



Work in Progress: A Study on Motivation in Teams Using Self Determination Theory

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Introduction

Given interest to study engagement in the classroom, when developing the framework on this project the authors utilized theories on the reasons for engagement. Underpinnings of self-determination theory provides perspectives on integrating optimal levels of stimulation with humans' basic needs for competence and personal causation. The process of transferring regulation of behavior from outside to inside the individual is called internalization; hence when individuals are self-determined, the reasons to engage in this behavior are fully internalized [1]. So, it is not just about the individual on his or her own, but how the individual interacts with the social context. In the absence of adequate support, intrinsic motivation is undermined thus diminishes sense of self [2]. In this case, we are interested in investigating team dynamics in the classroom as the social context.

At this time, this study consists of a pilot project conducted in a semester-long first year engineering design course. The authors evaluated motivation in teams, for which “Psych Safe” modules were used in the classroom to support team development and positive interactions within the team. These modules were a result of the primary author's training in integrating entrepreneurial mindsets objectives in engineering courses by KEEN (Kern Entrepreneurship Engineering Network) [3]. There was a subsequent training also done by KEEN, in which motivation was the main focus; it inspired the authors to explore how psychological safety in a team would truly motivate engagement in a team.

The construct of psychological safety comes from early research on organizational change; where Schein and Bennis (1965) discussed the need to create psychological safety for individuals if they are to feel secure and capable of changing. Unlike observing the team's learning behavior, as researched by Edmonson (1999) [4], the “Psych Safe” modules focused on the capacity of the individual working in a team. Further, a nuanced understanding of this capacity is measured by (1) autonomy: being the author of one's actions but doing so responsibly, which in turn preserves authenticity of self; (2) competence: confidence in goal oriented actions, which supports being a productive member in a social context; and (3) relatedness: to accept values and rules of their immediate groups and/or society, but doing so by internalizing the groups' norms/regulations as if it is your own [2].

We hypothesize that participating in these modules will help students feel more autonomous, competent, and related/connected--the three basic needs identified by Deci that supports Deci and Ryan's Self-Determination Theory of Motivation--and thus more motivated to engage in the team [2]. Ideally these basic needs are fulfilled evenly, though given the explicit tasks in the “Psych Safe” modules, the higher order is for students to feel autonomous and competent in the

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team; while relatedness is the furthest targeted goal--only because of the limited amount of time students are involved in this team.

To evaluate this, we administered a version of the Basic Psychological Needs Scale [5] modified to focus on students' perceptions within their teams. Fall 2019 is the first semester for data collection, to test the robustness of our methods and the surveying tool; hence it is a pilot project. We are continuing data collection in the Spring 2020 with a control group in an effort to research best practices for inclusive team development.

Methods

To examine changes in students' motivation within their teams across the course, we administered a version of the Basic Psychological Needs Scale [5] that we modified to focus on students' perceptions within their teams (see Appendix A). The survey was administered first in week 3, at the beginning of the semester, after students had just started working in their teams but before engaging in the "Psych Safe" modules. Of the 25 students enrolled in the course, 24 completed the pre-test survey. The post-test survey was administered again after students had completed all three "Psych Safe" modules, in week 7 of the course, and 22 students participated. Finally, the survey was administered during the 15th week of the semester, and 7 students participated in this delayed post-test.

Whereas the pre-test and the post-test surveys were administered during class, a snow day occurred on the class day that the delayed post-test survey was scheduled. Students received an email with the survey link instead, and this, combined with the fact that it was the end of the semester when students are usually extremely busy, likely accounts for the much lower response rate. Because of the lower response rate for the delayed post-test, our analyses focus on changes in students' motivation--specifically, their perceived autonomy, competence, and relatedness within their teams--between the pre-test and the post-test at week 7; the delayed post-test scores from week 15 were not included in this analysis. Students' scores were computed by averaging their responses for each of the dimensions of the modified Basic Psychological Needs Scale, which uses a 7-point Likert scale.

Results and Discussion

Paired-samples t-tests were used to examine changes in students' perceived autonomy, relatedness, and competence within their teams. All three dimensions showed an upward trend from the pre- to the post-test.

