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Digging into group establishment: Intervention design and evaluation ☆

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ABSTRACT

Previous research has documented challenges in students' group work. An identifiable segment of the previous research that relates to improving students' group work conditions is the study of group formation and self- and peer-assessment. Though studies that primarily focus on how to address the conditions of students' group work and the existing problems can be found, there are not many related to higher education settings. On this ground, the present article advances a qualitative evaluation of the intervention that promotes student groups' self-awareness and thereby self-regulation toward fair group work during a software engineering project. An inductive thematic analysis was applied to the students' written reflections on the intervention. To further understand the results, the concept of "group establishment," referring to destructiveness that complicates individuals' truthful living at the group level, was employed to reflect on the resulting themes. Hoggett (1998) provided this articulation by synthesizing previous results in psychoanalytic theory. Students' experiences with the intervention revealed several value gains, including personally identified benefits as well as open group mood, consolidation of grouping, conceptual learning about group work, and regulation for task allocation. Noted challenges included dishonesty and a personal role conflict, and some students reported minor effects on group performance. Students valued safety in the intervention situation and argued that the intervention was needed from outside the group. A summative review of the students' experiences suggests that the intervention was useful for all groups. The results are discussed from a pedagogic and the aforementioned psychoanalytic perspective, and remarks are made for software engineering education.

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1. Introduction

Employers set high expectations of graduates' inter-personal skills while identifying a gap between their expectations and graduates' levels of education (Hernández-March et al., 2009). In a systematic review of challenges and recommendations in global software engineering education, group work was accordingly identified as a key challenge and an area that requires educational attention (Clear et al., 2015). Conforming to employers' expectations, software engineering (SE) course project descriptions include narratives in which group work is explained as preparing students for working life (e.g., Brodie et al., 2008; Dos Santos et al., 2009; Jun, 2010; Pérez and Rubio, 2020).

Another, more pedagogic incentive for group work favors (social-) constructivist student-centered learning, although group work is not deemed a necessary condition for implementing constructivism (Baviskar et al., 2009). Narratives of group pedagogy associated with student-centered learning are shown in SE project course descriptions (e.g., Souza et al., 2019; Pérez and Rubio, 2020), and according to the feedback from such settings, students enjoy and benefit from peer learning and feel better prepared for the future (e.g., Ahmad et al., 2014). In challenging projects, the value of a group is evident in students' appreciation of a committed group as a support network that helps group members work through the project (Isomöttönen, 2011; Isomöttönen et al., 2019).

The implementation of group work in higher education courses does not come without difficulties, however. For instance, the notion that group composition can negatively affect the effectiveness of a group is present in studies by Livingstone and Lynch (2000) and Kamau and Spong (2015). Drawing on Steiner's (1972) work, Kamau and Spong (2015) explained that faulty group processes hinder groups from reaching their potential. The authors referred to lack of motivation and coordination, harmful group dynamics, and problematic individual differences as explanations for problematic group processes. These attributes reflect the impact of the group composition, that is, how the combination of individuals with varying motivations and other individual differences can negatively influence the performance of a group.

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Group problems have also been based on problematic group roles. One such role is a social loafer (e.g., Kamau and Spong, 2015; Pieterse and Thompson, 2010). Social loafing denotes a tendency toward reduced individual efforts when a task is group based rather than an individual task (Latane et al., 1979). Latane et al. (1979) considered that a social setting allows individual responsibilities to diffuse, and therefore loafing or hiding in a group is possible. Another problematic role emphasized by Pieterse and Thompson (2010) was a diligent isolate, condition where an advanced student appropriates work to save the project while excluding weaker ones. Pieterse and Thompson (2010) found that academic alignment – homogeneity regarding academic abilities, skills, and goals – explained the emergence of both social loafer and diligent isolate roles. Little to no social loafing was observed in groups with high academic alignment, while weak alignment was observed when advanced students excluded weaker ones. The authors also observed that students who appeared to be social loafers were often willing to participate but their opportunities were constrained by experienced group members. In the present authors' experience, skill differences provide a fruitful ground for such unintentional social loafing (low participation), and several factors such as communication courage, self-belief, and how students acknowledge and support each other influence the situation.

A major source of stress for students is unpredictability and relatedly the lack of control for justice (Hinds et al., 2000; Strauss et al., 2011; Yorra, 2012). That is, students do not know what to expect of a newly formed group regarding the group members' willingness to work and how this group eventually influences their course evaluation. The consequence is that students prefer homophilic and self-selected groups for predictability (Strauss et al., 2011), and they are attentive to whether prospective group members are hard workers from whom contributions can be expected (Strauss et al., 2011; Hinds et al., 2000). In line with these references, a systematic review of group work pedagogy in the business discipline revealed that journal articles often discussed social loafing and assessment, and that these attributes were interrelated regarding distributive justice experienced by students (Riebe et al., 2016). The distributive justice here refers to the fairness of rewarding in reference to the individuals' efforts, and commonly to how wealth is shared (e.g., Fleischacker, 2009). This student perspective is important for educators to recognize because, as Livingstone and Lynch (2000) noted, experiences of injustice sponsor persisting negative attitudes toward group work.

The pedagogic promise and the challenges outlined above characterize group work as a controversial pedagogy, which has been explicitly highlighted in SE education studies. Isomöttönen (2011) conceptualized group work as a "trade-off" (pp. 93–94) in that it was prone to create experiences of injustice and unfulfilled personal expectations in place of the available positive one in which commitment in the group helps its members survive projects for real customers (Isomöttönen, 2011). Iacob and Faily (2019) found that how group undertakings proceeded often differed from students' initial enthusiasm and positive expectations. Generally, the controversiality is likely to exist in students' coursework because group work may be initiated due to resource pressures (Burdett, 2007). In Burdett's study, educators were asked about their opinions on whether students' problematic group situations should be intervened. Part of the respondents opined that student groups should resolve their own issues, including that a group can cast off a member who is not contributing. Other respondents opined that interventions are needed and that changes in groups should not be enforced.

Motivated by the above considerations, this study sets out to investigate the question of how to improve the working conditions of SE project student groups. The study describes and evaluates an intervention that promotes student groups' awareness of their own situation and, by implication, self-regulated practice in relations between individuals and groups toward fair group work. This intervention is essentially a dialogic group session that requires students to analyze their own group situation regarding sensitive matters (e.g., (in)justice in the group) in the presence of other group members and the teacher who facilitates the session. The evaluation employs an inductive qualitative strategy, with a thematic analysis applied to the individual students' experiences of the intervention (N = 57). This is complemented with a summative review of the themes to illustrate the students' experiences as positive versus negative in the context of groups. In this study, the term intervention refers to an educational activity and not to controlled research.

The present study can be seen to continue SE education research that previously demonstrated the controversiality of group work (Isomöttönen, 2011; Iacob and Faily, 2019) because the focus is on understanding how the vulnerability of groups documented in these studies can be addressed. Compared to a related study that sought to improve students' group work by proactive education (Kamau and Spong, 2015) and a study that guided student groups to review their current group problems independently (Marques and Ochoa, 2014), the present intervention approach and evaluation is more focused on the experiences of individual students. The dialogic group analysis techniques reported by Clear (2002) and Isomöttönen (2014) resemble the present approach, but these studies did not include a systematic evaluation. The present work continues from what these two studies indicated in that attention is now given to how the students' ability to analyze their own group can be facilitated. Related educational actions are reviewed, and the research gap is further demonstrated in Section 3.

Through scholarly readings, a particular psychoanalytic perspective of groups was discovered as a frame of reference that explained teaching experiences in relation to why intervening in a group situation is challenging, and was deemed a frame against which students' experiences of the intervention could be reflected. This frame was the concept of "group establishment" (Hoggett, 1998). Hoggett's text outlined group establishment as a condition in which reactionary forces within individuals sponsor a problematic establishment at a group level. Our summarization of Hoggett's text is that any one group has a group illusion which the group willingly upholds but which can be harmful to the group and therefore calls for resolution. The group establishment was historically grounded in Freud's (1961) controversial concept of death instinct. Other scholars underpinning Hoggett's articulation were Klein (e.g., 1946), Bion (2003), Bollas (1987), Meltzer (1968), Rosenfeld (1987), and Steiner (1972), of which Bion took a central place. Incorporating this frame into the present study meant that the conceptual understandings of the resulting themes could be advanced in discussing the results. This frame also helped to characterize the present intervention approach in relation to other educational actions in the literature.

Section 2 explains the group establishment perspective. Section 3 reviews related literature to contextualize the present intervention approach and to demonstrate the research gap. Section 4 describes the context of the study and the intervention design. The research approach and the method are detailed in Section 5. The results are presented in Section 6. The remaining sections include the discussion, conclusions, and suggestions for future work.

2. Psychoanalytic grounding

Hoggett (1998) outlined a potentially problematic group establishment in any group's life, and characterized this establishment as an illusion that is willingly upheld (p. 20). Hoggett (1998)

case example of a community project explains that (pp. 16–19) group members had developed cynicism in their reciprocal relationships and were protecting their own expertise areas in the project. Lack of trust and communication characterized the group, and the members felt that the group had nothing to offer to them. The group establishment referred to the unspoken "something" (p. 23) that complicated the group's life and in a pathological manner prevented the group from addressing this unfruitful condition. Hoggett based the group establishment on previous notions in psychoanalysis. The following provides the present authors' review of the sources referred to by Hoggett.

Hoggett (1998) made use of conceptualizations of individuals' destructiveness and referred to Freud and Klein. Therefore, the following historical notions from Freud and Klein are given as the background. Freud (1961, pp. 32–47) assumed a death instinct[1] as a biological process in which "living dies for internal reasons" (p. 32). This was regarded as a destructive force operating from within, from which the organism protected itself by projection (p. 23). In Klein's work (see, e.g., Klein, 1946), Freudian death instinct assumed a central place in infantile destructive fantasies designated as *paranoid-schizoid* position. In this developmental position, psychotic anxiety is coped with by splitting, and by deflecting the split of bad and good objects onto the first object (mother/breast, as a part–object). This process of projection is accompanied by interjection, in which the projected, both persecutory (bad) and loving (good) first object, are absorbed and internally again represented. During the subsequent, consolidating *depressive* position, the infant experiences guilt and begins to acknowledge the first object as an independent, whole entity.

