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A Systems Thinking Approach to Student-supervisor Interactions and their Effect on Psychological Safety

A Case for Student Learning Labs

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Abstract

The increasing trend of anxiety among students is closely linked to psychological safety, which refers to an environment where individuals feel comfortable expressing their thoughts without fear of negative consequences. Conversely, environments lacking psychological safety can heighten anxiety. This report examines the impact of transitioning from group work to solo projects on master-level students at Aalborg University. The shift to solo projects, with only a supervisor for support, may affect students' psychological safety.

This study investigates the psychological safety of students during this transition, identifying factors that influence their sense of security and confidence when working independently. By understanding these factors, the study aims to provide insight for educators to better support students in solo

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projects and mitigate the entrenchment of group-work learning styles while retaining the benefits. Strategies to enhance psychological safety, such as forming learning labs, are explored to break the feedback loop leading to poor solo work experiences and reinforce positive learning outcomes.

Keywords: Psychological safety; student learning labs; solo projects; causal loop diagrams; feedback loop theory

Introduction

Anxiety has become one of the major concerns in tertiary education, not only because of student welfare, but as it has implications for lower academic achievement (Tan et al., 2023). The current trend of anxiety in students is increasing and globally, around one in three students (34.8%) suffer from anxiety according to a meta-analysis by Chi et al. (2023).

Psychological safety and anxiety are closely related. Psychological safety refers to an environment where individuals feel comfortable expressing their thoughts, ideas, and concerns without fear of negative consequences. It is characterised by mutual respect and trust, allowing group members to take risks, ask questions, and admit mistakes without the fear of being judged or punished (Han et al., 2022). This fosters open communication, creativity, and collaboration, leading to higher levels of engagement and innovation (Clausen et al., 2025).

Psychological safety is typically divided into four levels: included, learning, contributing, and challenging (Clark, 2020). Reaching the latter levels of psychological safety is essential for students engaging with supervisors as it enables individuals to contribute fully and authentically, asking questions, sense-checking, and admitting mistakes without fear of negative consequences (ibid.). These characteristics are particularly important in project-based pedagogical environments, as students need to feel secure enough to explore new ideas and approaches (Gonda et al., 2024).

Conversely, in environments lacking psychological safety, individuals may experience heightened anxiety. They might fear making mistakes, asking questions, or sharing ideas, leading to increased stress and a reluctance to engage fully (Harris et al., 2024). This can create a cycle where anxiety inhibits open communication, further eroding psychological safety (ibid.).

Psychological safety may be affected when students shift from familiar group work to unfamiliar solo projects (Edmondson, 1999). This can pose a problem for educators and organisations primarily working with group project-based assessment, such as Aalborg University, when students are expected to pivot to solo projects with only a supervisor to provide project feedback. This paper investigates the psychological safety of students during this transition, exploring the factors that influence their sense of security and confidence when working independently. By identifying these factors, the study aims to provide insights for educators to better support students both in solo projects, and to mitigate potential entrenching of learning styles associated with group-work. Through this process, we hope to develop strategies to enhance psychological safety to the third and fourth levels (contributing and challenging), thereby facilitating stronger student confidence and learning efficacy.

Methods

Educational intervention method

The data were collected from supervision meetings with Master students working on solo projects. During and after supervision meetings with the students, comments on supervision style were recorded using a reflective feedback approach. Reflective feedback is a method by which individuals reflect on and critically assess their performance from the feedback they receive (O'Connor & McCurtin, 2021; Yaman, 2020). By engaging in reflective feedback, supervisors can identify strengths and areas for development, ultimately enhancing their effectiveness and achieving their goals more efficiently (Cornu & Peters, 2005).

Feedback is one of the most important characteristics in the Aalborg PBL model (Clausen, 2024; Jiang et al., 2023). The method is aimed at understanding how these students working on solo projects are adapting to the pressure of working alone and engaging differently with their supervisor. Moreover, the feedback allows adaption of the supervision to their needs, hopefully improving the support of them.

Data collection and analysis

The students were asked to give feedback at the start and end of each supervision meeting about the supervision methods and how the supervisor could improve support for them and future students. Data were recorded from 17 meetings from October to December.

At the beginning of each meeting, students were asked to share conversational style feedback on the past week/days of their work. These reflections were recorded and, key words were noted, with tick marks or crosses to indicate the degree of emphasis being conveyed.

At the end of the meeting, the supervisor asked the student to give constructive feedback on the meeting, how helpful it was for them, if all their questions were well-understood and well-answered, and what improvements could be made. Space was also given for their answers to wander into other feedback topics.