The change in students' perceptions of autonomy was not significantly different before engaging in the modules ($M = 5.20$, $SD = 0.93$) than after ($M = 5.57$, $SD = 0.45$, $t(21) = -1.96$, $p = 0.06$), although it did approach significance. Similarly, students' perceptions of relatedness were not significantly different before the modules ($M = 5.01$, $SD = 0.77$) compared to after the modules ($M = 5.31$, $SD = 0.57$, $t(21) = -1.60$, $p = ns$). However, students' perceptions of competence did show a significant difference when comparing their pre-test scores ($M = 4.74$, $SD = 0.48$) to their post-test scores ($M = 5.13$, $SD = 0.46$, $t(21) = -2.52$, $p = 0.02$).

Student scores on all three dimensions averaged between 5 (“Somewhat agree”) and 6 (“Agree”) on the rating scale, even at the beginning of the semester, which suggests that students are generally positively motivated throughout the course. This is a benefit, pedagogically, but also reduces the room for growth in students’ perceptions across the semester, which may help explain the non-significant changes in relatedness and autonomy. Nonetheless, these scores do suggest that there is still room for improvement in the strength of students’ motivation. Competence showed the lowest overall average at the beginning of the semester, suggesting that students’ overall motivation may be driven somewhat less by this dimension compared to the other two.

At the start, current “Psych Safe” modules target more of the autonomy and competence rather than relatedness. The latter dimension arguably develops over time, though it might be worth bolstering in the modules, irrespective of how long the students are put in teams. Autonomy is a dimension that was heavily emphasized, though it is more of a mindset objective that is relatively harder to attribute compared to competence, which directly relates to skill-based learning objectives. For example, proof of being a good team member is more tangible (competence dimension) compared to the ability to own and justify decisions in a team (autonomy dimension). Also, confidence in contributing ideas without judgment in a team--which is also indicative of competence, is psychological safety at its core. Hence, having a relatively significant positive change in this dimension might be considered successful. Though we have yet to further compound these results with qualitative data; with both combined there might be insights on internalization or lack thereof, which may provide better directions on further improving these modules.

High level summaries of Modules 1 through 3 are included in Appendix B, the initial plan was to have these modules interjected respectively at each design phase. In reality seeds of team building were needed in the beginning phases of the design process. Related to Tuckman’s theory on team development, it is during the forming and the norming stages that direct intervention could be most effective [6]. Yet we also see the possibility of having a fourth module that might help sustain the team’s momentum in the performing stage. Though students are giving responses to the module in a team setting/context, what is operationalized in the study is the individual as a team member. Therefore, the distinction here is the focus on the individual and their capacity as team members, not the team learning behavior as researched by Edmonson (1999).

Additionally, although students’ motivation did trend upward after participating in the modules, it is not possible to conclusively attribute this to participating in the modules using the data collected in the Fall 2019 pilot. For example, it is possible that students’ perceived motivation would have increased simply by definition of spending more time working in their teams, and that the “Psych Safe” modules may not be responsible for the upward trend in student motivation.

As described previously, this study has continued on into the Spring 2020 and now includes a control class that is not participating in the modules to help address this limitation. The Spring

2020 study originally was to address the very low response rate for the delayed post-test survey, as all three surveys will occur during class. However, with the COVID-19 pandemic we found that administering the delayed post-test survey was problematic and is not consistent with the environment that was created in the in-person class interaction. Also due to these extenuating circumstances, we had to delay evaluation of this set of data until mid Summer 2020, in planning for our next research stage.

This work in progress has given the opportunity to experiment with the Basic Psychological Needs Scale survey tool, which has been a robust tool for the objective of this study. Though initially the team learning behavior survey tool developed by Edmonson (1999) was considered for the next research stage to analyze the team as a whole entity (for insights on internalization); focusing on a research framework that will potentially be bi-modal for courses online and in-person will take precedence.

Online team building will require modifications and presumably a different approach than in-person team building; hence this is a relevant area to be explored. To better understand the robustness of the “Psych Safe” modules, the purpose of the modules will be better aligned with articulation of autonomy, competence and relatedness; which will be reflected in the qualitative survey questions. We also look forward to results from Spring 2020, that includes the control group comparison. As such, we are continuing this study into the next academic year, 2020/2021, with better research strategies learned from this pilot study.