A key point in Hoggett's (1998) text was drawing parallels between individuals' destructiveness and difficulties faced by groups, and attention was thereby given to Bion's (2003) work on groups. In Bion's work, a dynamic process in which a container (cf. the first object) detoxifies anxieties of a contained (cf. infant) (Symington and Symington, 2002, pp. 51–52) resembles the above notions from Freud and Klein. Bion's (2003 pp. 130–133) view was that an individual is always in a group, and, echoing (Freud, 2010, pp. 11–13) in not assuming a distinct herd instinct, that the characteristics of the individual as a gregarious animal simply become demonstrable when individuals gather as a group (Bion, 2003, pp. 130–133).

Bion (2003) differentiated between a work group mode and basic assumption modes in the life of a group. The first refers to a group's task-oriented mode in which the group is able to organize itself and make progress with the task (Bion, 2003, p. 98). A group is nevertheless destined to demonstrate so-called basic assumption modes – dependence, fight–flight, and pairing – which are characterizations of group challenges (Bion, 2003, see, Chapter 3). These are indications of a group coming together to preserve the group (Bion, 2003, p. 64). For instance, "flight-fight" indicates a phenomenon in which a group makes it possible to fight something or ignore (flight) it (Bion, 2003, p. 65). An example is a group who opposes a new idea when this idea imperils the group's status quo (Bion, 2003, p. 155). Bion (2003, p. 154) explained that one basic assumption is active at a time and complicates the group's work mode. To account for the destiny of the two inactive basic assumptions, Bion (2003, p. 101) linked these basic assumption phenomena to a proto-mental system, in which these assumptions were assumed to have prototype counterparts. The inactive basic assumptions are idle in this system (Bion, 2003, p. 102). Bion noted that

> "It is these proto-mental levels that provide the matrix of group diseases. These diseases manifest themselves in the individual but they have characteristics that make it clear that it is the group rather than the individual that is stricken" (Bion, 2003, p. 102).

He linked this human quality with Klein and Freud, along with explaining the primitive characteristics of the proto-mental system and the manifestations of basic assumptions:

> "But approached from the angle of psychotic anxiety associated with fantasies of primitive part–object relationships, described by Melanie Klein and her co-workers, the basic-assumption phenomena appear far more to have the characteristics of defensive reactions to psychotic anxiety, and to be not so much at variance with Freud's views as supplementary to them. [...] In fact I consider the latter [refers to primitive anxieties of part–object relationships] to contain the ultimate sources of all group behavior" (Bion, 2003, p. 189).

For the present purposes, it is further emphasized that Bion (2003, pp. 62–64) regarded a basic assumption group mode as a manifestation of preservation. He then stated that the group as a target of analysis arouses extremely primitive fears (p. 162). This is clarified in an extract that Symington and Symington (2002, pp. 130–131) marked as Bion's "new understanding of Kleinian theory":

> "[...] the group approximates too closely, in the minds of the individuals composing it, to very primitive phantasies about the contents of the mother's body. The attempt to make a rational investigation of the dynamics of the group is therefore perturbed by fears, and mechanisms for dealing with them, that are characteristic of the paranoid-schizoid position" (Bion, 2003, p. 162).

Bion is characterizing here the challenge with the analytic investigation of a group. In Hoggett's (1998) text, the foregoing – our adumbration of the sources consulted by him –amounted to the interest in a problematic group establishment. It appears that Hoggett (1998) was addressing the challenge that Bion is referring to above ("...perturbed by fears..."), describing it as a reactionary, secretive, and sensitive force that is in play in groups and makes group analysis challenging (p. 23).

Furthermore, Hoggett (1998) explained the persistent nature of the group establishment by citing destructiveness in narcissism, in particular the pathological control therein. Here, he made use of Rosenfeld's gang analogy. Rosenfeld (1987, p. 111) acknowledged destructive narcissism (cf. death instinct) as an internal organization that upholds a narcissistic position by guarding against any life-seeking tendencies. This organization was considered similar to a "gang dominated by a leader" (p. 111) that provides protection while exerting pathological control over the individual. With the help of Melzer, Hoggett (1998) emphasized that this gang-like organization provides protection from the destructiveness from which it itself derives. This altogether refers to a persistent group illusion that is subject to being injurious to the group itself (Hoggett, 1998).

Hoggett (1998) also briefly suggested that the "unthought known" in the work of Bollas (1987) corresponds with the group establishment. Bollas (1987, Chapter 1) theorized that an infant experiences the first object as transformative. The first object is understood as a process that transforms the infant's world and is associated with the continuation of being and survival in place of a demarcated entity. According to Bollas, this condition influences object relations throughout adult life, as adults seek transformations (whether an ideology, person, etc.). Bollas designated this condition as unthought known because it is recognizable

[1] A much-debated view; for instance, Kernberg (2009) adumbrates an emotional system (in place of inborn instincts) where aggression springs from, while putting that Freudian death instinct continues to be relevant in clinical practice.

(existence is known), but due to the nature of the transformative process, it is not cognitively rememberable (cannot be thought about). Hoggett (1998) stated that "the establishment guards an area in the life of the group that cannot be thought about" (p. 19). The present authors would add that the notion of the unthought known emphasizes the challenge of group analysis highlighted by Bion because the origins of group issues appear rather unspecified when the first object relationships are considered transformative.

Altogether, the above explanation of the challenge of group analysis was considered to be informative and to persuade research on students' responses to group interventions.

3. Related work

This section reviews actions that SE and other educators have taken to counteract problematic group situations and concludes by considering the present approach – stimulated by the above psychoanalytic perspective – in relation to the actions reviewed. The section begins with grouping strategies (a.k.a. group formation) and self- and peer-assessment techniques. These lines of research were considered to loosely relate to the present goals of the study. This is followed by studies that were recognized to resemble a group work intervention.

As Fincher et al. (2001) conceptualized, a grouping strategy can be selected for a particular function (goal) in the project course setting, and each strategy has its own pros and cons. This reflects thinking in project-based education that, once the course goals have been decided, means to achieve those goals can be selected accordingly (Clear et al., 2001; Fincher et al., 2001). An example is provided in the study by Pieterse and Thompson (2010), which noted that with little social loafing observed in groups with high skill and goal alignment, the authors stated a preference for homogeneous groups. The authors also stated that it is preferable that students face challenges at an individually appropriate level, which provided another argument for homogeneous groups. Another strategy is the attempt to form balanced groups for successful projects (see Clear et al., 2001). Perhaps because different grouping strategies emphasize different functions, research has documented divergent opinions among educators on whether to seek homogeneity or heterogeneity of skill distribution in groups (Cheng et al., 2008). Computer algorithms have also been used for group formation. For instance, Sahin (2011) focused on analyzing students' preferences for groupmates using a particular algorithm and reported on the superiority of this strategy over random selection, teacher selection, and student selection based on several indicators of project success. A recent mapping study on group formation in the SE industry showed that algorithmic techniques have received a high level of attention in the past ten years (Costa et al., 2020).

Self-and peer-assessment studies are motivated by the challenge of assessing individual contributions fairly, while also stating that such assessment activities promote learning about group work (e.g., Sanders, 1984; Wilkins and Lawhead, 2000; Hayes et al., 2003; Smith and Smarkusky, 2005; Clark et al., 2005; Farrell et al., 2012; Basholli et al., 2013; Bastarrica et al., 2019). Implementing these assessments during students' coursework naturally provides a setting for self-regulation. This formative assessment perspective was emphasized, for instance, by Farrell et al. (2012). In the study by Basholli et al. (2013), students agreed that peer-assessment is a useful measure for identifying individual contributions, while also reporting that biases arise from peer pressure and friendships. An additional challenge is that students dislike ranking their peers (Clark et al., 2005; Richards, 2009). Multiple data sources have been used to moderate potential biases (see, e.g., Magin, 2001), and computational methods have been used to facilitate the interpretation of assessment data (e.g., Chai et al., 2015). These studies appear altogether linked with the academic environment due to the focus on assessment. In the settings of computer-supported collaborative learning (CSCL), in which students collaborate through a learning platform, both students' contributions and collaboration activities are available for automatic analysis (see, e.g., Hernàndez-Garcia et al., 2018). CSCL and learning analytics research are not within the scope of the present article.

Resembling an intervention, Pieterse and Thompson (2006) and Oakley et al. (2004) documented a way to deal with non-contributing group members, which allowed a student group to remove such a member. Both Oakley et al. (2004) and Pieterse and Thompson (2006) implemented this removal process gently by trying to resolve a group problem through supervision when an initiative for eliminating a group member emerged. This seems to be an action by which misinterpretations of uncommitted behavior are avoided. Oakley et al. (2004) discuss the topic in classroom teaching context and propose short crisis clinics. Pieterse and Thompson (2006) argued that merely knowing the possibility of being removed from a group gives potential loafers an incentive to contribute. Generally, it is worth discussing that a great deal of responsibility regarding sensitivity for individual students' backgrounds rests on the student group if the removal process is not carefully thought out. For instance, if observed social loafing (low participation) is unintentional, arising from skill differences or low self-belief, the student group considering a removal is dealing with the responsibility to acknowledge such factors.

Kamau and Spong (2015) and Fronza and Wang (2017) used educative interventions. In the former, the actions included a lesson about group processes, having a tutor available for the groups, and encouraging the groups to name a leader. The evaluation was done at the group level, and the authors observed that the educated groups performed better than the control groups who showed faulty group processes. Fronza and Wang (2017) raised students' awareness of social loafing (hence, educative) at the beginning of the course and continued to address this phenomenon through questionnaires during the course. The goal was to promote adherence to the terms promoted in the beginning. This study does not include evaluation. Fronza and Wang (2017) concluded that they need to consider skill levels in groups in order to differentiate between low performance and social loafing in their future work. This arguably relates to the unintentional social loafing discussed above.

