Late or Not Late - Student Perception of Performance, Confidence, and Sense of Belonging When Late Submission Is Accepted

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***Abstract*—In this research full paper, we report on the results of a large-scale study to answer the following research question: What is the impact of the late submission practice on students' perception of their sense of belonging, confidence, and performance, their actual performance in the course, and other experiences in their course?; Does the impact differ by different socioeconomic, and demographic student groups (e.g. ethnicity/race, gender, first-generation, transfer-student status, work status, etc.), and whether students utilized or did not utilize the practice?**

Being intentional in fostering an environment where diverse groups of students can thrive in a discipline can contribute to increasing diversity in the corresponding workforce. This is especially true for fields like Computer Science and Engineering where lack of diversity continues to be a major challenge. One way to broaden participation and increase student success is the adoption of equitable pedagogical and grading practices. In this paper, we describe students' perception of performance, confidence, and sense of belonging (SoB) when they are permitted to submit coursework past a set deadline. We report on the data in the context of the different student groups outlined above. Our hypothesis is that such practice contributes to improved student performance by focusing on learning rather than grades. Our results show that students highly valued this practice and provided a 4+ rating on a 5-point Likert scale, indicating a positive perception and more specifically perceived them as having a positive impact on their SoB, confidence, and performance. This practice also helped in improving students' course performances. This work will help in understanding the empirical evidence of the impact of this practice on student experiences across various student groups.

I. Introduction

Women and other marginalized groups continue to be underrepresented in different STEM fields [1], [2]. The term *pipeline shrinkage* encapsulates this well-established phenomenon and is evident from the early educational phases where a reduced number of students from these groups pursue STEM degrees to the professional stage where career advancement and representation in leadership roles persist [3]–[5]. Promoting equitable practices in the classroom is a key strategy in addressing pipeline shrinkage in STEM fields [6]. Building equitable classroom environments cannot by itself increase representation, but it can help retain marginalized students and be included in the classroom [7]. A variety of pedagogical methods has proven effective in promoting equity among students and ensuring similar learning outcomes regardless of systematic disparities.

Results of two prior works [8], [9] focused on finding the current perspectives within the CS Education Community on equity and their use of practices adopted in pursuit of equity in the classroom, revealed that most faculty participants consider this topic important, but not all are clear on the meaning of equity or the actions to take to make the classroom more equitable. The CS community seemed to be familiar with the list of practices that were included in the study to promote equity in the classroom, but there was wide variability in the adoption of those practices to make the classroom more equitable. Although we know that these practices promote equity in the classroom, there is a lack of adoption and evaluation of these practices within CS and engineering undergraduate education. Most of these pedagogical practices are mostly implemented in K-12 settings [10]–[12]. Cooper et al. [13] have emphasized that computing education researchers need to better understand the lack of diversity in computing and also investigate ways to make computing classes more equitable for a diverse group of students.

This led us to choose four equitable practices and implement them in a large introductory CS1 course at a doctoral university with high research activity in the south-eastern US during the Fall of 2023. For this paper, we choose to delve in-depth into one of the practices, namely the *late submission practice* for a thorough analysis. Through this practice, we aim to increase participation and improve the performance and success of students across social groups in the course as well as more widely in the CS field. The purpose of this paper is to present the implementation of this practice and its evaluation in terms of how students perceive its impact on their performance, confidence, and sense of belonging, as well as their performance in the course. Further, we present the variation of this result according to various student groups.

The contributions of this study are:

- empirical evidence of how students perceive the impact of the practice on their performance, confidence, and sense-

of-belonging, their actual performance, and their course experience
- variation in students' perceptions by factors including practice utilization, employment status, first-generation, transfer students, full-time students, financial aid, financial risk indicators, and gender-race intersectionality.

II. Literature Review

In this section, we present literature related to equity, student experience constructs, and the late submission practice.

A. Equity

In this work, we utilize the following definition of equity [9] to understand equitable practices:

> ***Equity in CS Education*** *is the absence of systematic disparities in educational outcomes between social groups, who have different levels of underlying social advantage/disadvantage.*

This definition acknowledges the existence of **systematic disparities** and emphasizes that the goal of equitable education is to eliminate these disparities in **educational outcomes**, which may include assignment grades, passing grades, course completion, or graduation rates. It underscores the importance of achieving uniform learning outcomes across all **social groups**, and recognizes that varying levels of underlying social advantage can influence these outcomes, potentially requiring additional resources or special attention for some groups to provide them the opportunity to achieve the educational outcomes as others. We refer to educational practices that help promote this idea of equity as equitable practices.