Acknowledgment

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References

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Appendix A

Modified Basic Psychological Needs Scale

Rating Scale:

- Strongly disagree = 1
- Disagree = 2
- Somewhat disagree = 3
- Neither agree nor disagree = 4
- Somewhat agree = 5
- Agree = 6
- Strongly agree = 7

Items:

1. I really like the people in this team
2. I do not feel very competent in this team (Reverse-coded)
3. People tell me I am good at what I do in this team
4. I feel like I am free to decide how to do things in this team
5. I get along with people in this team
6. I pretty much keep to myself when I am in this team (Reverse-coded)
7. People care about me in this team
8. I am free to express my ideas and opinions in this team
9. I feel pressured in this team (Reverse-coded)
10. I consider people in this team to be my friends
11. I have been able to learn interesting new skills in this team
12. People are generally friendly to me in this team
13. Most days I feel a sense of accomplishment in this team
14. I frequently have to do what I am told in this team (Reverse-coded)
15. In this team, I do not get much of a chance to show how capable I am (Reverse-coded)
16. I feel like I can pretty much be myself in this team
17. There are not many people in this team that I am close to (Reverse-coded)
18. There is not much opportunity for me to decide myself how to do things in this team (Reverse-coded)
19. The people in this team do not seem to like me much (Reverse-coded)
20. I often do not feel very capable in this team (Reverse-coded)
21. People I interact with in this team tend to take my feelings into consideration

Dimensions:

- Autonomy: 4, 8, 9, 14, 16, 18
- Relatedness: 1, 5, 6, 7, 10, 12, 17, 19, 21
- Competence: 2, 3, 11, 13, 15, 20

Appendix B

“Psych Safe” Module Summaries

Module 1 - research web jigsaw

By the end of module 1, students should be able to examine and qualify facets of the design problem through independent and collaborative research as well as explore and discuss dissenting views.

Teaming

Maximum 25 students in the class

Teams are formed in the beginning of class, through Purdue’s CATME tool

4 to 5 students in the team, stays in the same team the whole semester

Deliverables and student assessment

Teams will write a Problem Definition Statement together, assessed through the class’ peer feedback (formative)

Final problem definitions will later have a summative grade in a deliverable separate to these modules, but related to the course, i.e. instructor check-in

Deployment/resources

Jigsaw: students will be divided into expert groups focusing on different facets of the problem (sub-topics), and will come back to the team (home group) to discuss their Problem Definition and further populating their research web.

Gallery walk: after displaying Problem Definitions on poster, students will give peer feedback while doing a gallery walk (un-conference style) and give comments on sticky notes;

Peer editing: teams will refine their Problem Definition after the peer feedback

Module 2 - team contract

By the end of module 2, students should be able to finalize their team’s contract and agree upon the terms in the contract, as a guide to work with each other throughout the semester.

Teaming and process

5 students in the team will negotiate terms on their contract

Students are prompted with guided questions that have them reflect internally first and then call out in a team discussion their individual preferences

Deliverables and student assessment

Teams are expected to finalize the contract by next project day, this is a formative assessment where all team members will receive the same grade

Deployment/resources

Think pair share on: What is a contract? What should be in a contract?

Questions asked are based on “Team Writing” by Joanna Wolfe p.30, which is also recorded into their Learning Portfolio

Contract template is based on “Team Writing” by Joanna Wolfe p.38

Module 3 - constraints negotiation

By the end of module 3, students should be able to negotiate constraints for the solution through collaborative discussion, as well as explore and discuss dissenting views.

Teaming and process

5 students in the team will negotiate constraints on the tentative solution

Constraints are limitations to the design, hence negotiating constraints help with part of the decision making for the final solution

Deliverables and student assessment

The result is an in-depth discussion on constraints on a solution, with formative assessment (without a grade), a copy of their individual work is also included in the Learning Portfolio

Deployment/resources

The constraints worksheet is an adaptation of one by Sid Saleh (Colorado School of Mines)