Marques and Ochoa (2014) used so-called thinkLets to prompt student groups to review their challenges. That is, when the researchers overheard a potential group problem in a project meeting, they suggested that the student group considers this problem through a documented problem pattern (a thinkLet), which was provided to the group to be independently investigated outside the meeting time. An evaluation was performed by taking notes of the group's feedback on the usefulness of thinkLet during a next project meeting. The evaluation occurs at the group level and focuses on the overall usefulness of thinkLets, using the categories of positive, neutral, and negative. On the majority of occasions, the groups' feedback was positive.

Two studies used dialogic sessions in which the group's situation was discussed in the presence of the teacher (Clear, 2002; Isomöttönen, 2014). Clear (2002) reported on a technique in which group members were asked to assess each other and then to share the results of the assessment for discussion. Teacher experiences indicated that the success of this technique depends on the facilitation of the situation toward subjective and honest discussion. Another relevant study is the examination performed by one of the authors of this current study of the previous version of the present intervention (Isomöttönen, 2014). The present study focuses on a renewed intervention based on a several-year

observation that the previous version (Isomöttönen, 2014), although helpful, induced teacher-led discussions with insufficient student participation in group analysis. In particular, the present intervention uses exercises to facilitate students' participation in the analysis of their own group. Compared with the two predecessors, attention is given to how the group can do analysis, and a systematic evaluation is included.

Finally, it is noted that the empirical studies by Pieterse and Thompson (2010) and Marshall et al. (2016) on students' participation patterns help to contextualize the present research. Marshall et al. (2016) defined the student roles of insightful shaper and compliant worker in addition to those of diligent isolate and social loafer addressed previously. In comparison to Marshall et al. (2016), the present work emphasizes emergent (cf. defined) characteristics of a group composition and roles in prompting students to do analysis of their own groups (see Section 4).

The previous paragraphs pinpoint different points in the studies that overlap with each other: many of them include discourses on justice and can be interpreted to include educative actions. In light of the above, group pedagogy considered from the psychoanalytic perspective (Section 2) indicates an unused contextualization. This contextualization conveys that groups are vulnerable to problems regardless of the educational (pre)counteractions because individuals' histories impact groups in a complex way. If we consider the sensitivity of the group establishment (see Bion's views about group analysis above), this contextualization suggests that intimate dialog and teachers' considerations of how to facilitate such dialog are important factors in promoting the group's ability to analyze itself. In the present intervention, all course students are accordingly prompted to speak, and therefore their views of their group work situation are heard with the teacher being present as a facilitator. It is concluded that the presented group work pedagogy (intervention) complements the approaches in the literature and that the selected qualitative evaluation focusing on individual students' experiences contributes to project research.

4. Intervention approach

This section describes the project course during which the intervention is provided and the intervention itself, which is a dialogic session provided to each group during the course.

4.1. Context

The intervention is implemented during a project course (referred to as "target course") where small groups ideate and implement applications that utilize open-data resources (Fig. 1). The preferred size of the group is four students. The faculty has two major study lines for bachelor studies: information systems and computer science. The target course is for computer science students who study computer science and SE topics. To develop a project idea, students review open-data resources on the Internet in conjunction with considering their personal interests in a project topic. The groups are also guided to consider target groups, that is, who would use the open-data application they are considering implementing. Hence, the course emphasizes an open-ended and ill-formed starting point and requires creativity. Students' perspectives of these features of the course were critically evaluated in a previous study (Isomöttönen et al., 2019).

Prior to the study being performed, students have typically developed web applications, while a few mobile and desktop applications have also been developed. These projects have demonstrated usefulness in a multitude of areas of life: a web service in which users can browse land profiles and the service gives users a 3-D model of the user-selected profile, which can be utilized in computer game design; a web application with the interactive illustration of the migration of refugees, using a world map and United Nations data; an interactive illustration of Finland's history based on political and cultural archives; and a mobile application for hikers in which a user can receive information on the vegetation and animals on a hiking route. The student groups select implementation technologies for their projects, which means that the open-ended starting point also concerns technology. Students are informed of software development approaches (waterfall and Agile/Scrum), and told that they need to consider how to arrange the group work. The adoption of a software process did not inform the intervention design, however. Use of Git (or another version control system) is required, and the importance of managing within-group communication is emphasized at the beginning. The course spans 12 weeks, is worth five ECTS[2] credits, and is recommended for third-year students.

The outline and the main principles of the target course are as follows. Groups are formed ("1" in the figure) with a strategy in which students in a group have not worked together previously. Kamau and Spong (2015) concluded this strategy to be useful to avoid high cohesion groups (friends) in which performance may turn out to be non-optimal regarding projects goals. The rationale for the selected grouping strategy is that each student starts the project from an equal starting point (with new people) in the course in which group work is a learning goal. Potential stress regarding what will take place in a newly formed group is mitigated by evaluating the course with a pass/fail scale with no numeric grade characterizing individual student's performance afterwards. Another argument for the pass/fail evaluation is to allow for discussions about group work situations without a competitive atmosphere. An individual student must show active participation by logging a minimum of 100 work hours. To support autonomous group work, each group is provided with a work room in the faculty's facilities.

In the beginning, students are educated about the group concepts of roles, statuses, norms, and justice ("2" in the figure). During the weekly per-group meetings ("7" in the figure), groups are coached toward a self-directed and creative mode, and the group situation and project state are discussed. In the end-of-course learning reports ("9" in the figure), students individually reflect on their experiences with the group concepts that were presented at the beginning. It was observed that discussion during the informal weekly group meetings ("7" in the figure) focused on the project's state and technical questions, and that the previous group intervention (see Isomöttönen, 2014) yielded teacher-led discussion with insufficient student participation. Therefore, a specific group self-evaluation session was designed and is currently provided to each group as an established educative part of the course. This intervention (item "6" in the figure) is the object of the present evaluation. It is arranged little before the midpoint of the course because it is assumed that newly formed groups have by then taken shape for sensible group analysis. Additionally, this timing means that students have plenty of time left to benefit from the intervention during the course. The personal self-evaluation ("5" in the figure) precedes this intervention, and its pedagogic purpose is to help students feel more comfortable in the intervention session that follows during the same week. This self-evaluation asks students to consider their personal role, how justice was achieved in the group, and what the student had done during the project so far.

[2] European Credit Transfer and Accumulation System.

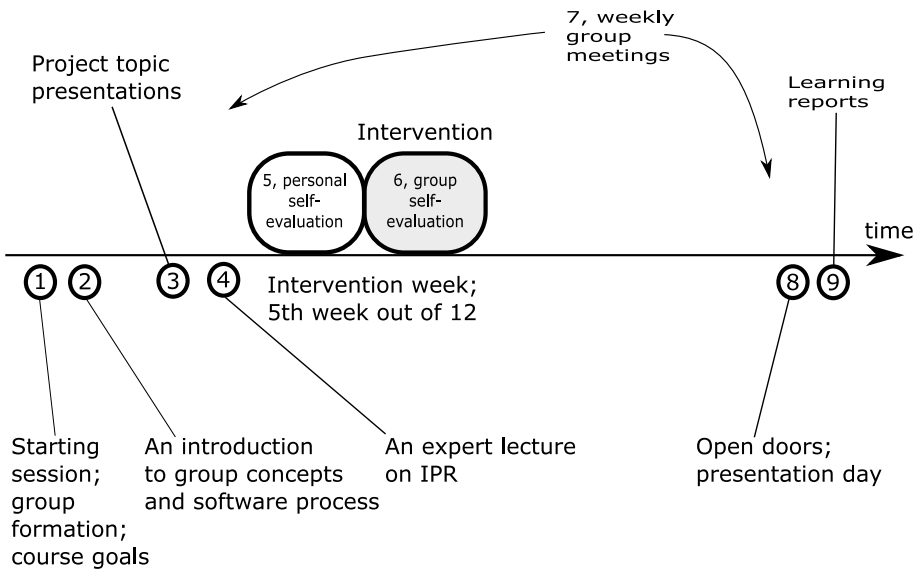

Fig. 1. Course events illustrated.

4.2. Conceptual background

The intervention session ("6" in the figure) prompts student groups to analyze their own situation by using exercises that are motivated by group concepts on which the students received instruction at the beginning of the course. The reflection in relation to Section 2 is that this promotion of group analysis indicates "digging into" the group's establishment. The concepts included the group norms, roles, and statuses attached to individual roles. Brown (1988) explained that although these constructs can be based on decisions (e.g., setting up group rules or assigning a leader), they also emerge in groups. By being emergent, they were deemed a suitable conceptual background for analyzing a group.

An example of the emergent role in a student project would be a student reporting that he or she turned out to be the one who ensured that everyone was heard when decisions were made. This would have signaled a social–emotional and managerial role, which the student observed to possess (the role emerged) in a newly formed group. Brown (1988) explained that the role as an emergent construct may be understood through dimensions such as socio-emotional versus goal-oriented. Status relates to the role (Brown, 1988), with a high status indicating an ability to help the group proceed toward its goal, and vice versa (see Berger et al., 1966). In the present context, status indicates that when the student's abilities (background) match what advancement of the project demands, the student demonstrates a high status. This is a dynamic matter because a project may come to require skills that a group member with a current low status possesses. Similarly, Brown (1988) explained that group norms have emergent characteristics. An example would be what kinds of behaviors and conversations are considered appropriate in a project group as an unwritten, emergent group code.

Also, fairness, or justice, was used as the analytical tool of the intervention. In the introduction of group concepts ("2" in the figure), fairness is conceptualized through two dimensions signifying what an individual's participation indicates for others in the group. The first includes that an individual's effort could narrow the learning opportunities of others, while the second includes that working too little may burden others. This view of fairness was conceptualized earlier from students' perceptions of a software project course in the same educational–cultural context (another project course in the same faculty) (Isomöttönen, 2011, p. 97, pp. 157–158). When appearing strongly, the two dimensions align with the roles of diligent isolate and social loafer (Pieterse and Thompson, 2010). The relevance of the topic of justice for group analysis is evident in the studies referred to in the Related work and Introduction (e.g., Hinds et al., 2000; Strauss et al., 2011; Yorra, 2012; Riebe et al., 2016).

