

Effectiveness of Implementing Team Contracts in a Client-sponsored Project-based Learning Course

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Abstract—This Innovative-Practice Full Paper presents the design, implementation, and evaluation of the effectiveness of team contracts in a client-sponsored project-based learning course. A team contract is a collection of procedural rules, expectations, guidelines on team etiquette and task delegation, as well as penalties for violation that are mutually agreed upon by all members of a team working together to complete a project. Agreeing to adhere to an explicit set of expectations and rules at the beginning of the course has been found to reduce conflict, increase accountability, and provide a benchmark for the obligations of every team member for effectively and efficiently completing a project. While we set down the framework of the contract, we encouraged every team to discuss the contract and its terms in detail amongst the members and make reasonable updates and amendments to any term if they deemed it necessary. The final amended version of the contract is signed by every team member as a sign of acknowledgment that they will adhere to the contract throughout the duration of the project. We implemented this team contract in a client-sponsored project-based data science course consisting of undergraduate, master's, and doctoral students. We collected feedback from the students on its effectiveness through a questionnaire that included questions requiring yes/no responses, responses on a Likert scale, and free-text responses. In general, the responses indicated a positive attitude and appreciation towards the usefulness of team contracts, especially in reducing social loafing, the explicit nature of the expectations, and in creating a professional working environment. We discuss how the implementation of the team contract has led to reduced conflicts, fewer complaints about non-contributing team members, increased engagement, a sense of ownership through the definition of rules and responsibilities, and a collectively enforced mechanism for the accountability of team members. Finally, we note how team contracts must be supplemented with other strategies, such as anonymized peer feedback and grading policies on individual contribution to teamwork, for more positive student learning outcomes in team-based learning courses.

Index Terms—team development, team roles, project based learning, experiential learning, active learning

I. INTRODUCTION

Project-based learning (PBL) is an active learning paradigm that is being widely used in degree programs in science, technology, engineering, and mathematics (STEM), business, law, and the social sciences. This form of experiential learning empowers students by promoting a large degree of autonomy, collaborative learning, communication, goal-setting, and an opportunity to deal with real-world problems [1], [2]. Following the constructivist learning theory, PBL usually involves

teams of students working on completing a project, thus also incorporating benefits such as improving social skills in a professional setting, task delegation, nuances of teamwork skills, and leadership skills [3].

The benefits of working in teams include greater in-depth learning, better information retention, lower dropout rates, acquiring teamwork and communication skills, and gaining an understanding of a professional working environment. However, an ineffective team might be a deterrent to reaping these benefits and might be discouraging for learners. While working in a team-based PBL setup, instructors must be cognizant of imbibing skills related to project management, time management, conflict resolution, and communication for success in teamwork. Explicit steps should be taken by instructors to not only ensure that the students gain these skills but also to help equip the students with mechanisms to effectively handle and overcome logistical and interpersonal challenges that are commonly seen while working in teams [4].

For achieving the best possible learning outcomes in any course, it is of paramount importance that the expectations of the coursework are explained clearly to the students. For team-based PBL courses, additionally, it is equally important that the students reflect on a number of components that would lead to a successful team product at the end of the project. These components include what a team wants to achieve in the course, expectations from teammates, responsibilities of team members, timelines, guidelines on professional standards of communication, and general working procedures of the team [5]–[10]. While these ideas of reciprocal social obligations are usually implicit in the formation and working of teams, it is often better to set them down explicitly in writing to ensure that all team members agree on common ground and are aware of the team standards [10]–[13].

Besides mutually agreeing on the responsibilities, expectations, working procedures, and other components as mentioned, it is also imperative that the consequences for not following these standards and responsibilities are set down and mutually agreed upon for the smooth operation of the team throughout the duration of the project [5], [7], [13]. In addition, discussions on these topics and a collective agreement on these aspects allow a team to be self-managed and self-regulated. Further, discussions and agreement on responsibilities and operating procedures aid in the development of a

strong team identity, making the enforcement of norms and expected behaviors “horizontal” rather than “vertical” [14]. By extension, it creates a sense of autonomy and also imparts a sense of collectively enforced accountability within the team as opposed to the enforcement of accountability by the instructor [9].

