ties to the design process were also made to help students form connections as well. Students also set goals associated with their professionalism and technical learning spaces of how those would influence their completion of the proposed design work.

Overall, this deliverable ended up being a little overly complicated as a worksheet based on the tokens that were associated, so for Spring 2026, this has been shifted to a Scoping Presentation to better align with framing students receive in their first semester of design. Students are asked to share their co-op information then connect their work they will be doing to design, technical, and professional learning. This structure aligns with the goals of standards-based learning; students describe how they will show competency while still having flexibility.

Design Updates and Artifacts: Next, a bulk of their documentation of the design learning while on engineering co-ops comes from design updates and artifacts. A design artifact is some kind of documentation or evidence of design work being completed. For example, in S1, leading design in complex systems, a student may include a screenshot of a task list or project management tool showing design-related goals. Students are asked to describe the artifact and its value in their design learning.

Design artifacts are paired with design updates where students update their learning coach on their roles in their co-op, and reflection on how their role connects to that semester's theme. Example reflection prompts are provided to students each semester related to their theme. One of the example prompts for S2, Designing for broader impacts, is "How did you consider long-term consequences or sustainability in your design?" The design artifact tokens align with specifications-based grading – students can choose many different types of artifacts and earn credit for the number of sufficient pieces of evidence shown. The reflection tokens align with standards-based grading – students are expected to meet the standard of that specific design theme (e.g. considering long-term consequences or sustainability). In Fall 2025, students completed the 9 artifacts and 3 design updates separately, which was a lot of separate deliverables that were overwhelming students. In Spring 2026, the artifacts are instead included more intentionally within the design update for ease of submission and integration for students, especially when tying to the design themes. These deliverables also lend well to standards-based grading where students are trying to show the design work they are doing and the design skills they are learning in a way that is helpful to them.

Design Videos and Reflection: Students experience a wide variety of different approaches, tools, methods used in engineering design based on which position and industry they are in for their co-op. To ensure some consistency in design instruction for all students, we have five 10-minute videos introducing concepts in design to students each semester, again related to the theme for that semester. Students are asked to watch the video and record engagement with the video through responding to reflective prompts:

1) What is something new you learned from this video?
2) Name a specific project you have worked on that came to mind during this video
3) What is a goal related to this video that you have for your design work this semester?

Because students can reflect on many different elements of the videos, these assignments are aligned with specifications-based grading: students earn tokens for completing each assignment to a sufficient level rather than showing evidence of meeting specific standards.

Systems Engineering: In Systems Engineering, students are expected to identify a system, typically from their role on co-op.Throughout the semester, they create a system diagram, learn about a type of system analysis (e.g. framework analysis or failure modes and effects analysis), and present their work. The Systems Engineering tokens come from a mix of standards-based grading and specifications-based grading. Standards include being able to conduct parts of system analysis including identifying inputs and outputs, components, and interfacing systems. Specifications-based grading activities include creating a rough draft diagram and learning about a systems analysis technique.

Design Presentations: At the end of each semester, students are evaluated on their design learning in the format of a presentation to faculty and peers on their design learning that semester. These are framed as co-op presentations for juniors and capstone design reviews for seniors with some variation in expectations between semesters. The design presentations mostly align with standards-based learning because there are specific outcomes expected for juniors and seniors. Juniors are expected to 1) describe engineering work completed, 2) demonstrate technical and design learning, 3) create and meet design goals, 4) synthesize experiences and provide professional advice, and 5) professionally present design work to peers. Seniors are expected to 1) describe engineering work completed, 2) show that they were able to design for constraints and standards, 3) follow an iterative design process, 4) incorporate prior design, professional, and technical learning into a design solution, and 5) synthesize experiences and provide professional advice. Many of these senior standards directly come from ABET requirements for a capstone experience.

Methods

Data Collection

All data collection and analysis procedures were approved under the appropriate Internal Review Board (IRB). Each semester, students complete work in an online management system for their (Design, Professionalism, and Seminar) DPS courses. In Fall 2025, students were invited to participate in a study where their gradebook data could be analyzed and paired to data in previous semesters. Approximately 75% of students opted to participate in the study. Participants could also choose to provide demographic data.