4.3. Intervention exercises

During the intervention session ("6" in the figure), exercises are used to facilitate students' expression on sensitive matters and thereby to prompt students to actively participate in the analysis of their own group. The term sensitive refers to roles, statuses, and justice being dissected in the presence of the whole group and the teacher, and an atmosphere where the group is working for its own benefit is promoted. In practice, this means that the group members are seated face to face in the room where the intervention takes place, and the teacher who facilitates the session must avoid taking over the discussion. The intervention session lasts one hour and consists of an opening exercise, an exercise based on fairness, an exercise based on roles and statuses, an exercise based on group norms, and a final summarizing exercise. The middle three exercises are educationally motivated by the group concepts, but their intention is not to test whether the students comprehend those concepts. The aim is instead to have exercises that, due to such basing, would be relevant for helping students to do analysis of their own group. The students are familiar with these concepts because the concepts are introduced at the beginning of the course, and they are given an opportunity to consider them in the preceding personal self-evaluations. The intervention is arranged separately for each group in a meeting room (Fig. 2).

4.3.1. Opening

The intervention session begins with an ice breaker exercise in which picture cards are used. A pack of picture cards is spread out on the table, and each student sitting around the table is instructed to choose one card that describes their current mood. Each student then explains their thoughts regarding the selected card and the mood that this card describes. The teacher who is facilitating the session participates in this opening exercise. The purpose of this first exercise is to evoke discussion and ease the atmosphere for the benefit of the remaining part of the session.

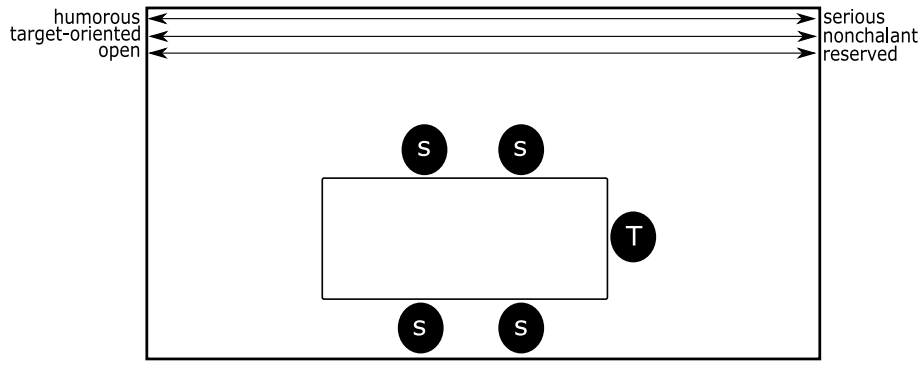

Fig. 2. Intervention room in which (S)tudents analyze their own group with help of (T)eacher. The empty space in the top part of the figure is used in a norms-related exercise, as explained below.

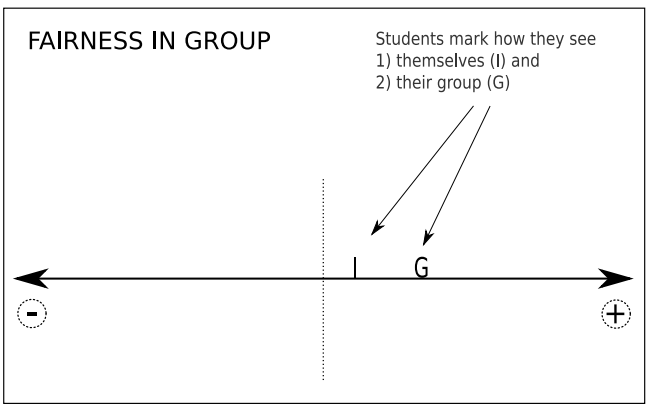

Fig. 3. Exercise on fairness.

4.3.2. Fairness

In this exercise, the students are first instructed to individually contemplate what fairness in a group means, and they are free to make notes about their main thoughts. After this step, the teacher hands each student a paper showing a line with a "+" symbol on the one end and a "−" on the other. The students are then instructed to draw two marks, one symbolizing fairness in the group and the other symbolizing their own fairness toward the group (Fig. 3). Then, the papers are revealed to the whole group, and everyone elaborates on their markings. The group members are encouraged to discuss and reflect on the group's situation. Finally, they are instructed to summarize what fairness means in their group, for example, by creating a mind map.

4.3.3. Roles and statuses

In this exercise, the students are given a coloring picture of multiple figures doing different activities around a tree. These figures can be interpreted in different ways, and the student's purpose is to contemplate their own role and status through them. Some figures are high in the tree, some in the middle (e.g., climbing), and some on the ground, which enables students to reflect on their status, for instance. The students are instructed to color the figure that reflects their current position in the group and the figure that they would want to be. Each student presents their colored figures to the group in order to provide a setting for discussion.

4.3.4. Norms

In the exercise motivated by group norms, opposite conceptual ideas intended to help students become aware of their group norms are fixed on opposite walls of the meeting room. Such pairs of opposite ideas are presented and reviewed one by one, with the teacher putting up the next pair on the walls after the previous one has been discussed. As illustrated in Fig. 2, these pairs are humorous vs. serious, target-oriented vs. nonchalant, and open vs. reserved. With each pair, the group is asked to move to a place in the room that would demonstrate their group on the continuum of the given dimension. Hence, the group members has to discuss their group situation to be able to decide on the position that characterizes their group as a whole on the given continuum—an example of how the exercises intend to facilitate the group's analysis of itself. The group is also asked to explain their position to the teacher. The selected conceptual pairs are based on teachers' considerations of what conceptual ideas would be relevant in the project course context, while being motivated by the theoretical idea of emergent group norms influencing group work.

4.3.5. Summarizing the ideas for improvement in group work

In this final exercise (and step) of the intervention session, the group is asked to consider how they would improve their group work, and hence the ongoing project, as an outcome of the intervention session. This is facilitated by prompting students to think about the aspects that they discussed and the scratch papers they produced during the previous exercises. The group is asked to select a member who writes down the improvement ideas for later use.

5. The study

5.1. Research approach

Hsieh and Shannon (2005) presented three approaches to qualitative content analysis: conventional, directed, and summative. The conventional approach indicates that research results are discovered from the data without relying on preconceptions (also known as an inductive approach (e.g., Patton, 2015, p. 47)). The directed approach indicates theory-directed (deductive) analysis, and the summative approach indicates quantification of viewpoints discovered in the data. The present study used inductive thematic analysis and complemented this with a summative review of the themes. The inductive approach was followed because no previous research that would have encouraged a directed study was identified (e.g., Hsieh and Shannon, 2005). The summative research step was adopted for an overview that illustrates the prevalence of the inductively generated themes in the context of groups.

The terms content analysis and thematic analysis are used interchangeably, while the former has been noted to focus on manifest content and the latter has been noted to focus on meanings (Vaismoradi et al., 2013). The present study emphasized

thematic analysis, and presentational means were selected accordingly. The results were supported with thematic maps that depict analyses at different levels of abstraction (Attride-Stirling, 2001; Braun and Clarke, 2006). Here, researchers' analytic thinking regarding similarities and differences in low-level themes suggests themes at the next, higher level of abstraction. For instance, in Fig. 4, the low-level perspectives "Helpful exercises", "Timing", and "Facilitation over form" were grouped under a conceptual idea of "Apposite implementation" based on the identification of a meaning that was common to these low-level themes.

The literature was utilized as Hsieh and Shannon (2005) proposed with the conventional (inductive) research approach: literature offers a framework against which the results can be interpreted and discussed. In particular, the psychoanalytic theory in Section 2 helped to comprehend the intervention situation and to theorize hypotheses for future research. The authors also believe that the psychoanalytic perspective helps teachers conceptualize why interventions are challenging and why group situations tend to persist in the form they emerge, which provided, in its own right, an incentive to include this literature.

5.2. Research question, data, and procedure

The research question was how students' group work conditions can be improved. With the selected research approach, this study sought to contribute to this question by revealing how students perceived the intervention described in Section 4.

Based on observations that receiving research data from all students in a course through post-course invitations is troublesome, the data collection was integrated into a course assignment. The research data were the personal end-of-course learning reports (see item "9" in Fig. 1). This timing allowed students to see how the intervention influenced their group work. The report writing guideline asked students to report what they did during the project, to reflect on group norms, their role and status during the project, the software process, how they would define and saw justice in their group, how they perceived the group intervention (which is the target of the present study), how intellectual property rights were addressed in the course, and to consider their personal learning gains. The exact form of the intervention-related prompt was: "What do you think of the group self-evaluation session? Was it useful? What kinds of effects does it possibly have?" It was explained to students that all prompts in the guideline were open-ended, while emphasizing that the accepted learning report was personal reflective writing.

Consents to use learning reports for research were systematically acquired at the beginning of annual implementations of the target course and were received from all students. The prompt regarding how students experienced the current form of the intervention was added to the report writing guideline in 2016, meaning that the data comprised four course cohorts (2016–2019). A total of 59 students started the course during these years and were assigned to 15 groups with three to four students in each. The data available for this research was N = 57 learning reports due to one self-selected drop out during the course and one unreturned report.

Research consent did not cover reporting of demographics. To summarize the students' backgrounds, the target course was attended during late bachelor studies when basic technological skills had been studied—this is recommended in the third year. During the first two years, students study introductory programming courses (CS1 and CS2), algorithms, computer networks, and basic office and web technologies. The required prerequisite courses are CS1 and CS2. Due to reasons such as individual planning of yearly studies, a student may also come later than the third year. A few students have asked if it is possible to attend the course during a second year when the teacher has described the challenge of the course to help the student to consider participation.