B. Performance, Confidence and Sense-of-Belonging

In the context of education, performance is measured through classroom assessments where student academic outcome is commonly associated with how well they perform on those assessments. Educators and institutions use these outcomes such as grades on assignments and final grades to calibrate instruction, course content, and the assessments themselves [14]. Numerous studies explored the factors that can predict student performance [15], [16]. These studies have been used to identify interventions that educators can implement and actions students can take to improve their academic performance and success.

Self-efficacy encompasses a person's confidence not only in their skills and capabilities but also in their capacity to overcome challenges and obstacles [17]. Nicholson et al. [18] identified confidence as one of four keys to successful achievement as an undergraduate student. Students who might be confident in their abilities in general education courses find themselves confronted with unfamiliar concepts in computing courses that can lessen their confidence in their ability to perform well. One of the things that contribute to feeling confident is experiencing success [19]. Adopting practices that address areas where students are more likely to experience failure or unsatisfactory results can be impactful on students' perception of confidence. Offering choices for how students can meet course milestones makes education accessible to a spectrum of students. Inclusive interactions and a supportive learning environment contribute to an equitable atmosphere, recognizing and addressing the unique challenges students may face.

Within educational research, Sense of Belonging (SoB) is known as a strong predictor of performance and persistence. Several studies have tried to identify factors that might contribute to the representation gap and have found that one of the biggest barriers to retention is students' SoB [20], [21]. SoB is related to students' perception of ability. Belonging is a fundamental human need that has been placed third on the Maslow's hierarchy of needs highlighting the importance of individuals feeling that they fit in. SoB has been identified as a factor affecting student learning in relation to attrition, persistence, performance, engagement, motivation, and confidence [3], [22], [23].

In investigating SoB in first-year college students, Hoffman et al. highlighted the importance of social and academic support [24] and noted that the quality of connections between students is influenced by students' perception of how much they are supported by their instructors. Students who reported stronger connections with their instructors tended to attribute this to instructors' traits that relay compassion such as flexibility and understanding.

Several studies revealed that SoB vary across different student groups [23], [25], [26]. This has resulted in identifying SoB as an important component in any discussions and initiatives for targeting the lack of representation in STEM fields. Kapoor [27] highlighted the need of the computing community to understand these variations in order for us to be better equipped to address them.

C. Late Submission Practice

Grading practices have become a source of inequity in classrooms with traditional practices hindering academic progress, and demotivating students [28], [29]. According to Feldman [30], traditional grading includes a component that evaluates student's behaviors, often including timeliness, and other behavioral measures. Often these expected behaviors may not fairly accommodate diverse life circumstances outside of school, disadvantaging those with work commitments or family responsibilities. To promote equity, he mentioned penalties should be removed, grade scales should be compressed, and assignments should be allowed to be resubmitted. Guskey [12] discussed four grading policies that could facilitate a more equitable classroom experience for K-12 students. Both Guskey and Feldman stress the importance of assessing students solely based on their academic performance rather than their behavior or relative performance compared to peers. They advise against practices like grading on a curve, using grades as punishment, and employing zeros to penalize behavior. This study implements and assesses a late-submission policy without imposing grade penalties.

Various studies have explored different deadline structures with late submission practice within computing courses, in-

cluding no deadlines, suggested deadlines, soft deadlines, and mid-term hard deadlines, aiming to understand their impact on student success metrics such as pass rates fail rates, incomplete rates, and withdrawal rates [31]. Others investigated the effects of extension lengths [32]–[34], and the utilization of automatically approved extensions and staff-approved extensions [**?**]. Additional studies examined the placement of deadlines throughout the day and week [35].

Much of the existing research concentrates on the effect on student performance with late submission practice. There is a limited number of investigations that have looked into the ramifications of allowing late submissions on students' perceptions of their sense of belonging, confidence levels, and academic performance. Our work addresses this gap by investigating student perception of the impact of allowing late submissions without a grade penalty on their performance, confidence, and sense-of-belonging. Furthermore, our study investigates how this practice is perceived by different student groups, aiming to uncover any variations in attitudes, experiences, and reactions among diverse cohorts of students.