Analysis

Aggregate grade distributions were pulled for all semesters of Design in both Spring 2025 (old grading style) and Fall 2025 (new token style), which allowed for a comparison of all students enrolled. In addition, for students who opted into their individual gradebook data being included in the study, grades were analyzed by 1) calculating percentage of tokens earned in each assignment area, 2) pairing students' Spring 2025 (old grading style) and Fall 2025 (new token style) grades using a student identifier, and 3) using student-provided demographic data to calculate average grades across demographics. The demographics explored were gender, race, first generation status, veteran status, and neurodiversity. Diversity was defined by underrepresented groups within engineering [14]; gender diversity was defined as any student who identified as female, nonbinary, or transgender, and racial diversity was defined as students who identified as Black or African American; Hispanic, Latino, or Spanish origin; Asian; American Indian or Alaska Native; Middle Eastern or North African; or mixed. Students were also asked if they are first generation (neither parent earning a 4-year degree) or identify as neurodivergent. Because there were so few participants who were veterans, this data was excluded from final analysis. Final grades were compared for various demographic groups between the original grading scheme and the new token grading scheme. The Mann-Whitney U Test was conducted to determine if these changes were statistically significant ($p \leq 0.05$). This test was chosen because it does not assume normal distribution and is appropriate for a small sample size.

Results

Rates of Tokens Earned

To analyze which assignment categories students were prioritizing and which standards students were meeting, the percentage of tokens earned was calculated for study participants. Each value corresponds to the total tokens available in that category that were earned across all students. The breakdown by category type and semester in the program is shown in Table 1.

Table 1

Rates of tokens earned by assignment category and semester in program during Fall 2025

	J1 (n=17)	*J2 (n=16)*	*S1 (n=9)*	*S2 (n=19)*		*Total*
Design Proposal (2 tokens)	0.79	0.97	0.67	0.88		0.85
Design Updates and Artifacts (18 tokens)	0.69	0.84	0.82	0.87		0.80
Design Videos and Reflection (5 tokens)	0.74	0.85	0.84	0.95		0.85
Design Presentation (10 tokens)	0.84	0.93	0.84	0.96		0.90
Systems Engineering (17 tokens)	0.63	0.89	0.81	0.94		0.82

Visibility of Outcome Achievement

The Design Presentation was an assignment that stayed similar in expectations between the old grading system and token grading system. In Table 2, the average scores on design presentations are presented for each of the four cohorts. Table 3 and 4 then present a comparison between the rates of tokens earned on the design presentation outcome by outcome. While rubric items did exist for Design Presentations in the old grading system, the achievement of specific outcomes is lost when the aggregate score is put into the gradebook.

Table 2

Average scores on the old 5-point scale for Design Presentations in Spring 2025

	J1 *(n=17)*	**J2** *(n=12)*	**S1** *(n=24)*	**S2** *(n=8)*
Average Score	4.09	4.06	4.05	4.08

Table 3

Rates of tokens earned for junior design presentation outcomes in Fall 2025

	J1 (n=17)	*J2 (n=16)*
describe engineering work completed	0.97	1.00
demonstrate technical and design learning	0.91	1.00
create and meet design goals	0.74	0.78
synthesize experiences and provide professional advice	0.76	0.97
professionally present design work to peers	0.83	0.88

Table 4

Rates of tokens earned for capstone design presentation outcomes in Fall 2025

	S1 (n=9)	***S2 (n=19)***
describe engineering work completed	0.94	1.00
design for constraints and standards	0.83	0.91
follow an iterative design process	0.83	0.97
incorporate prior design, professional, and technical learning into a design solution	0.89	0.97
synthesize experiences and provide professional advice	0.72	0.97

Final Grade Distributions

Figure 1 shows the overall grade breakdown of students from Spring 2025 and Fall 2025. This data is aggregate, so it includes the overall distribution for all students, not just those who opted into other parts of the study. Analysis of final grades shows an evening of the distribution of final grades. Most notably, in the old grading scheme, 30% of students earned a B+, but grades were more evenly distributed across the B- to A+ range for the new token grading system.

Figure 1

Overall grade breakdown comparison for all students in course using old grading scheme (Spring 2025) and new token grading scheme (Fall 2025).

