Have Your Tickets Ready! Impede Free Riding in Large Scale Team Assignments

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ABSTRACT

Teamwork and graded team assignments in MOOCs are still largely under-researched. Nevertheless, the topic is enormously important as the ability to work and solve problems in teams is becoming increasingly common in modern work environments. The paper at hand discusses the reliability of a system to detect free-riders in peer assessed team tasks.

Author Keywords

MOOC; collaborative learning; teamwork; peer assessment

CCS Concepts

•**Applied computing** → **Collaborative learning;** *Learning management systems; Distance learning; E-learning;*

INTRODUCTION

The ability to work in teams is becoming an increasingly required skill in modern work environments. Therefore, teaching how to work in teams and assessing the results of team assignments has a high relevance. Many modern approaches to learning and teaching, such as active learning or project-based learning require students or participants to engage in a rigorous team work where collaboration among team members is a key to go through their learning journey [1]. In MOOCs, however, teamwork and, particularly, gradable team assignments are widely under-researched.

We have started to examine different aspects of teamwork in MOOCs and gradable team tasks in 2015/16. By now, we have conducted more than fifteen MOOCs offering peer assessed team tasks in the areas of Business innovation, Design thinking, and Object-oriented programming.

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In our view, reviewing and grading the work of peers is not an unavoidable chore for participants. It is however—next to the scalability of grading—one of the major benefits of peer assessment. Many of our participants share this perception and actually enjoy being forced to examine other approaches in great detail. Our system enforces the participants to assess the work of their peers, as otherwise they will not receive any points for their work. This applies for both, peer assessed *team* assignments and peer assessed *individual* assignments. In the peer assessed team assignments, this mechanism also solves another common teamwork problem: *Free-riders* or *lurkers* are team members, who do not contribute to the solution of the task but in the end earn points for the work of the other team members. As assessing the work of the other teams is a mandatory step, free riders will be detected automatically and will not receive points for their work as—according to our hypothesis—those who do not contribute to the task, will also not assess the work of their peers.

Research question

We set out to answer the question if our assumption—team members, who do not contribute to the team's solution for the given task, will also not review the work of their peers—is correct. Is, therefore, our implementation of the team peer assessment process sufficient to separate lurkers from active team members?

Structure

Section 2 sets the context and shows the relevance of our research. Section 3 provides more details about the course design, the assignment, and the data. Section 4 evaluates our results. Section 5 concludes our findings.

RELATED WORK

Many authors emphasize the importance of the ability to work in teams for the future labor market. In 2016, Riebe, Girardi, and Whitsed [4], conducted a systematic literature review on teamwork pedagogy in higher education. According to their sources, it is no more just "desirable" being able to work in teams, it is "essential." They refer to reports from the major English speaking countries, as well as from Eastern

Europe and China, which express the view that the ability to work in teams and the "related interpersonal skills are equally or more important than the graduates' technical skills" [4] . Hughes and Jones [2], state that, nowadays, teamwork is employed in nigh on all organizations. Furthermore, they report about a poll by the Association of American Colleges and Universities (AACU) in 2009, which revealed that 71% of the employers wish that colleges place a greater emphasis on teamwork skills [2]. Kivunja [3], lists collaboration, teamwork and leadership next to the classic 3Rs, critical thinking and problem solving, and digital literacy as the essential skills for the 21st century.

METHODOLOGY

In our previous work, the assignments that our participants were asked to perform, have been solely outcome oriented and did not take the team process into account. Now, we developed and conducted an assignment, which was particularly designed to establish a better understanding of the processes within the teams. In this section we present the design of the course and the assignment. Furthermore, we introduce the data sets that we have analyzed to obtain our results.