III. Course Background

A. Course Overview

The course this study was conducted in is an introductory programming course for non computer science (CS) majors and the first course for students interested in pursuing a CS major or related minor. The course introduces students to basic computer literacy, computational thinking, and problem-solving using a high-level programming language. Throughout the semester, students learn various computational concepts and apply them to solve introductory problems and build programs that implement their solutions. On average 35% of students that take this course are non-CS majors. Based on a course introductory survey, the majority of students identified using he/him pronouns (around 70%), while a quarter (26%) preferred she/her pronouns. Both groups — those identifying as 'they/them' and those who preferred not to disclose their gender — comprised less than two percent (1.6%) of the total. In this survey, students also reported their previous exposure to computer science, with 60% having prior experience (e.g., high school, summer camps, self-taught).

The course section had an enrollment of 1016 students at the start of the semester and 979 students at the end. The course schedule comprised one lecture session and two lab sessions. Each meeting lasted 75 minutes, resulting in a total of 3 hours and 45 minutes of weekly instructional time.

The lecture time was dedicated to introducing weekly topics, drawing connections to previous material, and featuring interactive demonstrations by the instructor. During lab sessions, students engaged in problem-solving activities to apply concepts learned in the course. These sessions were facilitated by instructional assistants, a team of 40 students — both graduate and undergraduate, who were enrolled in the program.

The activities and coursework are divided into several components and for assessment purposes, these components are divided into two parts:

TABLE I: Course components and grading criteria

Category	Description	Points
Textbook prep	Interactive textbook introducing course concepts.	10
Lab problem sets	Students work during lab sessions with peers and instructional assistants solving computational problems.	20
lab portfolio	Students complete an entry for each module to demonstrate their knowledge, skills and understanding in relation to the module objectives	30
Module quizzes	Students complete a check your understanding quiz at the end of each module	50
Final portfolio	The final portfolio assignment is designed to encourage students to think critically reflect on their learning experiences, and synthesize their knowledge across the course topics.	30
Final exam	A cumulative quiz that covers the topics covered in the course.	50
Active learner	These activities assist students in being active learners, engaging and participating in the course through reflections and discussions.	10

- Learning Opportunity (LO) are activities students complete to engage in learning the topics introduced in the course.
- Learning Showcase (LS) are activities that serve as a compilation of student work, reflections, and demonstrations of knowledge, skills, and understanding in relation to the course objectives.

Throughout the course, students have opportunities to earn points for participating in and completing learning activities. Table I outlines the grade components and the distribution of points. The course grade is computed using a point system with a total of 200 points. Students don't have to get everything correct to earn some of those points. For example, students earn points for their textbook prep by reviewing assigned textbook sections and attempting the embedded activities (multiple-choice questions and interactive code blocks). The course places a strong emphasis on the process of learning rather than solely focusing on the end result.

B. Late Submission Practice

Each assignment was given a specific due date to provide structure and ensure a smooth progression of learning. Students were reminded in the syllabus and throughout the semester that meeting these deadlines is expected and ensures consistent progress and optimal engagement with the material. Students were permitted to submit assignments past their due dates, with submissions accepted until the last day of classes and without any penalties. Quizzes were proctored activities, and students needing to make up a quiz were required to submit a request via Google Forms. All requests for make-up quizzes were approved, and students had to attend office hours to complete any missed quizzes.

IV. Method

The goal of this study is to *examine the impact of a late submission practice on students' perceptions, performance,*

and experiences of a course, and how it differs by various student groups. We conducted this IRB-approved study with pre-experimental research design to answer the following research question:

- What is the impact of the late submission practice on students' perception of their sense of belonging, confidence, performance, and other experiences in their course?
- Does the above impact differ by different socioeconomic, and demographic student groups (e.g. ethnicity/race, gender, first-generation, transfer-student status, work status, etc.), and whether students utilized or did not utilize the practices?
- What is the impact of the late submission practice on students' performance on two specific assignments in their course?

In this section, we provide details about the timeline of data collection, the variables measured, and the study participants.