The two authors independently applied an inductive thematic analysis to the data from the first two years (N = 26/57) to yield a rich set of perspectives. Only the first author could attend this research regarding the latter two years, and he analyzed the data that accumulated during this period (N = 31/57). Conforming to the research approach, no pre-set coding scheme was used, but instead the authors attempted to extract perspectives in the data that explained how the intervention was experienced. Following the data analytical process explained in the research approach section, these analyses were iterative processes in which relevant perspectives with respect to the research interests were observed in the data, and, through reflecting on the commonalities, low-level themes were grouped at higher levels of abstraction. It was observed that the independently conducted analyses did not contradict but complemented and overlapped with each other (same perspectives were raised in different wordings). These analyses were combined so that the second author's perspectives absent in the first author's analysis were added to the latter, and different wordings from the second author were utilized in how the themes were written out. One example of such a combination is that only the second author had focused on the importance of teacher encouragement during the intervention session, which was added to the thematization (see Fig. 4). Another, smaller example is the "normalizing effect" in Section 6.4.1. The first author emphasized this normalizing effect, while the second author focused merely on motivation. The combination was that this normalizing effect occurs and can be motivating. The first author continued with the analysis from this stage. This subsequent phase yielded several new perspectives (explicit reference to a particular intervention exercise as useful, the facilitation over form, the fatalism, the justice-related theme, and the future-oriented references to professional practice; see the results) and made it possible to develop the thematic maps and refine the narrative.

It is important to note the boundaries of the analysis. First, the thematic analysis in Sections 6.1–6.4 focuses on individual students' experiences of the intervention. The viewpoints from the other team members were occasionally referred to only to support an interpretation of a theme, as in Section 6.3.1. Second, links between a student background or position in the project and their experiences of the intervention could not be systematically identified because the open-ended data collection prompt did not guide students to provide such reflection. In this respect, some themes could be elaborated by comparing differences between the individual students' experiences, and this is occasionally done at the ends of the results sections, as in Sections 6.2.3, 6.4.1, and 6.4.4. These comparisons yield summarizations and also conceptual hypotheses that refine the themes, fitting the inductive research approach. These hypotheses are steps toward theorizing in the manner of classic grounded theory, in which comparison yields conceptual hypotheses (Glaser and Strauss, 1967; Glaser, 1978).

Finally, the summative review in Section 6.5 was done at the highest and second-to-highest level themes because the low-level themes overlapped. For instance, when students described how they became capable of taking "concrete actions" to better advance the project, the impression was often also indirectly the "consolidation of grouping" (see Section 6.4.2). To be able to provide an overview in terms of positive versus negative experiences, students' responses that included the aspects of the theme of reservedness (Section 6.2) were characterized in this analysis step.

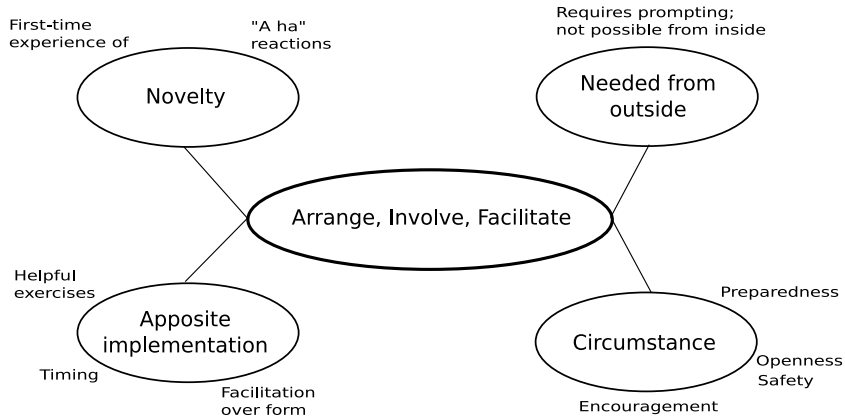

Fig. 4. Thematic map explaining the intervention arrangement.

6. Results

The analysis differentiated the results into four high-level themes. The first characterizes the intervention arrangement. The second explains students' reserved experiences of the intervention. The third refers to the aspects that students considered useful when no obvious contribution to the group work was personally experienced. The fourth explains the valuable implications of talking directly during the intervention session. The themes are presented as thematic maps in Figs. 4–7 and are explained in the following sections.

6.1. Arrange, involve, facilitate

Students' experiences were interpreted to provide an evaluation that the intervention needed to be arranged, participants needed to be involved in it, and the involvement needed to be facilitated (see the thematic map in Fig. 4).

6.1.1. Novelty

The theme of novelty was indicated by two aspects (see Fig. 4). The first is that the students reported a *first-time experience*. That is, students noted that they had not encountered this kind of group self-evaluation:

> [Student-ID40]: "Group's self-evaluation meeting was at least something new that I had not come across during my previous studies".
>
> [Student-ID49]: "I have not encountered this kind of mid-course [group] evaluation in other courses, but at least personally, it was useful".

Moreover, the passages that marveled at the intervention as an "interesting" experience showed an *"aha" reaction*, indicating novelty. This theme of novelty does not directly evaluate the intervention arrangement but explains the intervention arrangement in a wider educational context, and was therefore deemed a valuable perspective on which to report.

6.1.2. Needed from outside

Students argued that dissecting the group's situation *required prompting* from outside the group because it was unlikely that analysis of the group would have occurred otherwise:

> [Student-ID40]: "[...] I think it was nevertheless useful because the issues that emerged in the meeting are not necessarily discussed otherwise within the group. This exactly requires some kind of guidance and prompting".
>
> [Student-ID06]: "Addressing fairness within the group would have been challenging without this meeting".
>
> [Student-ID54]: "Our view of the group situation was basically up to date, but maybe it was useful that *we got a chance* to discuss important matters such as justice and roles". (Emphasis added)

As seen in the last quotation, although students could continually discuss their group's situation (they were, for instance, provided with project rooms to support collaboration), students argued that it was the intervention that provided the opportunity to discuss the group's situation. These student views follow Hoggett's (1998) case illustration in which addressing the group's establishment required intervention from outside the group.

6.1.3. Circumstance

The theme of circumstance comprises three aspects (see Fig. 4) that characterize an intervention situation valued by students, while also indirectly evaluating the intervention.

The personal self-evaluation administered prior to the group self-evaluation helped students to realize their personal standpoints and thereby to *prepare them for* sensitive group discussions:

> [Student-ID47]: "I felt that it was very useful that I had done the [personal] self-evaluation before the group self-evaluation. I had had to ponder particular aspects during the [personal] self-evaluation, and I was hence able to raise those issues during the group self-evaluation".

Moreover, the importance of an *open* and *safe* atmosphere was noted:

> [Student-ID36]: "Conversation was free and open, and everyone got to know the opinions of group performance".
>
> [Student-ID50]: "During it [the group meeting], the group continued to be decorous, and everyone was granted an opportunity to comment on the project progress without a fear of others' opinions".

Also, supervision during the intervention was valued. The students' comments emphasized *encouragement*:

> [Student-ID56]: "The teacher's encouragement did good for the group's self-esteem. [...] The teacher reinforced [our] experience of taking a proper direction for the project".

It is interpreted that the aspects reviewed bespeak the sensitivity needed in prompting students to analyze their own groups, and hence in addressing the group's establishment.

6.1.4. Apposite implementation

Favorable evaluations of the session were evident in the passages describing its implementation or the session in general as a positive experience. More analytic passages characterized the implementation as apposite in three ways (see Fig. 4).

It was noted that the intervention provided *helpful exercises*. The following conveys that it became possible for the groups to analyze their own situation through them:

> [Student-ID56]: "The exercises were childishly fun and [practically] easy. Nevertheless, they were such that they allowed us to approach and immerse [ourselves] in the topic [group work]".

> [Student-ID111]: "The exercises that opened up discussion worked well, giving rise to new thoughts and ideas about group dynamics and project management".

The next two quotations refer to particular exercises:

> [Student-ID59]: "In particular, the functionality of the exercises where we had to position ourselves within a line segment [refers to group norms exercise] was fun, concretely depicting our group member's views on group dynamics".

> [Student-ID114]: "I personally liked that manner through which [our] feelings were asked. The picture with those bods climbing the tree was a good descriptor for the then-time feelings. At least personally, it made me think of my role in the group, as you explained your decision. The pictures of this kind appeared very stupid at first, but I do have to admit that they work, in particular because other members also explained their decisions".

The following hints that the exact form of the exercises was not critical compared to the outcome of successfully prompting group members to think and discuss (*facilitation over form* in Fig. 4), which conforms to the intervention's goal of facilitating expression on sensitive matters.

> [Student-ID108]: "In my view, in these kinds of situations [refers to the intervention session], it does not matter that much what is exactly done but rather that everyone has to ponder how the project is making progress and discuss potential problems. Generally, I hope that these kinds of events would be arranged more often when working in a group is in question".

Also, the *timing* of the intervention was considered apposite:

> [Student-ID111]: "The group self-evaluation that was done at about middle of the course was, in my opinion, just the right time for it. We had just got into some kind of routine with advancing the project and got to know each other and our roles. [Our] communication culture in our work room was open but yet minor [communication], and for that reason, it was nice to get the chance to talk with group members a bit more".

6.2. Reservedness

Fig. 5 depicts the thematic map for students' reserved experiences. The theme of reservedness hence captures those aspects that explain why students did not find the intervention useful or experienced it negatively.

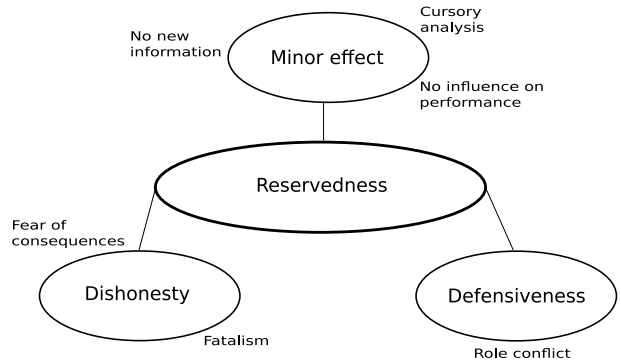

Fig. 5. Thematic map describing reserved experiences.