Course

The course "Introduction to Successful Remote Teamwork" was particularly designed to serve as a vehicle to research the processes within the teams in an optimized setting. The course topic was aligned as close as possible with the research topic, and the tasks in the course assignment rather targeted the documentation of the team process than the outcome. At course end, the course had 2,991 enrollments. 1,351 participants have visited at least one course element by course middle. On course level, we differentiate between *no-shows*—enrolled users who have never visited a single course item, *active course participants*—enrolled users, who have seen a minimum of one course item, and *dropouts*—active course participants, who have not completed the course with a Record of Achievement (RoA). To join the team assignment, the course participants had to register separately from their existing course registration. Due to the early deadline of the team registration, only the active course participants at course middle[1] have been able to register for the team assignment. About 25% of them registered for the team assignment. The team assignment provided 45% of the course points, another 55% have been provided by an additional exam. Thus, it was possible to earn a Record of Achievement (RoA) without participating in the team assignment. The RoA included a note that participants, who have achieved more than 55% of the points have not only submitted the exam but also have successfully participated in the team assignment. In the end, about 20% of the active participants completed the course with a RoA.

Team Assignment

The team assignment has been designed to establish a better understanding of the team processes and consisted of several individual steps with different weights and purposes.

[1]Throughout the rest of the paper, we will call them active participants for briefness.

1. Pre-team: We asked the participants to write an individual reflection on a personal experience in poorly performing teams. This task was open for all active course participants.
2. Warm-up: The teams were asked to create a team profile. Basically, they had to enter the same data that we had asked for during the team registration. In previous courses we observed that many teams have not been aware that we have matched them based on the data that they provided. One purpose of this task was to create this awareness within the teams. Furthermore, it allowed us to distinguish between team members who became active and those who did not show.
3. Main task: The participants had to apply what they have learned during the first three weeks. They had to design a plan for a company that needed to grow but did not have sufficient office space. The task was to identify options for remote teamwork settings, such as home or satellite offices. Furthermore, they had to document the team processes they employed to solve the task. Finally, they had to update their team profile to include information about the contribution of the team members beyond the initial profile. This information enabled us to distinguish between active members, no-shows, and team dropouts, which is key for the paper at hand.

Data Set

We collected and merged the data from a variety of sources within the openHPI platform to obtain a holistic view on the course and the assignment offered. The platform's course report provides the data on course participation and performance, socio-demographic data, and user interaction with the platform. We joined additional reports from the team building and peer assessment tools and added the data from the assignment's team profiles. All regular platform data is pseudonymized by default. The participants have been asked to use pseudonyms in the team profiles. We further pseudonymized the team names so that they cannot be traced back to the actual team names on the platform. Figure 1 shows the distribution of the teams in different *categories of success* in the team assignment. A team is defined as *successful* if two or more members have finished the task, *dysfunctional* if one member finishes the task. It is defined as *failed* if one or more team members have started to work on on the task but did not submit, and as *no-show* if none of the members started. The results of the current course are compared to the results in previous courses.

EVALUATION AND DISCUSSION

Based on the team profiles that have been created as part of the assignment, we defined two groups

- Successful: they have received more than zero points.
- Unsuccessful: they have not received any points.

Within these two groups we defined five categories. We differentiate the successful members as of

1. Active/successful—contributed to the submission of their team and collected points by writing reviews.

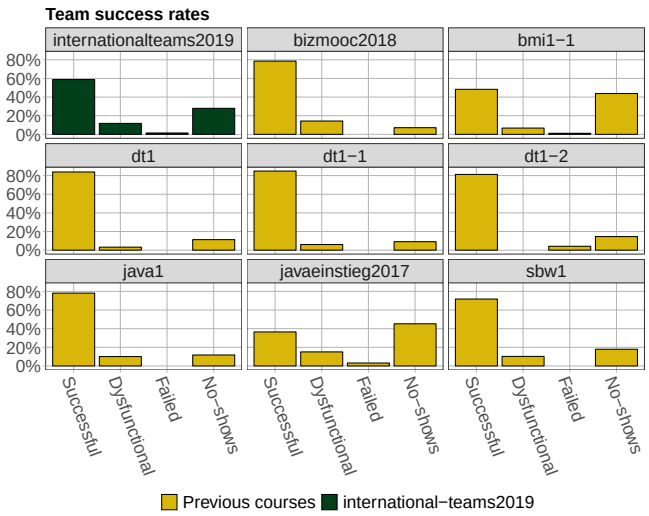

Figure 1. Percentages of team results in the current and previous examined courses.