A thematic analysis inspired by Madison (2011) was conducted based on the written notes applying the following approach. 1) The data were collected in a table for each student. Notes from each meeting were typed into these slots, including language indicative of positive and negative tones. 2) The results from the meetings were then organised by month and aggregated for student anonymity. 3) Within each month, salient themes were identified in order to analyse the progression in the student-supervisor relationship throughout the supervision period. 4) Themes were continuously discussed with my two pedagogical supervisors to counteract bias.

Results

October meetings

Feedback began in October. Two themes were immediately visible. On one hand, students gave positive feedback on supervisor engagement, consistency and speed of responses. It was noted that the students had previously experienced that some supervisors are not interested in students' work and sometimes give contradictory feedback. On the other hand, students gave the constructive feedback that more direct encouragement, especially early in project ideation would help, and the absence of this created feelings of disheartenment and confusion.

A distinct topic emerged across students with regard to working solo rather than in groups. Students noted they were used to working in groups with friends and using them for bouncing ideas off. Without this option during the internship, students noted they used their supervisors in a similar way and that this change of roles created a feeling of insecurity due to the sheer number of questions that were being presented during supervision meetings.

November meetings

Feedback during November meetings was also lumped into two themes. In some cases, this period marked the crossing of a threshold in the relationship between the supervisor and the students. For example, some discussions included explicit statements of appreciation. Again, the theme of supervisor engagement was highlighted in the feedback, this time associated with the positivity of comments on the project work. This helped create belief about being on the right track, which was a topic for students who felt isolation during their solo project work.

Another theme included doubtfulness about some of the supervision suggestions. For example, it was noted that some supervisor comments on project work were unique among supervisors, and that this took students by surprise, again leading to confusion.

December meetings

The final meetings were held in December. At this point, student projects were in good shape, and the feedback was reflected the positivity of the students as well as the trust built over the duration of the semester. Feedback themes included gratitude for pushing students outside their comfort zones. This was also linked to concessions about the difficulty in accepting challenging comments on students' work.

Students suggested that in the future, supervisory comments on student projects could be structured into the following three points: one thing that is going well with the work; one thing that is not going well and should be improved; and one thing to think about changing. The first point is useful to help students understand which part of the work could be developed into other parts of the report. The second point obviously helps students know what to avoid doing. The third point helps students see how a good idea could be more impactful.

Discussion

Reflections on student engagement

Over the observations, student-supervisor interactions were generally positive or constructive, and continued to develop well during the projects. This is demonstrated in the depth of feedback which increased over time. The feedback grew increasingly more honest but also critical at times, indicating the student-

supervisor trust progressed from a learning level to a challenging level of psychological safety.

This finding is a good demonstration of what does work. On the other hand, it is difficult to know from this what would not have worked. Few difficult conversations were had, so it is difficult to know how things would have turned out under different circumstances. In general, student-supervisor engagement may also be a function of personalities and likely fostered higher levels of mutual trust and psychological safety.

Considering the literature on feedback, constructive feedback sessions can be crucial to rehabilitating student-supervisor relationships and recovering higher levels of psychological safety (A. C. Edmondson & Lei, 2014; Maximo et al., 2019).

Group work versus individual work

During the supervision meetings, a common point was mentioned multiple times in students' supervision meetings. That is, that the internship semester was more challenging because the students have become used to working in groups for project reports in the PBL environment. While initially group-based projects can be difficult for some students, when it becomes habitual, it creates a safety net for students who motivate each other and use their peers as sounding boards for sense-checking ideas. Ultimately, the mutual benefits of group work cultivate a dependency between students.

The students observed for this study struggled with self-confidence when making autonomous decisions for their projects. This was due to the shift from normally having the safety of a group in which to seek direct feedback. They alluded to using supervision meetings (rather than peer-to-peer student group meetings) as their bouncing board for ideas, and that this was different because it exposed them to feeling vulnerable and potentially revealing their weaknesses. On the other hand, students found this necessary because they were otherwise isolated. This shows the value of group work for consensus building, and refinement of ideas in a safe space of peers. It also seems to foster the spirit of constructivism in general, as a group of students must make concessions to reach a compromise, acknowledging that no single member of the group is necessarily objectively more correct than another. In the internship semester, this reflexivity is more difficult because the student and supervisor dynamic is academically hierarchical. Understandably, the student may feel (as the feedback discussions showed) that there is a more objective truth, and that the supervisor has access to that truth. In reality, the supervisor is also a construct and may in fact be much more institutionally constrained to think

within a certain academic paradigm, than say a student who still retains some idealist normativity and a sensitivity for the factors that influence them.

The studied effect on self-confidence and vulnerability sheds light on the psychological safety of students in different supervisory and group-work contexts. It then becomes relevant to consider, what are the different types of support, different students need along the stages of their educational development to feel psychologically safe? From the experiences and observations during this study, psychological safety is high at the beginning of the semester and can deteriorate as stress and deadlines mount as the semester bares down on the students. Not only that, but as there are aspects, as discussed above, of differing expectations on learning development before the internship semester that build a reliance on group work. This expectation changes when the students are taken out of that comfort zone and expected to work on a report alone.