The explicit statement of these aspects of teamwork among the students in a team is often successfully encapsulated through a team contract (also known as a team charter or a team expectation agreement). A team contract is a document adopted and drafted (and/or amended) by all the members of a team through discussion, mutual agreement, and consensus. It explicitly states the realistic expectations and responsibilities of each team member towards the team and the project and also serves as a “quasi-legal” document that is binding on every member of the team. In addition, there might be a separate policy statement that lays down guidelines for effective team functioning, the roles of every team member, the responsibilities associated with the roles, working procedures, and strategies for handling uncooperative team members [4]. Further, the existence and enforcement of these documents have been shown to minimize conflicts in the teams and reduce “social loafing” among team members [13], [15], [16]. These benefits are due to the increased accountability through the codification of the rules and responsibilities, clearly articulated expectations, and the explicitly stated norms of social and intellectual behaviors [7], [9], [17], [18].

In our study, we report the design and implementation of team contracts in an interdisciplinary PBL course that involves students working in teams to complete a client-sponsored project. In particular, our course is a data science capstone course that includes students from different academic disciplines as well as different academic levels across the university. We stress on the effective use of team contracts especially in an interdisciplinary framework where different students in a team might have different backgrounds, and thus, different viewpoints on expectations and responsibilities in a team setting. Therefore, the use of team contracts is expected to create a common set of rules, working procedures, and expectations, that are explicitly stated and mutually agreed upon by every team member. In addition, in contrast with the approach of having separate documents for policy statement and team contract [4], we have simplified the design by incorporating policy statements as clauses in the team contract itself to reduce the administrative burden on the instructors and the paperwork burden on the students.

We also note that in the presence of client-sponsors, a team has collective accountability towards a client for successfully and efficiently completing a project by trying to achieve all its objectives. This translates to requiring accountability for individual members of the team toward the teamwork and agreeing on common working procedures for the team. We propose that implementing team contracts is a useful method to instill and reinforce the idea of individual accountability as a crucial component of team accountability.

Further, given the interdisciplinary nature of our course,

we emphasize on every student learning a variety of skill sets throughout the project, such as programming; statistical analysis; interpretation; and visual, oral, and written communication. We encourage every student to contribute to every aspect of the project in some capacity so that they are not exclusively honing and applying the skills that they already possess but also learning new skills. To this end, we discourage the students from taking permanent roles in the team and instead rotate the different roles, such as meeting leader, secretary, code reviewer, and researcher. In this aspect, we deviate from existing and reported studies of team contracts in the classroom that include the assignment of roles to students in the team through the team contract [8], [19]–[22].

We observed applications of team contracts in several studies. However, we noted a lack of literature on student perceptions of how effective the team contract was. While it was reported that students appreciate the existence of the team contract when problems arise later [5], there has been a lack of empirical evidence on the value and appreciation of team contracts from the student perspective. Some studies have collected feedback from students on whether team contracts were used and some aspects on the usefulness of team contracts [9], [23], [24]. Despite these studies, there is a lack of studies on a comprehensive assessment of student perceptions and the usefulness of having team contracts for interdisciplinary PBL courses. Moreover, due to the client-sponsored aspect of the projects in our course, we stress on greater accountability of students towards the team project as it reflects on the overall team accountability towards the client-sponsors. Therefore, we designed a comprehensive questionnaire to understand the perception of students towards the team contract and its usefulness and collected the feedback of students over four semesters.

We summarize the contributions of our study below:

- We designed and implemented team contracts for an interdisciplinary PBL course with client-sponsored projects, particularly taking into consideration the challenges of the interdisciplinary and client-sponsored aspects of the course.
- We combined policy statements, expectations, working procedures, and consequences for violations into a single team contract document.
- We collected and analyzed the feedback from the students through a comprehensive questionnaire involving student perceptions of the contract and its usefulness.
- We recommend applying other mechanisms for improving teamwork and individual contribution that supplement the use of team contracts.