A. Measures for Performance, Confidence and Sense of Belonging

We utilized a Qualtrics survey during the last week of the course to collect the data. The survey included the following: students' email ids, questions on students' demographics and backgrounds (presented in Table II), questions shown below on students' perception of the practice on their performance, confidence, and SoB using a 5-point Agree/Disagree Likert scale, an open-ended to understand other ways in which the practice might have impacted students' experience in the course.

- Helps me improve my performance in the course
- Helps me improve my confidence in the course
- Contributes to my feeling of being accepted in the course
- Contributes to my feeling of being comfortable in the course
- Contributes to my feeling of being supported in the course
- Contributes to my feeling of belonging to in the course

The last four questions are for the assessment of SoB, which are a subset of questions adapted from the SoB instrument from [36], which focuses on SoB at the class level. Levy et al. (2021) [26] also used this subset of SoB instrument questions to measure SoB in various introductory computing courses, lending credibility to our selection of these items in our survey. To address the construct and content validity of this survey questions, we piloted it in an introductory computing course, and the results are presented in [37].

Supplementing students' perception data, to understand the impact on students' performances in the course, we examine the students' grades in two assignments. The lab portfolios, and quizzes, were considered for students' performance as only for these assignments, we were able to track if students submitted their assignments late or not from the Canvas LMS. For each of these assignments, for each student, we calculated their grades if the practice was not put into place and the grades that they received with the practice. We conducted a paired t-test to examine the difference.

B. Analysis of Student Experiences

In addition to the quantitative data collected from the survey, participants also provided feedback to an open-ended question where they were asked "Are there any other ways you think this practice impacted your experience in the course? If so, please explain".

To understand the text responses collected from the surveys, we utilized Natural Language Processing (NLP) methods. NLP allows us to extract concepts and relationships from text. The two main methods we used are word frequency analysis and clustering.

The first step in both approaches is to represent the text as a vector of features. A common feature extraction technique for textual data is the Bag-of-Words (BoW) model, which represents text based on the occurrence of words. The BoW model includes a vocabulary of known words and measures the presence of these words in the text. This provides information about the words that appear (and do not appear) in the text.

We used an NLP Python library to remove stop words and perform stemming, generating a list of each word that appeared in the text. Additionally, we created a frequency list that records the number of times each word occurs in the text. This process was applied to the text from the open-ended questions.

The second text analysis approach we used was clustering. Clustering groups similar items together to reveal patterns in the data. To measure the presence of a word, we can use simple word frequency or the TF-IDF method. TF-IDF, considered an enhanced text representation, normalizes word frequencies based on their relative occurrence in a single document and across the entire corpus. In TF-IDF, the term frequency for each word is adjusted by the inverse document frequency (IDF). This normalization reduces the weight of terms that occur frequently across the corpus, emphasizing more discriminative words with relatively low frequencies. To improve clustering performance, we utilized the TF-IDF representation and applied KMeans clustering using Python's scikit-learn library.

C. Study Participants

The course had a total of 1016 students, out of which 384 students consented to participate in the study. In Table II, we present their demographic and background information.

V. Results and Discussion

This section presents the results of the evaluation of students' perceptions of the impact of the late submission practice on students' performance, confidence, SoB, and their experiences in the course.

A. Practice Utilization

The survey included a 5-point Likert scale question that asked students the frequency with which they utilized the late submission policy. Among the participants of the study (n = 384), students who chose **always**, *often*, or *sometimes*, or *rarely* were identified as the group of students, who utilized the practice (n = 309), and students who chose *never* were

TABLE II: Background information about the participants

Gender	**Man**	**Woman**	**Gender Diverse**	**No Response**	
	223	128	11	22	
Race and Ethnicity	**White**	**Asian**	**Underrepresented**	**Mixed Race**	**No Response**
	127	106	98	31	22
Practice Utilization	**Utilized**	**Un-utilized**			
	309	75			
Employment Status	**Employed**	**Not Employed**			
	108	276			
First Generation	**Yes**	**No**			
	107	277			
Transfer Student	**Yes**	**No**			
	102	282			
Full Time Student	**Yes**	**No**	**No Response**		
	340	15	29		
Financial Risk Indicators	**One or More Selected**	**None Selected**			
	64	320			
Financial Aid	**Yes**	**No**			
	241	143			

denoted as the group that did not utilize the practice (n = 309). Across these two groups, we examined the impact of the late submission practice on the three constructs: performance, confidence, and SoB. From the students' responses, we find that the practices have a positive impact on their performance, confidence, and SoB in the course (average rating of more than 4) as shown in Figure 1. Additionally, after comparing the mean impact of the practice on each of the three constructs across the two groups of students, who utilized and did not utilize the practice, we find that there is a significant difference (p-value < 0.05). Students who utilized the practice had a higher perception of the effect of the practice on the three contracts compared to the other group.