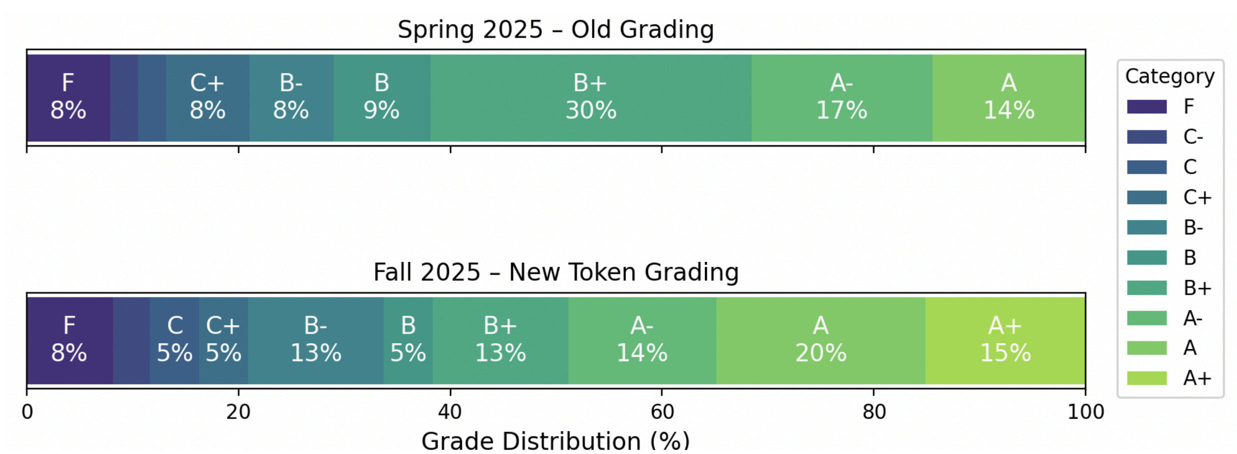
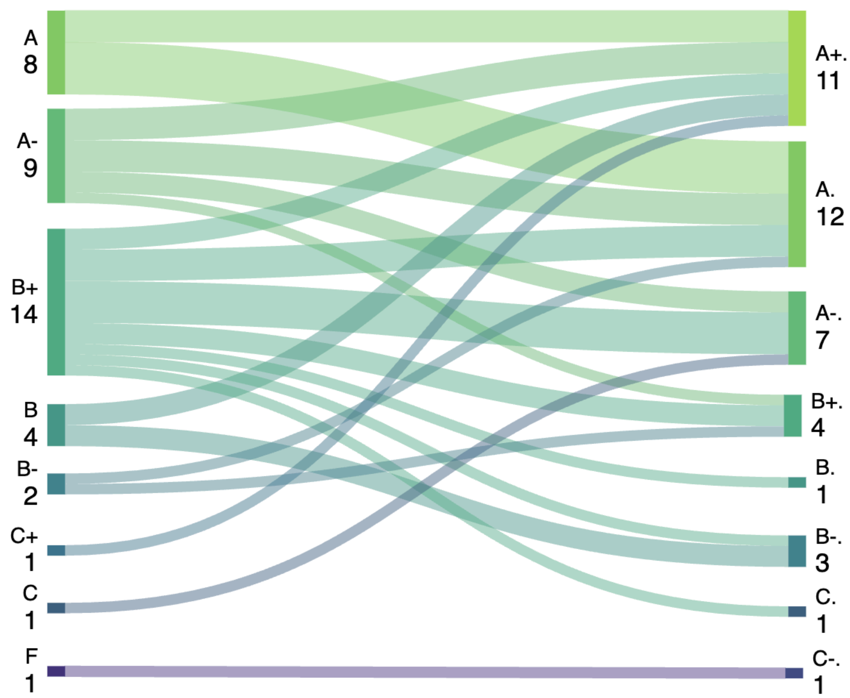


Figure 2 then shows a paired visual analysis between Spring 2025 and Fall 2025 for those students who consented to have gradebook data accessed in both semesters. The left side shows the grade the student received in Spring 2025 before the grading change and the right side shows the grade received in Fall 2025 after the move to token grading. This also shows the large number of B+ grades spreading out across the B and A range.

Figure 2

Paired visualization of students' grades for Design in Spring 2025 (left side) and Fall 2025 (right side). This only shows students who opted into sharing their individual grades.



Demographic Impacts

Table 5 contains average grades on a 4.0 scale under the two grading systems across three groups: 1) average Spring 2025 grade (old system) for all study participants who had a grade available, 2) average Fall 2025 grade (new token system) for all study participants, and 3) average Fall 2025 grade for all study participants who also had a Spring 2025 grade available. The third group, titled "returners", were students who had taken a course in the Design sequence the semester before and had opted into their gradebook data being shared in both semesters. For reference, an A+ is a 4.33, A is 4.00, A- is 3.67, B+ is 3.3, B is 3, B- is 2.67, C+ is 2.33, C is 2.00, C- is 1.67, and F is 0. These averages are given for the total sample of students and then is broken down into demographic groups. No statistically significant differences were found for any group, but the decrease in average grade for students who identified as neurodiverse should be considered.