II. COURSE STRUCTURE

For background and context, we first describe the structure of the course in which the team contract was implemented. The course is an interdisciplinary client-facing PBL course in data science (DS) and machine learning (ML) [25]. Projects are sponsored by clients from the industry, medical centers and hospitals, government and public entities, research labs, and

not-for-profit organizations. The projects are scoped, vetted, and approved by the instructors, and a list of available projects is created before the start of every semester.

Students enrolling in this course fill in a questionnaire indicating their background in different application areas of DS and ML, such as time series analysis, computer vision, medical signal and image analysis, natural language processing, signal processing, genomics, and geospatial data mining. In addition, students also indicate their preference for the available projects in that semester. Subsequently, the instructors evaluate the responses to the questionnaire and create teams of four to six students using a jigsaw model, where the students in a team have different skill sets and expertise to contribute to the team. The teams are then assigned appropriate projects based on their preference and background.

Students enrolling in the course might be from any academic level (undergraduate, master's, or Ph.D.) and any department, major, or minor across the campus, e.g., statistics, computer science, electrical and computer engineering, applied mathematics, biosciences and bioengineering, and several other STEM disciplines as well as the social sciences. The only prerequisite is that the students must have completed an ML course or a series of statistical analysis courses before. Throughout the semester, the students are evaluated through interim evaluations of their report, presentation, and software, with a final grading of all these three components at the end of the semester. To ensure fairness in grading, 30% of the grade is allocated for individual performance and the remaining 70% for team performance. While the team performance is measured through the presentation, report, and software, the individual performance of every student is assessed through self and peer evaluations, instructor-assessed individual contribution to the team, and class participation.

Two unique features of the course are its interdisciplinary nature and the client-facing aspect. Due to the interdisciplinary nature and the use of the jigsaw model in team formation, each team usually consists of students from different backgrounds and possessing different skill sets. Further, the client-facing aspect of the course results in the collective accountability of a team towards the client-sponsor.

The instructors provide guidelines on the best practices of team and project management before technical work starts on the projects. Besides the obvious technical aspects of the course, the students are required to have a weekly meeting amongst themselves as well as a separate weekly meeting with the sponsor. These meetings are not only needed to develop and maintain a timeline for the project but also to develop communication skills. In each of these meetings, all students in a team are required to rotate the roles of a leader and a secretary. The meeting leader is required to come prepared with a meeting agenda and set short-term goals in the meetings. The secretary, on the other hand, is required to note the minutes and circulate them within the team and with the client-sponsor.

In addition, each team member is required to take leadership in some aspect of the project, such as preparing presentations,

preparing the report, programming, research, and planning the timeline. These leadership roles might also be rotated in a round-robin fashion throughout the duration of the project. All decisions and delegation of tasks are to be discussed and decided by the team in consensus.

III. THE TEAM CONTRACT

The team contract is introduced to the students before commencing work on the project. As drafting a contract for possibly the first time might be difficult for the students, a contract drafted by the instructor is provided to the students. The members of a team are given reasonable freedom to make amendments to this draft team contract. As noted in a prior study [26], we have also anecdotally observed that students enjoy the freedom of being able to discuss the clauses of the contract and make minor amendments if needed.

The contract document prepared by the instructors consists of the following seven sections:

- A. Expectations for team meetings: This section sets down the expectations of team members when they attend weekly meetings. There are explicit clauses or rules, such as,
 - arriving timely for meetings and a grace time for joining late
 - informing teammates in advance if a member must miss a meeting
 - having camera and microphone checked and working before an online meeting
 - coming prepared to the meeting by reading related material and completing all tasks
 - remaining in the mentoring session until adjournment or providing reason for leaving before adjournment in advance
- B. Expectations for client meetings: The expectations for team members are explicitly stated here for client meetings. The clauses are identical to the weekly team meetings. However, for these meetings, if a team member must arrive late, leave early, or miss a meeting, they must communicate this with the sponsor in addition to the other team members.
- C. Class attendance and mentor meetings: Besides presentations, the class time in the course is devoted to mentoring sessions between the team, the instructors, and other mentors. The expectations for these sessions are as below:
 - attending all required classes and informing the teammates and the instructor/mentor beforehand about absences
 - committing to meeting in person unless there are reasons for meeting online
 - meeting the instructor/mentor during the mentoring session in every required class
 - coming prepared to the meeting by reading related material and completing all tasks