Unlike the beneficial reinforcing feedback loops between group work and psychological safety, solo work risks a loss of psychological safety as students experience isolation with their untested ideas, which they now have to present to their supervisor for sense-checking in lieu of group peers. Through the prioritisation of group work, experience of solo work is undeveloped leading to less feeling of safety in solo work, resulting in a reinforcing lock-in. This is illustrated in Figure 1.

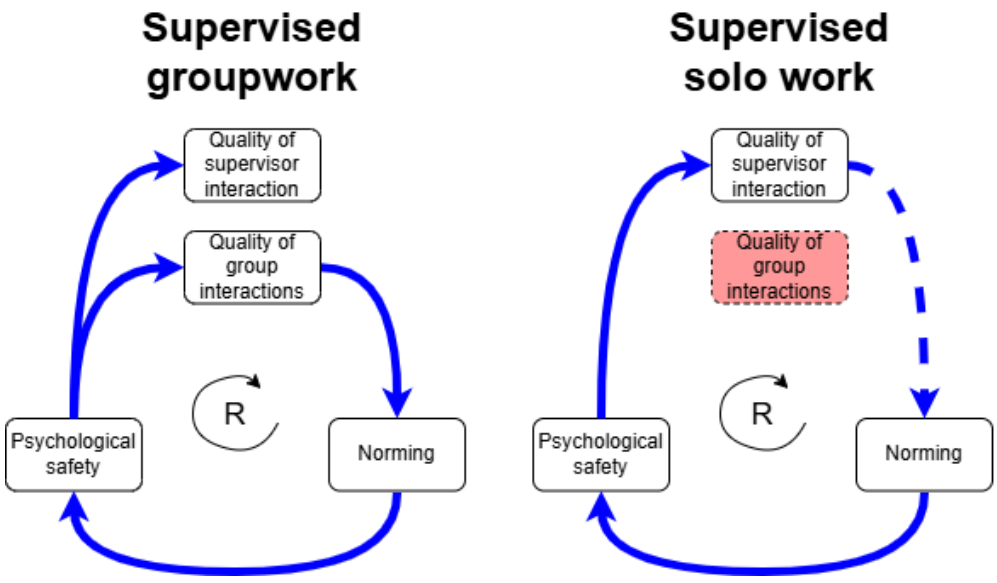

Figure 1. Casual Loop Diagrams showing two archetypes: working in a supervised group (left) and working on a supervised solo project. Red shading indicates the loss of group interactions

that drive group norming, which is instead driven by interactions with the supervisor. R stands for Reinforcing loop leading to lock-in.

In the left loop, Figure 1 shows a supervised groupwork archetype. The student who experiences high quality group interactions, and subsequently experiences higher group formation (indicated by norming in the figure), further elevates their psychological safety. The right loop shows a supervised solo work archetype. The student who experienced high quality group interactions is now working without a group and must substitute their group interactions with supervisor interactions (dashed causal influence). These two archetypes may also work to reinforce negative experiences. For example, low quality group interactions can lead to low group cohesion and erode psychological safety. This is especially relevant if in the case of solo work, the quality of interactions from the supervisor is insufficient, this can lead to decreasing psychological safety, and a negative lock-in may arise.

Figure 1 illustrates the theory put forward by this study, that a preference for either format can become entrenched through a reinforcing feedback loop, resulting in a lock-in to one or the other. This finding is described in systems thinking literature as a lock-in, or an eroding goal (Meadows & Wright, 2008).

Learning can be seen as a complex dynamic system due to the multiple elements and reinforcing feedbacks between them that relate to learning, such as institutional conditions and cultural values (Du et al., 2025). From this systems thinking perspective, it follows that improving the institutional conditions, i.e. the learning environment, and tailoring them to suit the variety of cultural values, can improve psychological safety and consequently also learning outcomes (Guerra et al., 2023). While PBL focuses on achieving highly beneficial group dynamics (e.g. Jiang et al., 2023), there is an underinvestment in solo work. This leads to some students (even high-achieving students) struggling to sense-check their ideas due to their learned reliance on group members for that role. One possible solution is to offer solo-working students the possibility to form proxy groups within which they can avoid isolation and foster aspects of group work such as sharing ideas while filtering the outcomes into their solo projects.

A case for student learning labs

Student learning labs offer a collaborative educational environment where students work together on their individual projects. Examples of student learning labs include monthly or bi-weekly sessions where several solo-students meet with each other and their supervisors. All students present progressions and challenges in their respective projects followed by rounds of

discussions with all involved. Meetings can be focused on specific common topics such as data collection, literature review etc. Student learning labs can have different compositions which may follow the definition by Sanchez et al. (2022), providing solo students with a community (of students) who work on shared activities (their projects) in a shared space.