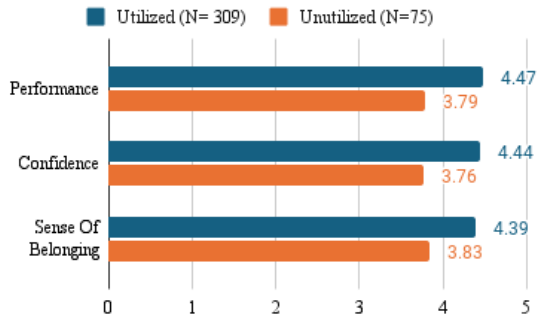

Fig. 1: Student utilization of the late submission practice

B. Performance

1) Students' Perception of Performance: Participants (n = 384), perceive the impact of the late submission practice on performance as positive and high (more than 4 out of 5). This shows that most students (81%) thought that this practice helped them improve their performance.

Next, we looked into this perception for participants who utilized the practice (n = 309) according to various factors, including employment status, first-generation, transfer students, full-time students, financial aid, and financial risk indicators.

TABLE III: Mean perception on performance according to various factors

Performance	**Member**	**Non-member**	**No Response**
Employement	4.56	4.43	
First Genertaion	4.54	4.44	
Transfer Student	4.47	4.47	
Full-time student	4.52	4.08	4.27
Financial Aid	4.52	4.42	
Financial Risk Indicators	4.5	4.46	

Table III illustrates the mean perception of the impact of the practice on performance according to various participant groups created by these factors. The name of the factor is in the first column, the second column shows the members that qualify with the factor (e.g. for the first-factor employment, the mean is for the group of participants who had employment), the third column shows the non-members with the factor (e.g. for the first-factor employment, the mean is for the group of participants who did not have employment), and the fourth column is for the no response category which is only relevant for the full-time student. Overall, the means of all the groups seem to be positive and high. Among the comparing groups, non-parametric tests did not reveal any significant differences between their means based on the different factors. This result is positive as it shows empirically that participants perceive the impact of the practice on performance in a similar way across groups of different factors. This provides evidence that according to students' perceptions, the practice can benefit the performance of various student groups irrespective of their underlying advantages/disadvantages and therefore can be regarded as an equitable practice. Further, although there are no significant differences among the comparing groups, the means for the member column are around 4.5 and seem to be the same or slightly higher than the values in the non-member column. This result is also positive as it shows that students who have some challenges, think more positively that this practice can improve their performance.

2) Students' Actual Performance: In addition to analyzing the survey data, we also examined students' performance data from the Canvas LMS. To illustrate the impact of the practice, we first present the aggregate result of all the students in the course followed by the results of the consented students. Out of 979 students in the course, 654 (67%) students utilized the practice by submitting one or more lab portfolio assignments late. This practice helped them to receive an average of 2.8 out of 3 for the lab portfolio grades. However, if they had not utilized the practice, they would have gotten an average of 0.37 out of 3 (calculated by assigning a grade of zero to students when they were not able to submit their lab portfolio assignment by the deadline). We also found that on an average students were late on 4.5 lab portfolio assignments out of a total of 11 of those assignments. For the quizzes in the course, 284 students utilized the practice by taking one or more quizzes late. Students received an average of 3.28 out of 5 with the late submission practice instead of an average of 2.64 without the practice (calculated in the similar way as the lap portfolio assignments). Students were late on an average of 2 quizzes out of 10 quizzes. As presented, the results look a little different for the quizzes compared to the lab portfolio assignments. The reason might be associated with the convenience of completing and submitting it. Students worked on the lab portfolio assignments outside of class and submitted them through Canvas at the end of each learning module. Whereas, quizzes were scheduled during class time to assess the learning of each module. This might have led more students to take the quiz in-class and on time, which is more convenient than the lab portfolio assignments, which students had to submit on their own outside the class.