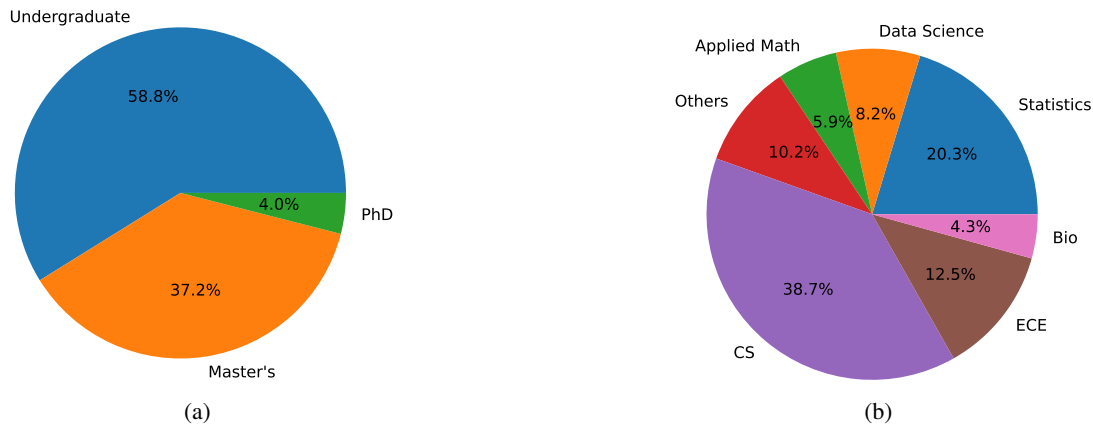


Fig. 1: Distribution of the students across (a) academic level, and (b) departments (academic units, majors, and minors). (CS: Computer Science, ECE: Electrical & Computer Engineering, Bio: Biosciences & Bioengineering)

- remaining in the mentoring session until adjournment or providing reason for leaving before adjournment in advance
- D. Team etiquette: This section describes the rules for general team etiquette, as below,
- treating one another with respect, e.g., no name-calling or ad hominem attacks
 - no cross-talking or interrupting when a member is speaking
 - deciding on the meeting agenda by the leader in consensus before a meeting
 - note-taking by the secretary during a meeting
 - coming prepared and leading the meeting by the leader
 - committing to working 10 hours outside of class time on the project for every team member
- E. Delegation of tasks: This section describes the policies on the delegation and completion of tasks by individual members of the team, as stated below,
- committing to complete tasks within the deadline by every team member
 - seeking help beforehand if meeting a deadline is not likely
 - participating in every component of the project, e.g., programming, researching, preparing presentations, and preparing reports.
 - taking the lead in some component of the project
- F. Procedural rules: This section lays down a few general procedural rules for the team. Students are encouraged to discuss and expand on this section with any additional rules they would like to add to the contract. These rules are as follows:
- Each team member has the right to point out a violation of the rules.
 - The team must actively seek a consensus of opinion based on the opinions of every team member.
 - Each member will take turns listening as well as talking, and active listening will be a strategy for all group discussions.
- Sexist, racist, xenophobic, or other discriminatory/derogatory remarks will be reported to the instructor(s) immediately. This will also result in immediate dismissal from the team.
- G. Policies on contract violation: The contract would be rendered useless unless there is a way to enforce it and team members must have consequences for violation. This section lays down the procedures and penalties for three levels of violation. The students are encouraged to discuss and decide on the penalties.
- The recommended consequence for the first violation is informing the instructor of the violation.
 - For the second violation, the recommended consequence is a penalty of 5% on the final grade.
 - For the third violation, a team member is dismissed from the team and must complete the project individually with no change to the expected standard of the course deliverables. All dismissals are final.
- It must be noted that the first violation itself results in dismissal if it is due to making derogatory or discriminatory comments, as stated earlier in the procedural rules.
- Every member of a team must read and sign every clause with their initial as well as sign at the end of the contract. Signing with initials for every clause is a safeguard to ensure that a student has read and understood every clause clearly. A copy of the contract is submitted to the instructors and the team maintains a copy as well.