6.2.1. Dishonesty

The theme of dishonesty refers to students' doubts about honesty in intervention discussions and is characterized by two different aspects (see Fig. 5).

Students' comments on dishonesty resemble Hoggett's review of group establishment, in which a group illusion continues to exist readily:

> [Student-ID21]: "The group's self-evaluation session was fun but not that useful nor an important part of the course. I believe that many of the group members did not reveal their real thoughts about the project and its situation, as this would have affected the group's behavior during the remainder of the project. Almost all the conversations seemed to be positive and focused on compliments".

This reflects a *fear of consequences* if the group's situation would be honestly addressed. It is noteworthy that, in these cases of group work, another group member would find the evaluation highly important (e.g., the clarification-related themes and the student ID12 under the liberating effect). Moreover, this student who doubted a certain level of honesty found the intervention useful in a way other than the group analysis, which will be indicated below.

The fear of consequences was also evident in students' speculations:

> [Student-ID98]: "[...] If you alone were the one who doesn't regard the group atmosphere as good, or something similar, then you would not want to endanger the group's cohesion".

It is noted here that the fear of consequences (disintegration) links with Bion's basic assumption group modes (see Section 2) understood as "survival myths", as Hoggett (1998, p. 14) referred to them.

Dishonesty was also indicated in the experiences of a group situation where it is impossible to improve and the intervention session therefore becomes not much more than a play. This is thematically referred to as *fatalism* in Fig. 5.

6.2.2. Defensiveness

When the situation of the group was analyzed, conflict regarding personal roles surfaced with defensiveness as an emerged consequence (*role conflict* in Fig. 5). This is illustrated in the following:

> [Student-ID53]: "The group feedback session was hardly of any value because the group's operation was already quite clear for all. All that it caused, to me, was that I questioned my own position and the amount of code I had written, basically

without any good reason. I did not observe any influence on the groups' working. I personally do not see that the group feedback was of any value for us, but maybe someone else would disagree? Perhaps it was good to arrange it in case someone would have had something important to say".

6.2.3. Minor effect

Students reported that the intervention had minor effects, comprised of three aspects (see Fig. 5). They noted that the intervention did not add much to what was currently recognized as a group situation (*no new information* in Fig. 5). Subsequently, little value was attributed to the intervention:

> [Student-ID48]: "The group's self-evaluation session wasn't that useful if you ask me. It gave some new information about how others were doing and feeling, but it felt like I knew most of the things we discussed already *because our group got along pretty well*. Maybe after the meeting, the roles changed a bit, but the change was already happening before". (Emphasis added)

The added emphasis conveys that when a group has built trust, the group's situation is addressed to some extent without specifically requesting it. Further review of the learning reports confirmed that varying skill levels were acknowledged in the group and that task allocation was managed accordingly (with reciprocal respect).

Another illustration includes the following:

> [Student-ID52]: "The shared self-evaluation and the reflection therein was interesting, as one was able to overhear other members' thoughts about the course and the project, *although cursorily*. It is difficult to say if it was useful because the outcome was not far from my personal view". (Emphasis added)

Here, the reference to the *cursory analysis* hints that the way in which a group participates during intervention exercises affects the experienced usefulness.

Moreover, a tone of doubt regarding the intervention's usefulness was identified when little to *no influence on group performance* was observed:

> [Student-ID58]: "Group evaluation was an interesting event, giving an interesting picture of how other members perceived group performance. Nevertheless, I think it did not affect our daily performance that much".

The above response was from the student who saw value in conceptual learning about group work.

Looking at the situations from which these experiences of minor effect emerged revealed that all but one was coupled with a student view that the group was performing well and with no significant group problems. The view of a decently working group is almost synonymous with the minor effect. However, the data suggest a hypothesis that the view of a well-performing group can relate to a group condition (cf. establishment) that hinders a detailed analysis of the group: in some groups, where the minor effect and the well-performing group were signaled, an unequal division of work was also referenced. Furthermore, with the current data collection, the reasons for *cursory analysis* (emphasized in the quotation from the student ID52 above) could not be readily explained, but such a situation can be anecdotally supported. Each intervention session "emerged" and how fruitful discussions appeared varied.

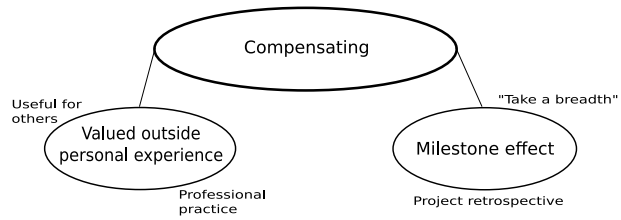

Fig. 6. Thematic map describing compensating aspects.

6.3. Compensating aspects

The thematic map in Fig. 6 captures aspects that were considered compensating in the sense that the value of the intervention was found outside of personally experienced usefulness for the group matter. The themes in Section 6.4 about usefulness also naturally "compensate" when discussed in conjunction with a reserved experience.

6.3.1. Valued outside personal experience

The students' experiences showed an understanding of the potential usefulness of the intervention in a way that was interpreted to indicate valuation outside of personal experience. Two aspects characterize this theme (see Fig. 6). Students seemed to sense that other group members found the intervention highly valuable and could therefore react to it objectively as a professional practice:

> [Student-ID02]: "Better than nothing. It opened my eyes a little about the project and awakened me to think otherwise. Let's say that it was not personally necessary but potentially very *useful for others*". (Emphasis added)

Group comparisons confirmed that in these kinds of cases, students' opinions of the intervention had diverged. Relatedly, the comments conveying that the session was not that useful because the group was doing well already, while also speculating that it would have been a useful occasion if the group had problems, indirectly refer to the acknowledgment of the intervention as a professional practice.

6.3.2. Milestone effect

The theme milestone effect is also explained by two aspects (see Fig. 6). The value in the intervention was primarily recognized as a *project retrospective* or a milestone for the project:

> [Student-ID57]: "The group's self-evaluation meeting was a workable milestone. It awakened one to consider the current stage of the project's progress and what kind of work profiles had emerged. In practice, I feel it did not affect the project's direction much, but as a milestone inspection, it worked well. Group undertakings during [my] previous studies were small scale and few in quantity. So, it was interesting to stop to think and review how the project was progressing and how the group's performance had evolved. Although we had our own group meetings once a week, and meetings all the while with the supervisors, [this] somewhat bigger self-evaluation meeting was good and made one think of the course's bigger picture, more than the [other, weekly] short meetings".

The illustration reveals the difficulty of initiating focused group discussions that provide an overview picture of the project. Another wording, with a similar effect, is the valuation of the meeting as a *take a breath* affair:

[Student-ID21]: "The self-evaluation session did have a nice pacing effect; it was a nice opportunity to take a breath in the middle of working on the project".

This is the same student who raised dishonesty concerns previously.

6.4. Direct talk implications; usefulness

Students stated that the intervention was "important", "needed", and "useful", and "used too little", which are reactions that confirm the call for action on student-experienced unpredictability (see Introduction). All themes displayed in Fig. 7, explaining the usefulness of the intervention, were grouped under the holistic idea of *direct talk implications*.

6.4.1. Individual-psychological

The *individual-psychological* theme captures three low-level themes that were interpreted to demonstrate personal reliefs that direct talk can engender (see Fig. 7).

The importance of *clarification, confirmation*, and *revelation* of the group situation were consistently noted and valued:

[Student-ID54]: "During the self-evaluation case, it was emphasized that our group members got [along] well together because we were able to discuss the group's situation, roles, and the effort of each member directly".

[Student-ID50]: "The group meeting confirmed my view that our group indeed wanted to finish the project decently".

[Student-ID05]: "The group evaluation meeting was useful because it enabled us to express thoughts that were already established as taboos. It was good to know the experience of other group members regarding group work fairness and project progress".

With an identified open and secure environment during discussions, students also found it "interesting" to hear their peers' views of the group's situation. The impression is that this refers not only to a valued possibility to understand oneself as part of the group, but also to the learning-related themes in Section 6.4.3.

Overlapping with the previous illustrations, even a *liberating effect* was noted:

[Student-ID47]: "The issues [in my mind] saw daylight, and I did not need to ponder on them alone anymore. Thus, I felt some kind of liberation because of this".

A similar relief is illustrated in the following evaluation:

[Student-ID12]: "I think the group's self-evaluation was very good [...] Personally, I believe that it helped me to tell [another group member] that I had a bad conscience about my easy part in the project".

Relatedly, a type of *normalizing effect* can occur when personal pressures are both revealed and heard from peers:

[Student-ID31]: "The group's self-evaluation meeting was useful regarding personal *motivation*. All members expected their own participation to be too low, so I was apparently not the only one who experienced some kind of pressure". (Emphasis added)

This is interpreted to mean that an experience of relatedness leads to an experience of (internal) motivation, harmonizing with the self-determination theory of Ryan and Deci (2000). This relatedness was further indicated by the reports of an emerging open group mood, described below.

Furthermore, the intervention engendered *justice-related* considerations. The direct talk appeared to cause self-exploration regarding the level of participation:

[Student-ID115]: "After the session, I had to do serious soul-searching. I noticed some kind of motivation improvement toward the project, which helped me to work for the project until the end of it".

Other examples of this kind showed considerations between finding explanations for low participation while admitting it.

Additionally, a student who reported personally taking on a high level of responsibility for the project stated the following:

[Student-ID118]: "Group problems were reviewed in the shared meeting, and this did foreground problems, but I do not see that it would have remarkably changed group performance in one direction or another. Perhaps it nevertheless caused group members to think about how to perform in a group in the future".

There were also examples in which an experienced issue in fairness was noted to arise from the lack of communication and reported to be resolved after the session.