Table 5
Average grades for students under the old system and token system, both paired and all students.

	Average Grade with Old System	Average Grade with Token Grading	Average Grade with Token Grading for Returners Only
Total	3.3 (n=40)	3.4 (n=63)	3.7 (n=40)
Gender diverse	3.5 (n=16)	3.6 (n=23)	3.9 (n=16)
Racially diverse	3.4 (n=20)	3.5 (n=27)	3.7 (n=20)
First generation	3.3 (n=19)	3.3 (n=28)	3.9 (n=19)
Neurodiverse	3.5 (n=7)	2.9 (n=14)	3.7 (n=7)

Takeaways

Based on the results and the overall experience of the authors, all of which were part of the redesign of the design curriculum as well as evaluators on the course series, takeaways here are categorized for those who are looking to implementing alternative grading in design courses generally and those who are implementing alternative grading in a similar design course series.

For Those Implementing Alternative Grading in Design Courses & Experiences
Token grading led to more even grade distributions, which is likely due to the change in the grading system overall versus individual assignment/curriculum changes. From our perspectives as evaluators with familiarity of alternative grading literature, this shift is not particularly surprising. Token grading allows students autonomy in prioritizing assignments. The overall increase in average scores alleviates some of the concerns related to navigating a changing grading structure. However, it should be noted that the average grade for students who identified as neurodiverse decreased when comparing all grades for each grading type. On the other hand, the average grade increased for students who identified as neurodiverse *and* who had also taken a course from the Design curriculum the previous semester. These results could be due to a variety of factors such as who opted into the study and the relatively small sample size, but it does speak to the importance of supporting students in their first semester of this type of grading structure or students coming back from a semester away. Existing work that explores the intersection of neurodiversity and alternative grading schemes may give further insight to why this result may have occurred. Some scholars state that alternative grading schemes require students to re-learn the "rules" of grading and that neurodivergent students may struggle to adapt to these changes [16]. Other scholars have provided a critical response to this work, arguing that these grading schemes can provide students with more agency and open up conversations about expectations, which can dismantle "singular standards" that may be raced or abled [17]. Our findings may

further demonstrate this tension between the danger of "rewriting the rules" and the benefit of providing agency and autonomy. The impact of this change on students who identify as neurodiverse should be further explored, but instructors implementing a change to an alternative grading scheme should be mindful to create a scheme that embraces transparency and agency.

The hybrid approach of awarding tokens for standards met and work completed allows for assessment of both subjective and objective assignment types in design, which has been a long challenge within design learning spaces. Summative work such as the design presentations can be graded using specific standards that are expected of all students, whereas reflective assignments such as video reflections or artifacts can be graded based on completing work to a specified level. By not conforming to one specific type of alternative grading, students are able to receive a structured learning experience that helps them to understand, document, and capitalize upon their learning experiences, which may be a co-op or internship, industry project, or internal course project.

Token grading can give insight into which design standards are being met, as well as how students are prioritizing and interacting with their design work. For example, for tokens related to design standards, such as those with the design presentations and systems engineering, we could see growth as students went from their J1 to S2 semesters. J1 students earned 84% and 63% of tokens for design presentations and systems engineering, respectively; whereas S2 students earned 96% and 94% of tokens. Furthermore, achievement rates for specific standards were now made easily visible to instructors for assessment purposes. As seen in Table 2, before token grading was implemented, there was little information available about which standards were being met. In addition, average scores were consistent across all cohorts; no growth was measured from J1-J2 or S1-S2. As seen in Tables 3 and 4, when token grading was implemented, outcome achievement could be measured by looking at tokens earned, and clear growth is now seen between the J1-J2 semester and S1-S2 semester. In addition, for tokens related to specifications-based assessment, we could see how frequently students were choosing to engage with their design videos. There was a concern that students would opt out of assignments if they were not required, but we saw students completing required and opt-in tokens at similar rates. For example, about 85% of the design video tokens were earned.