IV. FEEDBACK & RESULTS

To evaluate the efficacy and usefulness of the team contract, we collected feedback from the students at the end of the semester, i.e., at project completion. The collection of feedback was anonymous and classified as exempt by the university institutional review board (IRB). Here, we present the results from the feedback collected. The implementation of the team contract has been done for four semesters and is still ongoing.

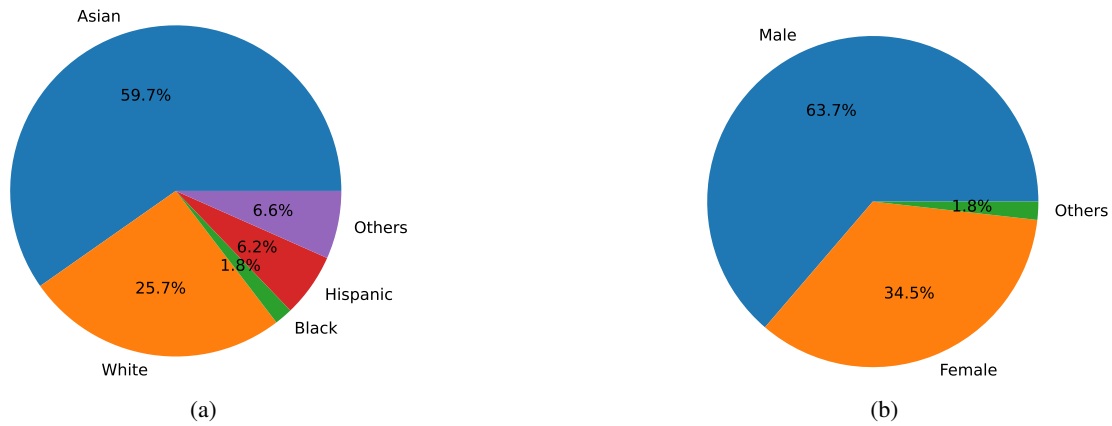


Fig. 2: Distribution of the students across (a) race/ethnicity, and (b) gender.

First, we present the demographic breakdown of the student population enrolled in the course.

A. Student Demographics

During the time it was implemented, there were $n = 226$ students who enrolled in the course and completed a project as part of a team. We first present the demographic information of the student population. The diversity of the enrolled student population across both depth and breadth is shown in Fig. 1. As seen in Fig. 1a, over half the students were undergraduates. There was also a sizeable number of master's students and a few Ph.D. students in the course. Given the interdisciplinary nature of the course, students from different departments, majors, and minors across the university were enrolled in the course (Fig. 1b). While most students were from computer science, statistics, electrical and computer engineering, data science, applied mathematics, biosciences and bioengineering, there were a few students from diverse backgrounds like physics, mathematics, economics, political science, cognitive science, mechanical engineering, social policy analysis, education, sports analytics, chemical engineering, linguistics, and business.

We also collected demographic data on race/ethnicity and gender, shown in Fig. 2. Fig. 2a shows the distribution of the students across race/ethnicity. We note that Asian is a broad category with several different races and ethnicities grouped into one category. In the future, we wish to collect more fine-grained demographic information on race/ethnicity for a better understanding of the student population. Fig. 2b shows the gender distribution of enrolled students in the course. We note that about a third of the student population was female, a few were non-binary, and the remaining were male.