In the case of solo students, this environment can foster the type of psychological safety they otherwise experience in group work environments, because the lab participants substitute the role of the group as a sounding board for ideas while allowing them to progress their individual work. Among other benefits such as improved learning outcomes (Admiraal et al., 2024), improved PBL competences for inexperienced students (Nordahl & Kofoed, 2007) and increased innovation (Sanchez et al., 2022), it minimises the feeling of isolation (Asgari et al., 2024). As illustrated in Figure 2, student learning labs thus have potential to break the feedback loop that leads to a negative lock-in of poor experiences by reversing the polarity of the causal link between experience of solo work (when experiences are few) and psychological safety in solo work (due to the work being supported by peers in a lab).

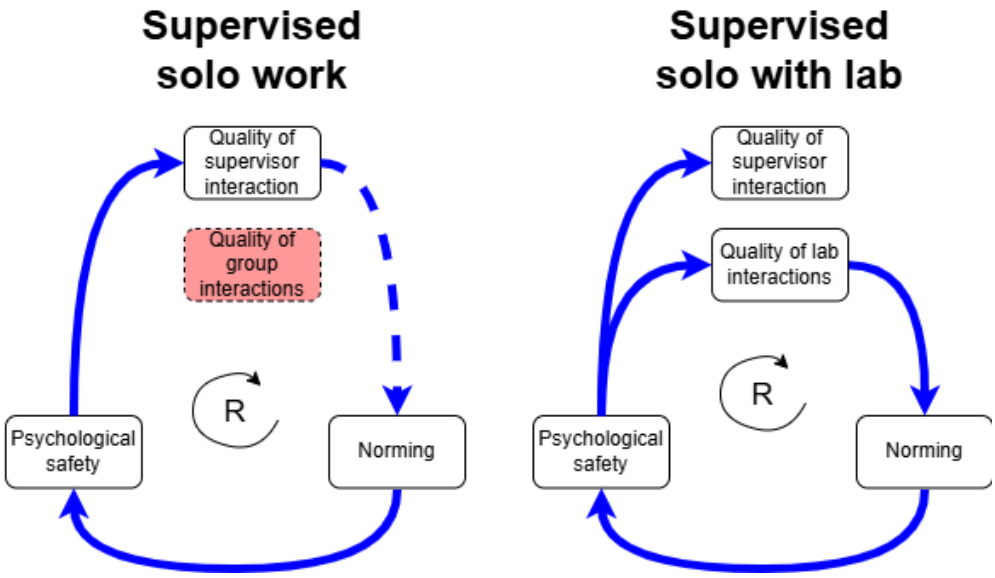

Figure 2. Casual Loop Diagrams showing supervised solo work (left, as in Figure 1) and solo work supported by a supervised student learning lab (right, as a solution to Figure 1). Red shading indicates the absence of group interactions that drive group norming, which on the right is instead driven by interactions within the student learning lab acting as a proxy group. R stands for reinforcing feedback loop leading to lock-in.

Limitations and future work opportunities

This study was limited due to the data and potential biases. During the supervision meetings when the data were being gathered, the subjective interpretations and lack of impartial coding of verbal information was difficult to manage while retaining a supervisory role. At one time, trying to elicit genuine feedback from the students that avoids pandering while interpreting and note taking proved difficult. Biases were handled by continuous discussions with colleagues (pedagogical supervisors). Limitations were exacerbated by the limited sample size, which was constrained due to the semester schedule. Ideally, a larger number of students could be included in the sample, and from different year cohorts to shed light on how the psychological safety of students may change over time with their experiences in group work settings, allowing for more general conclusions to be drawn. More work could be done to explore this, for example at Aalborg University in the University Pedagogy programme, which exposes educators to PBL methods and encourages them to experiment with such approaches.

Conclusions

The increasing importance of anxiety among students is closely linked to psychological safety, which refers to an environment where individuals feel comfortable expressing their thoughts without fear of negative consequences. This study investigates the psychological safety of students during the transition from group projects to solo projects, identifying student-supervisor interactions that influence their sense of security and confidence when working independently. By understanding these factors, the study aims to provide insights for educators to better support students in solo projects and mitigate the entrenchment of group-work learning styles while retaining the benefits. Learning labs are discussed as a possible solution to break the feedback loop leading to poor solo work experiences and reinforce positive learning outcomes.

We found that students enjoy feedback sessions. It empowers them to help create a learning environment tailored to them. Students showed keen interest in the feedback sessions and were willing to share positive and constructive feedback about supervision styles. This contributed to comforting some of their anxieties about working solo and creating a psychologically safer environment.

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