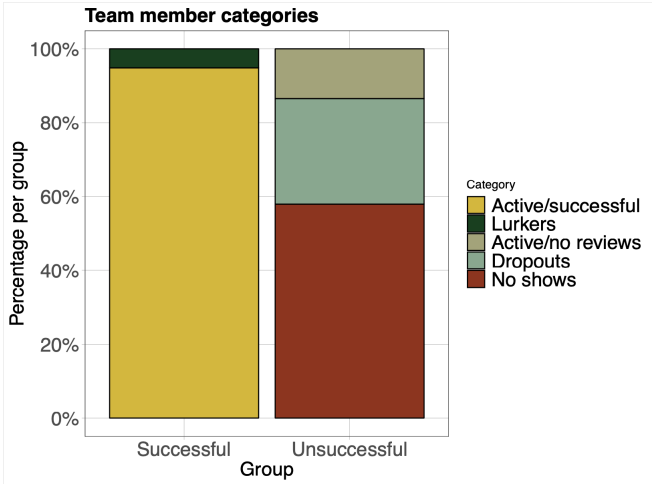

Figure 2. Percentage of team member categories within successful and unsuccessful members.

2. Lurkers—did not contribute to their team's submission but still collected points by writing reviews.

We differentiate the unsuccessful members as of

3. Active/no reviews—contributed to the submission of their team, but did not review the work of others.

4. Drop-outs—contributed to the initial team profile but then quit for some reason.

5. No-shows—registered for the team task but never joined the team and did not contribute to the initial team profile.

In total, 323 participants registered for the team assignment. Sixteen of the registrants did not submit the required pre-team task. We admitted them anyway. Only one of them has successfully completed the team assignment. This confirms the results of our previous publications and verifies our demand for a mandatory entrance examination. As we had decided to allow the team members to switch teams after the warm-up task, we also allowed another nineteen participants to join late, without a formal registration. Most of these have finished the assignment successfully. So in total, 342 course participants joined the team assignment. 135 of those successfully completed the assignment, 207 were unsuccessful. Among the successful participants, we found 128 active members and seven lurkers. The biggest groups among the unsuccessful members are the no-shows (120) and the drop-outs (59). Twenty-eight active team members did not submit reviews and, therefore, did not receive any points. Figure 2 shows the percentages of each category within their group of successful or unsuccessful members. The correlation between active team contribution and received result is statistically significant (0.78, $p<0.005$, Pearson). Figure 3 visualizes the participants' course activity in terms of visited items. The data are grouped by the presented categories. The y-axis shows the percentage of visited items, the bubble size shows the size of the category. It clearly shows that there are no significant differences in between the various categories of each group (successful/unsuccessful).

Figure 4 visualizes the participants' results in each of the course tasks. Again the data are grouped by the presented categories. Already in the initial *reflection* task, we can recognize a difference between the groups. Even though this task basically was not assessed at all, it would have been sufficient to reduce the amount of team dropouts by excluding those registrants who did not submit it. Admitting them, clearly was the wrong decision. Based on the results in the final exam, it seems that the majority of the participants in any category of the unsuccessful group rather have dropped out completely from the course than just from the team assignment.

In the successful categories we can observe that the active members have significantly better results than the (potential) *free riders*. The lower result in the initial *team profile* is caused by those who have not even contributed to the initial team profile. The lower result in the team assignment is another indicator that something was generally not going well with at least some of the free riders' teams.

In total, we, therefore, conclude that our hypothesis that team members who do not contribute to the team task will also not review the work of their peers has been proven to be true. We have shown that lurkers/free riders do not pose a threat to the integrity of our team peer assessment system. Only very few have been detected and our observations indicate that not even all of the few suspects might have had shady intentions. Thus, our implementation of the team peer assessment process sufficiently guarantees that free riders will not receive points for the work of their active team mates.