B. Survey Feedback

Anonymous survey feedback was collected from the students. Out of 226 students, $n = 183$ responded to the survey, which represents about 81% of the students. The survey was anonymous so that students could respond freely to the survey. We note that this entailed certain limitations such as the inability to analyze the responses vis-à-vis the individual

demographic information. However, we preferred anonymity in survey collection as more important in receiving honest and unbiased feedback.

The feedback consisted of the following questions:

- I have encountered a team member slacking in prior teamwork experiences before or outside this course. (Yes/No response)
- The team contract prevented team members from slacking in their efforts and contributions. (5-point Likert scale)
- The team contract prompted me to improve my teamwork contribution. (5-point Likert scale)
- Having an explicit statement of expectations, responsibilities, working procedures, and policies on violation is better than having implicit expectations. (5-point Likert scale)
- Communication between team members benefited from having the team contract. (5-point Likert scale)
- There was better team cohesion because of the team contract. (5-point Likert scale)
- There was better mutual support among team members because of the team contract. (5-point Likert scale)
- There was higher satisfaction in the team and the course because of the team contract. (5-point Likert scale)
- The team contract instilled a professional working environment in the team. (5-point Likert scale)
- Do you have any comments about the team contract and its implementation? (free-text response)

All questions on the Likert scale used the following responses: "1: strongly disagree", "2: disagree", "3: neutral", "4: agree", and "5: strongly agree".

In our survey results, we noted that 81.5% of the respondents had encountered social loafing in any prior teamwork experience before the course. This result shows the prevalence of social loafing in teamwork for university courses.

For questions on the 5-point Likert scale, the survey results are shown in Fig. 3. The questions have been meaningfully abridged in the plot for better visualization. The mean of the responses for each question is shown on the right. We note that while most students felt that the team contract prevented their

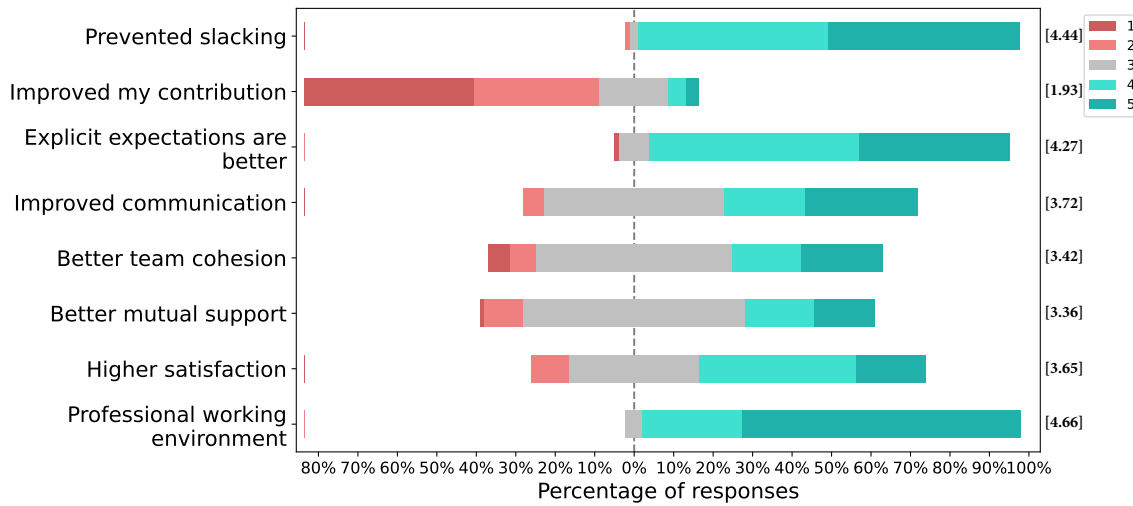


Fig. 3: Results from the student feedback data for questions requiring responses on a Likert scale. The averages of the responses are seen on the right. (1: strongly disagree; 2: disagree; 3: neutral; 4: agree; 5: strongly agree). Note that the questions have been suitably shortened for visualization; see Section IV-B for the complete questions.

teammates from slacking (96.7% agreed or strongly agreed), they also responded that having the team contract did not necessarily improve their own performance (74.8% disagreed or strongly disagreed and 17.5% were neutral). There was also almost unanimous agreement that an explicit statement of expectations was better than implicit ones (91.3% agreed or strongly agreed; 5.5% were neutral).