Out of the consented students (n = 384), we identified 250 (65%) students who utilized the late submission practice by submitting at least one lab portfolio assignment after the deadline. For these students, paired t-tests detected that their average grades on the lab portfolio assignment were significantly higher compared to their average grades on the lab portfolio if they had not used the late submission policy (p-value < 0.001). Similarly, 129 (34%) students utilized late submission practice by completing at least one quiz late or after the deadline. Similarly, for these students, the average grade on the quizzes was significantly higher compared to their average grade on the quizzes if they had not used the late submission policy (p-value < 0.001). These direct measurements also show that the practice has a positive impact on students' performances in addition to their perception of this impact.

C. Confidence

Similar to the results related to performance, the perception of participants (n = 384)related to the contribution of the late submission practice on their confidence is positive and high (more than 4 out of 5). This shows that most participants (81%) thought that this practice improved their confidence.

Table IV illustrates the mean perception of the participants who utilized the practice (n = 309) about the impact of the practice on their confidence according to groups created by factors, which include employment status, first-generation, transfer students, full-time students, financial aid, and financial risk indicators. When we compared the mean score across the various groups for each of these factors, there was no significant difference in most of the factors except for the factor related to first-generation students. For this factor, students, who were first-generation had significantly higher perceptions about the impact of the practice on their confidence than students, who were not first-generation. This shows that this practice might be more beneficial for first-generation students. Further, similar to the previous results, the means of the member groups are 4.4 and higher, and are slightly higher than the non-member groups. Therefore, this result indicates that the participant groups, who are non-traditional have a higher perception that this practice can positively impact their confidence. Results such as these are encouraging, because they show that the practice is equitable and doesn't disadvantage students who are already disadvantaged.

TABLE IV: Mean perception on confidence according to various factors

Confidence	Member	Non-member	No Response
Employement	4.54	4.43	
First Genertaion	4.6	4.38	
Transfer Student	4.48	4.42	
Full-time student	4.46	4.25	4.32
Financial Aid	4.48	4.38	
Financial Risk Indicators	4.52	4.42	

D. Sense of Belonging (SoB)

Analyzing the results of the perception of participants (n = 384) regarding the contribution of the late submission practice on their sense-of-belonging (SoB) revealed similar outcomes as the other two constructs measured. More than 74% of the participants rated the impact of the practice positively with an average of 4.3 out of 5. This indicates that most participants believed that this practice will enhance their sense of belonging. Additionally, we also find that participants believe that this practice has more contribution on their performance and confidence compared to their SoB.

Table V demonstrates the average perception of the participants for participants who utilized the practice (n = 309) regarding the practice's impact on their SoB across various groups delineated by factors including employment status, first-generation status, transfer student status, full-time student status, financial aid, and financial risk indicators. When comparing the average scores among these groups for each

TABLE V: Mean perception on SoB by various factors

Sense-of-Belonging	Member	Non-member	No Response
Employment	4.48	4.36	
First Generation	4.5	4.35	
Transfer Student	4.41	4.39	
Full-time student	4.41	4.31	4.26
Financial Aid	4.45	4.31	
Financial Risk Indicators	4.52	4.36	

factor, there was generally no significant difference except for the financial aid indicator. In this regard, students with financial aid perceived a significantly greater impact of the practice on their SoB compared to their counterparts. This suggests that this practice may be particularly advantageous for students having financial aid. Furthermore, similar to prior findings, we observe that the mean scores of the member groups exceed 4.4 and tend to be slightly higher than those in the non-member groups. Thus, this outcome implies that participant groups, particularly non-traditional ones, hold a more favorable perception that this practice can positively influence their SoB. Such a result is positive as it indicates that the practice is equitable and it is beneficial for the less privileged groups.

E. Race and Gender Intersectionality

Acknowledging the growing recognition of intersectionality as an analytical framework to better understand marginalized, underserved, and vulnerable populations [38], [39] we present our results by exploring the intersectionality of *race* and *gender* categories shown in Table II.