For Those Implementing a Similar Design Course Series

By **creating similar assignments across the multi-semester design sequence while adding different design themes for each semester**, students can develop new design skills in a structured way. Because the types of assignments are consistent, students could place more of their cognitive load towards developing new design skills and learning rather than trying to navigate new assignment styles and expectations. Students are learning new types of system analysis, new design approaches, etc., but these are still anchored in the same types of presentations, reflections, and documents.

Assignments like design artifacts, updates, and a final summative design presentation can allow students to use their internship and co-op work to show that design outcomes are being met. Design on individual co-op experiences can be complex and challenging to grade since they are all so different, but the design artifacts and updates provided enough structure to students to show that they met outcomes using work that was most relevant to their role and work. Because token grading is a hybrid of standards-based and specifications-based grading, it provides a balance between providing students with flexibility *and* structure; they can submit any artifact that is sufficient work (specifications-based), but they also can show that they are meeting outcomes through their reflections on the design themes (standards-based). This structure also supports faculty evaluators; the flexibility of artifact types allows faculty to gain insight into the wide variety of work that students are doing on co-op, and the structure of the assignments still ensures that there are clear expectations for evaluation.

Limitations & Future Work

This work intended to share the motivation and impact of the shift to a new alternative grading strategy in a four-semester design sequence. Exploring data from the first transition semester gave insight into what this shift looked and felt like, but it is important to continue to explore this data over future semesters to see the longer term impacts of the shift. A main limitation of this study is the many complex factors that play into the experience of token grading. Not only were students experiencing a new token grading system, they were also experiencing some new assignment types and navigating an overall curricular shift. We will continue to refine the structure of the grading scheme and analyze how student outcomes in design can be assessed and if they are being met long term. The shift from having assignment scores that aggregated multiple standards into a single numerical store to having tokens that directly tie to course outcomes will allow for long term assessment of course outcome achievement. Although the changes in the grading scheme did not allow for a controlled comparison of outcome achievement, the new grading scheme now provides clear information about outcome achievement, while still allowing for a combination of assessing outcomes (standards-based) and assignment completion (specifications-based).

Feedback gathered on the effectiveness of the design curriculum came from student questions, evaluator concerns, and formative feedback gathered and presented in this paper. The formative feedback did not specifically ask about design assignments, and continuous improvement was implemented based on an interpretation of students feedback on the overall token grading experience. An additional limitation of this work is the population; students opted into sharing their gradebook data, leading to a limited sample and a potential skew to our data.

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Appendix A: Design Themes in the 4-semester sequence

J1	**Design Theme: Applying the Design Wheel in Industry** In this semester, students begin translating their academic understanding of the design process into real-world practice. The focus is on recognizing and articulating problems, setting meaningful objectives, and engaging with the design wheel in the context of their Co-Op role. Students are expected to demonstrate awareness of how their work intersects with design, even if they are not in traditional design roles. This theme supports ABET outcomes related to problem identification, professional context, and the ability to apply engineering design to produce solutions that meet specified needs.
J2	**Design Theme: Deepening Design Practice** This semester emphasizes intentional engagement with design tools and methods. Students are expected to show growth in idea generation, modeling, testing, and evaluation; core components of iterative design. The goal is to move beyond awareness into active participation, using structured techniques to improve designs and processes. This theme aligns with ABET outcomes focused on experimentation, analysis, and iterative improvement, as well as teamwork and communication in design contexts.
S1	**Design Theme: Leading Design in Complex Systems** Students in this semester are challenged to take on leadership roles in design, whether formally or informally. The focus is on navigating complexity, integrating cross-disciplinary knowledge, mentoring others, and making data-informed decisions. Students should demonstrate how they influence design outcomes and contribute to systems-level thinking. This theme supports ABET outcomes related to leadership, systems integration, ethical and professional responsibilities, and the ability to function effectively on teams.
S2	**Design Theme: Designing for Broader Impact** In this final semester, students are expected to synthesize their design experiences and demonstrate how their work contributes to a broader impact on users, organizations, communities, and systems. The focus is on designing with intention, responsibility, and awareness of long-term consequences. Students should be able to articulate how their design decisions reflect considerations of sustainability, ethics, equity, and innovation. Importantly, students are also expected to engage with relevant engineering codes, standards, and regulations, showing how these frameworks guide responsible design and ensure safety, reliability, and compliance. This theme supports ABET outcomes related to societal impact, professional responsibility, lifelong learning, and the ability to apply engineering design in complex, real-world contexts.