The responses to whether the team contract improved team communication were mostly neutral. While 45.4% of students were neutral, 49.1% agreed or strongly agreed. Similarly, our survey results indicate that the use of team contracts did not necessarily improve team cohesion (49.7% were neutral and 38.2% agreed or strongly agreed). According to our results, team contracts did not result in better mutual support among team members (56.3% were neutral).

However, we note that 57.4% of students agreed or strongly agreed that they had greater satisfaction with the team and the course due to the use of team contracts. Further, the respondents overwhelmingly expressed that the team contract helped in instilling a professional working environment in the team (96.1% students agreed or strongly agreed).

Finally, we analyzed the student responses and comments for the free-text response. While some students expressed their satisfaction with being able to deal with social loafers, some were also not able to solve this problem. A few students pointed out that “some of the rules were needless”. It was interesting to note how some students commented on a feeling of insecurity, e.g., “the contract created some tensions in the team”, “... made me a bit wary about violating contracts and created a sense of fear”, and “It created a sense of distrust; I wouldn’t know if when someone can accuse me of violations and the consequences”.

Some students also noted a feeling of discomfort while pointing out violations (“pointing out violations was an un-

comfortable job” and “exposing slackers was easier due to clear expectations but uncomfortable”) and recommended that “there must be a way to report violations anonymously”. However, several students expressed their satisfaction with an equitable distribution of workload because of the contract laying down clear expectations.

V. DISCUSSION

The use of team contracts (used interchangeably with terms such as team charters and team expectation agreement) has been reported in prior studies. Primarily, it has been shown to be successful in creating an explicit set of expectations and responsibilities for all the members of a team. In addition, these documents can be used to clearly state working procedures, roles of team members, and mechanisms to deal with uncooperative or non-contributing team members.

One of the objectives of our course is to provide the students with a professional working environment in a team while working on a project, which is otherwise difficult, if not impossible, to experience within the university as an undergraduate or master’s student. To provide this experience, the students must also understand professional work ethics and expectations. Team contract serves as a mechanism for imparting and instilling these professional expectations while the students are still in an educational setting.

In our design and implementation of the team contract, we emphasize the expectations and responsibilities of team members with respect to team meetings and client meetings as well as class attendance and mentoring sessions with the instructor and mentor. Further, our team contract consists of explicit guidelines on team etiquette, delegation of tasks, other procedural rules, and finally, the policies on contract violation. We deem it crucial for teams to agree and sign the contract along with a clear understanding of the consequences for violations before the technical work on the project begins.

Besides reducing the chances of social loafing, we highlight how the use of team contracts serves to codify the responsibilities of team members and the working procedures of the team in an explicit fashion rather than implicit assumptions and unclear obligations. As the course has been offered for over twelve semesters to date, we were able to anecdotally compare our experience as an instructor before (8 semesters) and after (4 semesters) the use of team contracts. We observed that the number of reports on conflicts within the team and complaints about social loafing and uncooperative team members were sharply reduced after the introduction of team contracts. Additionally, we observed greater engagement of the students in meetings, mentoring sessions, and classroom activities after the implementation of the contract, possibly due to the explicit statements on expectations and procedural rules. We infer that these positive changes have, in fact, led to an improvement in the sense of ownership of a project among the team members.

The goal of the team contract is, first and foremost, to improve team dynamics and ensure that there is an equitable distribution of responsibilities and workload among the members of a team. To achieve these objectives, we supplement the use of team contracts with opportunities for students to provide constructive criticism to their teammates in an anonymous fashion through self and peer evaluation. Thus, we treat our implementation of self and peer evaluation in the course not only as a summative assessment tool but also as a formative assessment mechanism. In these assessments, there is also an option for students to communicate any remarks to the instructor that are not released to their peers.