First, we examined students' perceptions across the three constructs through this intersectionality lens. The intersection of the two groups resulted in 17 subgroups, and the number of participants in each subgroup varied from 1 (Underrepresented Gender Diverse) to 89 (White Male). Here we present the results for groups that had more than 10 participants.

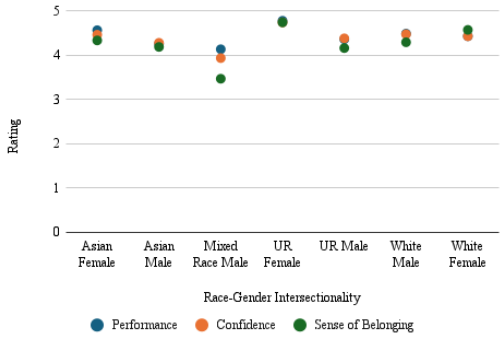

Fig. 2: Students' perception according to their race and gender intersectionality

Figure 2 shows the average rating of students' feedback across the three constructs. The lowest perception was for the SoB for the Mixed Race Male group (3.97). The underrepresented Female group had the highest (4.8) perception across the three constructs for all the subgroups.

To understand these results better we compared them to the individual groups of their intersection. Table VI shows a breakdown of this comparison. An up-arrow under one of the constructs indicates an increase when the intersectional group is compared to either race or gender individually. For instance, the up-arrow in the first data row shows that the Asian Female group had a higher perception of the impact of the practice on the three constructs when compared to the Asian group of participants and similarly when compared to the Female group of participants. Whereas, the down-arrow in the cell under the performance column for the Asian Male group indicates they had a lower perception of the impact of the practice on their performance when compared to the Asian group of participants and similarly when compared to the Male group of participants. Whereas their confidence was higher compared to the Asian group but lower when compared to the Male group. An interesting observation is that White females reported lower perception of performance and confidence compared to the Female group as well the White race group but had a higher SoB than those two groups respectively. We can see that for Mixed Race Male their perception of all three constructs was lower when compared to their race or gender groups respectively. On the other hand, Underrepresented females had a higher perception across the three constructs compared to the perception of students from underrepresented race groups or female students.

TABLE VI: Comparison of students' perceptions based on race and gender intersectionality to the perceptions of race and gender groups individually

Count	Race/Gender	Performance	Confidence	SoB
39	Asian Female	↑ / ↑	↑ / ↑	↑ / ↑
43	Asian Male	↓ / ↓	↓ / ↓	↓ / ↑
15	Mixed Race Male	↓ / ↓	↓ / ↓	↓ / ↓
27	UR Female	↑ / ↑	↑ / ↑	↑ / ↑
50	UR Male	↓ / ↓	↓ / ↑	↓ / ↓
14	White Female	↓ / ↓	↓ / ↓	↑ / ↑
72	White Male	↓ / ↑	↓ / ↑	↓ / ↑

F. Student Experiences

To begin analyzing the qualitative data, we used the BoW approach as described in Section IV to identify the most frequently mentioned words. We found the top 20 words that appeared in students responses were: *help, time, assign, allow, submit, work, stress, late, lab, turn, deadlin, cours, learn, realli, understand, abl, think, class, student, materi*. This initial step allowed us to highlight prevalent themes and trends, providing a foundation for future more in-depth analysis and insights.

Figure 3 shows a treemap with the result of clustering with the number of clusters set to 10. Each cluster displays the top 10 words, with the size of each cluster and its partitions corresponding to the TF-IDF values. While we expect concepts related to the prompt used to ask the question to appear in the responses, this analysis highlights that the practice implemented influenced students' strategies for managing stress and improving performance.

For example, words in Clusters 2, 4, 5, 7, and 9 all emphasize deadlines and the submission of assignments. The recurring mention of deadlines and related stress or management issues indicates a common concern among students regarding their ability to meet deadlines and handle the workload effectively.