CONCLUSION AND FUTURE WORK

In conclusion, we have proven the hypothesis that team members, who do not contribute to the team task, will also not review or grade the work of their peers to be true. As this hypothesis forms one of the foundations of our system's team grading mechanism, we can say that this mechanism sufficiently fulfills the task of separating the active team members from the free riders and ensures that only the active members receive points for their work, while the free riders do

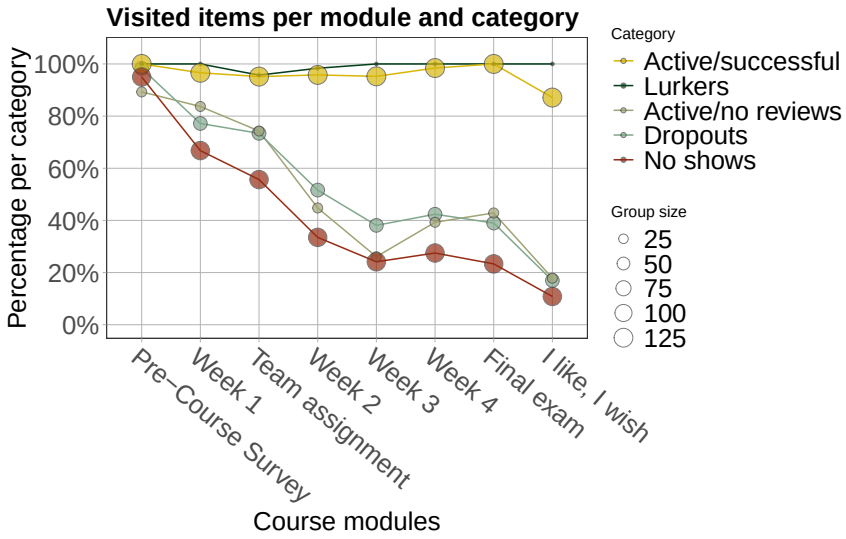

Figure 3. Team member activity

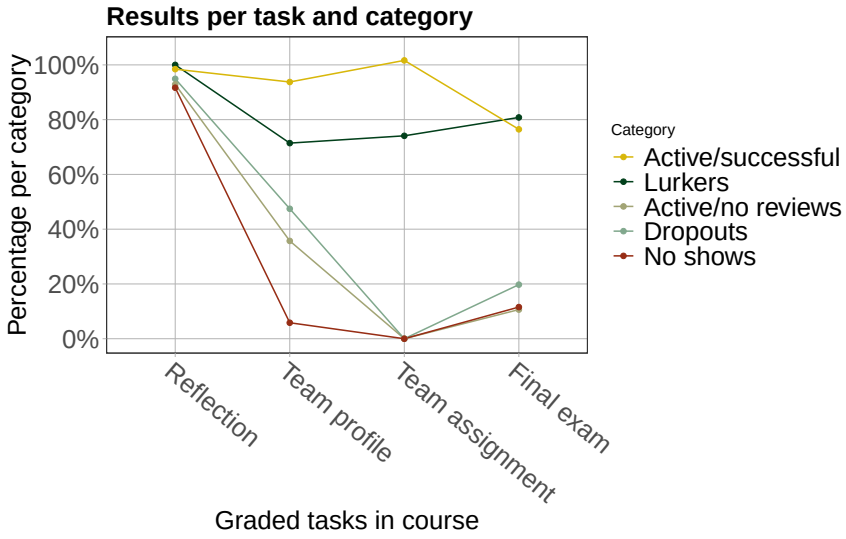

Figure 4. Team member results

not. The population of this course does not differ significantly from the population in other courses on our MOOC platforms, therefore, we are confident to conclude that this result can be generalized for all courses on our platforms. Nevertheless, we have set up a similar experiment in a different course to validate our findings. The team assignment in this course is currently running and will be evaluated soon.

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