Student perceptions of social loafing and non-contributing team members often stem from the feeling of unfairness in grading as all students receive the same grade irrespective of their contribution and engagement with teamwork. We would like to strongly emphasize that the use of a team contract alone is not sufficient in mitigating these concerns. To tackle this aspect, our grading strategy is designed to fairly evaluate the contributions of individuals besides the performance of the team as a whole. We award 70% of the grade for teamwork and 30% of the grade for individual contributions. Due to this grading policy, there is a possibility of two individuals receiving “A” and “D” letter grades in the same team. Therefore, we emphasize that tackling the problems of social loafing and non-contributing team members must be done through multiple mechanisms as we note that the use of a single method might not be the most effective approach.

It is also interesting to note from the survey results how students typically perceive themselves to have higher ethical and teamwork standards while expressing doubts over the standards of others. A large majority of the students felt that the team contract prevented their teammates from social loafing while stating that the team contract did not necessarily improve their contribution to teamwork. This observation is a fallacy in student perception that we believe cannot be reconciled with reality. We also note how this shows a degree of dissatisfaction for an individual student having to sign a

contract themselves while effectively wanting others to sign the same contract. A similar observation was reported in prior studies on self and peer evaluation where students typically rated themselves better than their team members [27].

While there was general satisfaction among the students with regard to the team contract as the students welcomed an explicit statement of expectations and agreed that it created a professional working environment, there were signs of discomfort, mistrust, and insecurity among some students. In the free-text responses, some students expressed a sense of fear and tension within the team caused by the clauses on contract violation. It also seemed that a few students were wary of being accused of violating the contract and facing the consequences for it.

There were also mentions of discomfort in exposing violators publicly and pointing out violations. We deduce that this feeling of discomfort results from a fear of possible retaliation, the creation of tensions within the team, or a deterioration of team dynamics during the remaining work on the project. There were also recommendations for an option to report violations anonymously, most likely due to a fear of a breakdown in interpersonal communication between the complainant and the violator or a general worsening of team communication. In the future, to alleviate these concerns, we wish to implement an anonymous violation reporting mechanism for team contracts.

Further, we note that the impact of implementing team contracts in our course did not necessarily improve team cohesion, mutual support among team members, or communication within the team. While these were some of the anticipated benefits of a team contract that we noted from the literature, the results of our study did not support these ideas. In the future, we wish to try and improve on these three essential aspects of team dynamics by other means. We have plans to introduce teamwork activities both inside and outside the classroom to improve team communication, cohesion, and mutual support, as well as to build more trust and confidence among the members of a team.

We note here that several strategies for enhancing and improving individual contribution to teamwork have been implemented in this course along with team contracts. In particular, we emphasize the design and development of a novel grading scheme that allocates 30% of the final grade towards the assessment of individual contribution to teamwork, out of which 10% is derived from self and peer assessment, 10% from instructor’s evaluation of individual contribution, and 10% from class participation in the form of presentations, leading meetings, engagement in classroom activities, and attendance.

VI. CONCLUSION

In our study, we report the design and implementation of a team contract in a client-sponsored interdisciplinary PBL course in data science. The team contract included clauses on expectations; responsibilities; working procedures; class attendance; policies for team meetings, sponsor meetings,

and mentoring sessions; team etiquette; and the consequences for violation. We collected responses from students using a questionnaire designed to understand the perceptions of students and whether they benefited from the contract. Our results indicate that students strongly felt that the contract prevented social loafing; appreciated that explicit statements of procedures, policies, and expectations were better than implicit assumptions; and agreed that the contract was able to foster a professional working environment in the team. We noted some negative attitudes towards the contract as well as some recommendations for improvement in the future. Further, we recommend that the implementation of a team contract in a classroom must be supplemented with other strategies, such as anonymized peer feedback and grading based on individual contribution to teamwork, to maximize its benefits and improve the learning outcomes in a team-based learning scenario.

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