Clusters 1, 3, 5, and 6 all discuss flexibility and stress. These clusters suggest that the flexibility of a course directly impacts

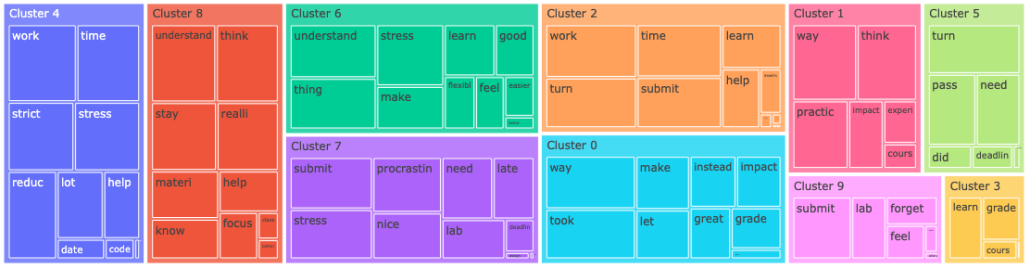

Fig. 3: Clusters treemap of text responses to the survey open-ended question

stress levels and the ability to focus, indicating that more flexible courses may help reduce stress and improve student focus and feelings about the course. For example, students said: *"... it positively affected my overall well-being. There were some weeks where I had unexpected things come up like interviews for example, so I had to miss a lab session. However, because I was able to make up missed quizzes, I didn't have to stress so much and become overwhelmed." P.26*; *"... it helps us put our best effort into our work" P.17*; *"It reassures me that my instructor is looking out for us" P. 110* ;*"It helped me amend for my bad time management and eventually helped me stop procrastinating in total." P. 43*

Clusters 2, 6, and 8 focus on learning and understanding course material. These clusters highlight the importance of resources and support in helping students comprehend the material better and the positive impact of such support on their overall learning experience. This can indicate that students found this practice addresses challenges they face and provides opportunities for development and positive experiences. *"This had helped me so much, as the course pace was extremely fast. This allowed me to catch up and actually learn."* P. 177; *"... being able to turn in late work took out the factor of forcing to learn or pretend to know a concept just to get work done. having a opportunity to learn concepts has helped me out so much."* P. 53; *"This makes me feel Like I am learning material rather than rushing to get it done because of a grade"* P. 59;

Overall, this analysis indicates that such practices address issues related to academic pressure and challenges students might face. It highlights the need for effective support systems and the importance of flexibility in helping students manage their responsibilities and succeed academically. Students related the late submission practice to strategies for dealing with stress and improving productivity and well-being and emphasized the importance of providing opportunities for learning and personal growth within the classroom context.

VI. Conclusion

In this paper, we present the implementation of a late submission practice within a large CS1 classroom, and evaluation of how students perceive its impact on their performance, confidence, soB, and experience in the course. Further, we explored the variation in students' perspectives according to different student factors including first-generation, transfer students, employment status, and intersectionality of race and gender. Additionally, we discuss how this practice impacted students' grades in the course.

Overall students' perspectives were highly positive for all three student experience constructs. Students generally valued the practice, with those who utilized it expressing significantly higher appreciation than those who did not. Analyzing the students' grades, we also found that the practice significantly improved their grades in the assignments, where late submission was accepted. Additionally, our study reveals that all student groups had highly positive perceptions of this practice, with a minor variation between groups formed by different factors. This suggests that the practice offers an equitable experience for students across all groups. Further open-ended feedback from students revealed that the late submission practice offers flexibility to manage academic pressure and challenges, ultimately enhancing their learning experience.

This implementation of the late submission policy in a large CS course provided valuable insights. First, clear guidelines were needed for both students and TAs: students required detailed instructions on how late submissions would be handled, while TAs needed clear procedures for grading late work. Since this was the first time implementing the practice, the guidelines were developed and adjusted as needed in response to emerging requirements. Second, keeping the late submission window open until the end of the semester led to challenges. As the semester wound down, students faced a backlog and rushed to meet deadlines, which could affect submission quality. Simultaneously, TAs struggled to grade a large volume of late work within a tight timeframe, which might have impacted the quality and consistency of their feedback while managing their own end-of-semester responsibilities.

These experiences and challenges we got from this initial implementation of the practice will be helpful in improving its future implementations. For example, we plan to reduce the time frame for the late submission, which will address the challenges we faced at the end of the semester. We intend to systematically record and share our experiences and resources in greater detail. Future studies could explore how this practice affects students' time management skills, as well as how instructors can effectively manage students' progress through coursework at different rates.

***Index Terms*—late submission, equitable practice, introductory computing, diversity**

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