The thought processes shown above are indicative of justice judgments and receiving justice due to the intervention session providing an educative message. Together with the student-observed *concrete actions* (below), it is possible to conclude that the intervention can improve group conditions to decrease the potential of social loafing.

When indications of clarification are compared, it can be summarized that the opportunity to speak and hear others' viewpoints about the group makes participating in the project more comfortable. The same impression is received when comparing references to receiving confirmation about the group's situation. The liberating effect arises from settings in which a student doubts his or her own abilities or role in the project. The doubt about one's own abilities may have existed before the project, or it became emphasized in the project as the student compared oneself with the other group members. Liberation can be preceded by moral considerations about the sufficiency of one's effort toward the group. It can also be coupled with a student feeling strongly encouraged to continue with the project. The justice-related theme instead captures situations in which students acknowledging small personal effort become more motivated to work on the project, or the students with a high effort are relieved because they notice more effort in their group or at least consider the intervention an educational message for those who were contributing less.

6.4.2. Continuing effects

Continuing effects refer to aspects that students identified as having occurred after the intervention session during the remainder of the project. This theme comprises four aspects (see Fig. 7).

One continuing effect was the self-*regulation* for the inclusion of group members, who unavoidably differ in their experience and skill:

[Student-ID40]: "It was good that issues relating to group performance and justice were talked about aloud. After the session, I paid attention to the issues and likely changed my own performance and behavior to improve the performance of the group".

Another extract from the same group member shows that this group had discussed the differing skill levels in the group and the participation from that perspective:

"In our group meeting, it came up that one member was perceived to produce too little compared to others. As a consequence, we considered together what was more important in our group: the actual outcome or the effort made".

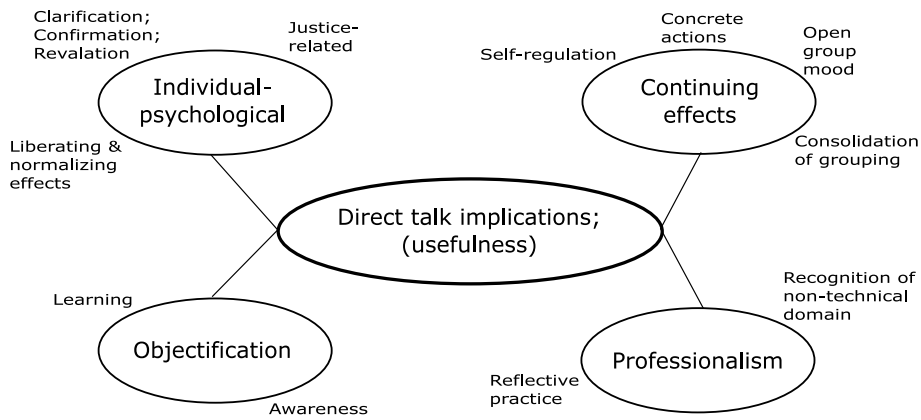

Fig. 7. Thematic map describing direct talk implications.

These discussions are evidence of increased collectivism and fairness. A related indication of collectivism is that inexperienced students reported that after the intervention session skillful group members gave them more space, meaning more needed time for learning.

Students' reflections also indicate that *concrete actions* were taken to improve performance:

> [Student-ID90]: "After the meeting [intervention], everyone began to take responsibility for their working [cf. diminution of social loafing], communication improved, and we were able to agree on common time slots for working [together] on the project [...] After the meeting, I began to feel that completing the project was not that impossible anymore".

Relatedly, the data indicate that it was important for the students to become aware of areas that needed improvement in the group's performance.

Another valued, continued effect was the *open group mood* emerging from the direct talks during group discussions:

> [Student-ID47]: "I think it was great that the meeting was open, that is, we were able to say our opinions of the group aloud and honestly [...] I believe that the openness continued to exist in our group meetings and communication". [Although the continued effect is emphasized here, it is noteworthy that the group session in itself provides valued experiences of togetherness.]
>
> [Student-ID13]: "My experience is that, after it [the group self-evaluation], our group's performance was a bit more open during the remainder of the project".

Yet another interesting aspect of continued effects is the experience of *consolidation of grouping*:

> [Student-ID17]: "I feel that the self-evaluation discussion was an important part of the group development. I argue that it served as some kind of new start for the group's identity and norms".

The review of situations in which these continuing effects emerged simply emphasizes the value of direct, honest talk. That is, these effects were not specific to how students perceived their position in the project or whether the group was considered to perform well or not. For instance, the intervention discussions were considered to improve the unity of the group not only when the group was not communicating properly, but also in situations in which the unity was identified to be already sufficient. Even in cases in which a student doubted the honesty of the discussions, a strong positive reference to improved group identity was identified. Conceptually, advancements in seriously discussing the group's situation appear important and can improve the unity of the group. Accordingly, a teacher's reflection is that even the groups who have demonstrated great difficulties in advancing the project as a shared undertaking have shown observable mid-course activation after the self-evaluation sessions, although the value of the session has seemed to be of little value.

6.4.3. Objectification

How students referred to learning suggests that their group situation became "objectified", that is, they received an objective view of the group as a whole. This can be explained by two aspects (see Fig. 7).

The quotation below conveys that a student could attribute the main benefits to the increased *conceptual learning*.

> [Student-ID58]: "Group evaluation was an interesting event, giving an interesting picture of how other members perceived group performance. Nevertheless, I think it did not affect our daily performance that much. Some kind of activation did happen, but I believe it was not directly due to the evaluation but rather due to the project's advancement. In my opinion, the benefits of the evaluation were more the *personal learning* and *understandings about group work* than its effects on the project's progress". (Emphasis added)

This valuation of conceptual learning was principally referred to as increased *awareness* of the group as a whole:

> [Student-ID13]: "The reflection on group processes was useful, although, in my experience, this is done too rarely [speaks generally]. The evaluation individually and as a group helped to understand not only one's own role but also the perceptions and observation of others".
>
> [Student-ID05]: "The objective perspective to own and others' thought granted an opportunity to analyze group members as individuals and as a group".
>
> [Student-ID14]: "The evaluation helped us, therefore, to become aware of our work. And it is always better to know than not to know".

The overlapping nature of the themes should be noted. The objectification received through group analysis also indicated a continued effect:

> [Student-ID17]: "As these [group] things were reflected upon, one started to pay attention to them [afterwards] while working on the project".

This indicates that conceptual understandings – theory – inform practice and that such an outcome can be prompted by an intervention.

The data did not allow the authors to develop an understanding of why learning about group work and group situations were referenced. A descriptive observation is that the quotations above reflect favorable positions regarding knowledge of group work. This theme serves to differentiate a learning perspective from clarification-related themes (Section 6.4.1) and the theme of professionalism (Section 6.4.4).

6.4.4. Professionalism

The theme of professionalism comprises two aspects (see Fig. 7). The reflective intervention session was considered an important *reflective practice*, together with an interest and an ascending intention to subsequently employ such reflection. This was deemed to relate to professional development and is in line with the compensating aspect raised earlier, that students could value the session outside their personal experience.

> [Student-ID101]: [...] "Also, *for the time after this project*, it was an educative experience to see how the session revealed insecurities that were never expressed in our own group meetings that lacked a format that would have pushed us to talk about these matters". (Emphasis added)

> [Student-ID112]: "Outside the university, it would be difficult to get any outsider to arrange a meeting like this, and it thus has to be personally taken over. I wouldn't see it a bad idea to arrange discussions in a group about group performance in the future. This could raise issues and prevent conflicts. It is often easier to address issues when they are still fresh in one's memory".

An interesting observation as to how to educate students about group work is the contradiction between the considerations that intervention was needed from outside the group (Section 6.1.2) and this recognized need to initiate a similar conduct as an insider.

Another aspect that was deemed to relate to professional development was the *recognition of a non-technical domain*:

> [Student-ID20]: "Group evaluation meetings helped at least momentarily see and think of group's functioning in a deeper way, [...] as a rather goal and technically oriented person I was usually just focused on what I was doing. [...] Also, the midterm self-evaluation was likely to help me focus on other aspects in group work than figuring out [programming] algorithms".

The intervention thus drew attention to a domain outside technical work. This has been raised as a challenge in science education as well: "a lack of interest in non-scientific matters and particularly the 'softer' human aspects of human" (Bridgstock and Backhouse, 1982, p. 154).

By comparing individual students' experiences, the theme of professionalism is further conceptualized as follows. It was possible to identify an experience in which the intervention was personally not considered useful, and in which other professional practices of the course (e.g., presentations) were also considered to be of no value. This position, in a sense, ignores discussions about group work as part of professionalism. On the other hand, the above illustrates that the intervention prompted some students to focus thinking on issues other than technical ones, while some other students (above) went even further and referred to the future directly and the intervention as professional practice. Conceptually, there is a continuum of how the SE discipline is viewed (how readily attention is given to the non-technical domain), and the hypothesis is that this provides a setting on how the intervention is reflected. Another hypothesis indicated by the data is that when the intervention is realized to improve on a matter that was considered problematic in the group (for example, communication), this can contribute to group discussions being regarded as a valuable professional practice.

6.5. Summative review

This section presents the summative review of the students' experiences, as displayed in Table 1. The students' experiences that included reserved responses were approximated into three clusters based on the nature of the experiences. The clusters are marked with black, gray, and light gray backgrounds in Table 1: the darker the color the more negative the student's experience. The experiences of three students (A/M1, E/M2, and O/M3) were deemed negative as a whole and were marked with the black color. The experiences of A/M1 indicated that there were hardly any effects observable because the group was doing fine. This does not indicate any critique of the intervention, however. The experiences of E/M2 (cited under the theme of reservedness in Section 6.2) indicated that the intervention had made explicit the conflict in which a role received in the group differed from what was personally expected. This was interpreted as a negative response toward the intervention itself regardless of whether the student noted that the intervention was useful for others; overall, the student's experience appeared irritated. The experiences of O/M3 indicated that dishonesty could not be avoided in discussing the group's situation, which was due to a perception that the group situation's was unresolvable.