Appendix B: Example Student Token Sheets for J1 Design in Fall 2025 & Spring 2026

Fall 2025:

Design Proposal	
Completion	☑
Supervisor Involvement	☐

Design Updates		
Update 1	Role & Work Documentation	☑
	Artifacts as Evidence	☑
	Reflection Response	☑
Update 2	Role & Work Documentation	☑
	Artifacts as Evidence	☐
	Reflection Response	☐
Update 3	Role & Work Documentation	☐
	Artifacts as Evidence	☐
	Reflection Response	☐

Design Artifacts	
Artifact 1	☐
Artifact 2	☐
Artifact 3	☑
Artifact 4	☑
Artifact 5	☐
Artifact 6	☑
Artifact 7	☑
Artifact 8	☑
Artifact 9	☑

Design Videos and Reflection	
Design Video 1	☑
Design Video 2	☐
Design Video 3	☑
Design Video 4	☑
Design Video 5	☑

Design Presentation	
Co-Op or Project Role	☑
Co-Op or Project Role	☑
Learning & Topic Variety	☑
Learning & Topic Variety	☑
Goals & Attainment	☑
Goals & Attainment	☐
Professional Advice	☑
Professional Advice	☑
Presentation Quality	☑
Presentation Quality	☑

Systems Engineering		
Phase 1	Rough Draft Submitted	☑
	Purpose Description	☑
	Boundary, Scope, & Feedback Loop	☑
Phase 2	Inputs/Outputs	☐
	Components	☐
	Interfacing Systems	☐
	Professional Presentation	☐
	Additional Description (bonus)	☐
Phase 3	Quiz Question 1	☐
	Quiz Question 2	☐
	Quiz Question 3	☐
	Quiz Question 4 (bonus)	☐
Phase 4	System Description	☑
	Framework Description	☑
	Application of Framework	☑
	Stated Recommended Change	☑
	Implications to Other Systems	☑

Number of Tokens	Grade
30	C-
33	C
35	C+
37	B-
39	B
41	B+
44	A-
47	A
50	A+

Your Current Tokens	32
At least 1/2 Design Proposal Tokens earned?	Yes
At least 5/10 Design Presentation Tokens earned?	Yes

Spring 2026:

Scoping Presentation	
Description of Co-Op and Work Responsibilities	☑
Presentation Techniques	☑
Connection to Design	☑
Connection to Professionalism	☐
Connection to Technical	☑

Design Updates		
Update 1	Artifact 1	☑
	Artifact 2	☑
	Artifact 3	☑
	Reflection	☑
	Reflection	☐
Update 2	Artifact 1	☑
	Artifact 2	☑
	Artifact 3	☐
	Reflection	☑
	Reflection	☑
Update 3	Artifact 1	☑
	Artifact 2	☑
	Artifact 3	☑
	Reflection	☑
	Reflection	☑

Design Videos and Reflection	
Design Video 1	☑
Design Video 2	☑
Design Video 3	☐
Design Video 4	☐
Design Video 5	☐

Design Presentation	
Co-Op or Project Role	☑
Co-Op or Project Role	☑
Learning & Topic Variety	☑
Learning & Topic Variety	☐
Goals & Attainment	☑
Goals & Attainment	☐
Professional Advice	☑
Professional Advice	☐
Presentation Quality	☑
Presentation Quality	☑

Systems Engineering		
Phase 1	Rough Draft Submitted	☑
	Purpose Description	☑
	Boundary, Scope, & Feedback Loop	☐
Phase 2	Inputs/Outputs	☑
	Components	☑
	Interfacing Systems	☑
	Professional Presentation	☑
	Additional Description (bonus)	☐
Phase 3	Quiz Question 1	☑
	Quiz Question 2	☑
	Quiz Question 3	☑
	Quiz Question 4 (bonus)	☐
Phase 4	System Description	☑
	Framework Description	☑
	Application of Framework	☑
	Stated Recommended Change	☑
	Implications to Other Systems	☐

To pass design, at least 5 of the 10 tokens on the Design Presentation MUST be earned. Even if you have 30 tokens without these, you will not pass the course.

Your Current Tokens	**39**
At least 5/10 Design Presentation Tokens earned?	Yes
Tokens still available	3

Number of Tokens	Grade
30	C-
33	C
35	C+
37	B-
39	B
41	B+
44	A-
47	A
50	A+