The experiences in the cluster of gray cells consist of reserved responses and aspects of usefulness in a way that judgment of the experiences as either positive or negative is not straightforward. Of these, three students (C/M2, D/M4 and F/M1) doubted the intervention's effect (minor effect) but reported, as an aside, a positive aspect. For C/M2 this aside was consolidation of grouping (eased atmosphere), for D/M4 it was confirmation of the group situation, and for F/M1 it was potential change in roles (cf. the continuing effect of self-regulation). It seems as if these students emphasized the lack of concrete observable changes and attributed less significance to other effects. To be able to approximate the students' experiences as a whole, the experiences with both a reserved aspect and a compensating aspect were also interpreted to fit in this cluster. Overall, this cluster cannot simply be read as negative reactions.

In the cluster of light gray cells, students included a reserved aspect, but their reflection showed overall positivity about the intervention and references to the aspects of usefulness. For instance, one student pointed out that "I cannot say how the situation concretely influenced the progress of our work subsequently, but at least not negatively", while indicating in a clearly positive tone that the intervention was needed from outside and provided confirmation of the group's situation.

The last column of Table 1 shows that usefulness was indicated by the majority of group members across the groups. Additionally, the experiences of only three students were considered negative as a whole (marked with black background). While there is no point of reference to which usefulness at a group level can be assessed, a pedagogically positive consequence is interpreted for all groups. Other observations include that the major reserved aspect was the minor effect (r_1, 11 occurrences), which appeared only once without compensating aspects or the aspects of usefulness. Of the aspects that were associated with direct talk implications, the themes of individual/psychological (u_1, 36 occurrences) and continuing effects (u_2, 28 occurrences) dominated. One can also identify groups where members had

Table 1
Summary of themes *(R)eservedness*, *(C)ompensating*, and *Direct talk implications* aka *(U)sefulness* for groups A–P. Each line shows if a group member indicated these highest-level themes. Second to highest-level themes are indicated with subscripts. For *Reservedness*, these are: r_1 = *Minor effect*; r_2 = *Defensiveness*; r_3 = *Dishonesty*. For *Compensating aspects*, these are: c_1 = *Valued outside personal experience*; c_2 = *Milestone effect*. For *Direct talk implications*, these are: u_1 = *Individual/psychological*; u_2 = *Continuing effects*; u_3 = *Professionalism*; u_4 = *Objectification*. See the themes and quotations in the previous sections for explanation. The last column shows totals for the highest-level themes for each group. The numbers of occurrences for the subthemes are displayed in the lowest line.

	Member 1 (M1)			Member 2 (M2)			Member 3 (M3)			Member 4 (M4)			Group in total		
	R	C	U	R	C	U	R	C	U	R	C	U	R	C	U
A	r_1					u_3			u_1	r_1		u_3	2	0	3
B			$u_{1,2}$			$u_{1,3,4}$			u_1				0	0	3
C			$u_{1,2}$	r_1		u_2	r_1		$u_{1,3}$	r_1	c_1		3	1	3
D			u_1			$u_{1,2}$			$u_{1,2}$	r_1		u_1	1	0	4
E	r_1		u_4	r_2	c_1		r_1		u_1			u_4	3	1	3
F	r_1		u_2			u_1			u_1			$u_{1,3}$	1	0	4
G			u_2			u_2		c_2	u_2			$u_{1,3}$	0	1	4
H			u_2			$u_{1,2}$		c_2	$u_{1,2}$		c_2	u_2	0	2	4
I			u_1			$u_{1,2}$			$u_{1,3}$			$u_{1,2}$	0	0	4
K		c_2	$u_{1,2}$	r_1	c_2		r_1		$u_{1,2}$			$u_{1,2}$	2	2	3
L			$u_{1,2}$			$u_{2,3,4}$			u_1			u_1	0	0	4
M	r_3	c_2		r_3		$u_{2,4}$			$u_{1,2}$		c_1	u_1	2	2	3
N			$u_{1,2,4}$			$u_{1,3}$			$u_{1,2}$				0	0	3
O	r_3		u_2			$u_{1,2,3}$	r_3						2	0	2
P			u_1			$u_{1,2,3}$			$u_{1,3}$			u_2	0	0	4
SUMS: r_1: 11; r_2: 1; r_3: 4; c_1: 3; c_2: 6; u_1: 36; u_2: 28; u_3: 12; u_4: 6													16	9	51

similar experiences (e.g., group H) and groups where the experiences were more varied (e.g., group A). This variation between and within groups is considered a descriptive outcome that can inform the pedagogy of the target course and future research (see Sections 7.1 and 8).

6.6. Validity considerations

The following explains the authors' relationships with the teaching context, the nature of the data, and validity. The authors had implemented the intervention session both independently and as a team. The first author was the teacher in charge, and the second author only participated in the interventions as a visiting teacher. The setting was deemed favorable because the second author added a perspective free from teacher–student relationships to the research. Furthermore, the learning reports were an integral part of the course activities instead of a separate task, and their strength is that they represent authentic data that accumulates along with the course implementations. There was no reason for an individual student to skew the report for a better grade because the course was graded with pass/fail based on active participation.

Lincoln and Guba (1985) suggested attributes of trustworthiness for qualitative research. Credibility was increased in the present research by the two independent initial analyses. It is acknowledged that having both authors available throughout the study might have provided a richer set of themes than currently reported and counteracted the possibility of previously identified themes constraining the data analytical process. In this respect, the analysis of the second phase conducted by the first author only began from reading the new data separately from the previous, ongoing analysis. New results were achieved during the second phase, as summarized in Section 5.2. Dependability was addressed by the constant illustration of themes with data extracts, which allows the reader to observe how the themes depend on the data. The thematic maps in particular demonstrate thinking from low-level themes to higher-level themes. Transferability, referring to how results apply to other situations, can be increased by depicting the research setting, which was done in Section 4. It is acknowledged that other cultural settings might give rise to different results, although the same intervention was attempted in a similar project course.

How to interpret the quantification in Table 1 must be done cautiously. Because no direct questions were used in the data collection, it is possible that the individual counts do not reflect student opinion well. It is assumed, for instance, that the direct question of "Do you think that the intervention demonstrates professional practice?" would have yielded high agreement among the students (see the theme of professionalism in Section 6.4.4). Another example is the following: when one or more students describe an observable continuing effect for the group, and the others in the same group do not, an obvious reason is that the others were more occupied by some other aspects. On these grounds, the summative analysis sought to explain the nature of reserved experiences to provide an overview in terms of positive versus negative experiences, and focused on the themes in Figs. 5–7.

The lack of direct questions was considered not to undermine validity, but rather the inductively developed themes were considered to make directed research subsequently possible. Generally, the authors did not emphasize summative information as an indicator of meaning in the present context. For instance, observations of negative and reserved students' experiences are of great importance regardless of whether there are few; they inform the further improvement of the present group pedagogy. Similarly, a few indications of compensating aspects (see Section 6.3) coupled with reserved experiences importantly explain that students acknowledged benefits for others if not personally.

Furthermore, the present study has the characteristics of critical research, which helps to explain its validity. In critical research, constraining structures are addressed to increase participants' control over their social situation, and success in this respect indicates validity (e.g., Carr and Kemmis, 1986; Greenwood and Levin, 1998; Melrose, 2001). Locally, there is a historical continuum where the first author initially concluded that the lack of attention to group work in student projects existed (Isomöttönen, 2011, pp. 157–158), and then attempted to address this gap in the context of the target course (Isomöttönen, 2014). The present study continues this improvement effort. The resulting themes and the summative review in Section 6 suggest that the

student groups who were involved benefitted from the actions taken. Moreover, the intervention was interpreted to improve control over the students' group work condition as compared to the previous attempt in the target course (reflection included below). What is advanced here is similar to validity as relevance, which Altheide and Johnson (2011) discussed among validity types in qualitative research. Validity as relevance "stresses the utility and 'empowerment' of research to benefit and uplift those groups often studied, relatively powerless people, e.g., the poor, peasants, etc." (p. 585). That the present research is relevant for people (students) whose condition lacks attention and calls for empowerment is reflected here.

7. Discussion

This section considers the results from pedagogic and psychoanalytic perspectives and makes remarks for SE education.

7.1. Pedagogic considerations

It is first pointed out that the target course students begin their project with group members with whom they have not previously worked, and this fairly short-term project course is just one course among the others studied in parallel. Acknowledging this perspective, the present authors have pondered whether short-term group projects can be more than cooperative studying and afford experiences of relatedness and group norms. The student-reported consolidation of grouping and the experience of the open group mood during and after the intervention (see Section 6.4.2) moderate this concern. An illustrative student experience was that the intervention initiated a new start for the group. Here, a connection to Freire et al.'s (2005 p. 188) treatment of the theory of dialogic can be made. Freire stated that trust is not needed a priori but emerges when subjects come together to reveal the world in a dialogic manner. Explaining the emerging consolidation of groupings and the open group mood in this way helps to conclude that counteracting experiences of unpredictability is possible *during* group undertakings. When trust is obtained, student groups may continue to resolve the problem of unpredictability. As raised in the Introduction, the literature emphasizes unpredictability as a student-experienced stress about group assignments.

The resulting themes suggest that intervention discussions caused serious reflection and motivated individuals to contribute to the project, and that those contributing to the project became relieved by the increased efforts in the group (see justice-related in Section 6.4.1). This indicates improvements in a group situation with respect to the problematic group roles raised in the Introduction (that is, social loafer and diligent isolate). Moreover, hearing peers' views during the intervention caused students to pay attention to task allocation (see self-regulation in Section 6.4.2). These student experiences are altogether interpreted to indicate increased fairness and collectivism in group work. For students who were doubting their abilities or position in the group, the intervention discussion in turn provided a relief referred to as the liberating effect in Section 6.4.1. It thus seems pedagogically beneficial that the individuals' worries are expressed in the presence of a group.

The reported doubts about honesty (Section 6.2.1) call for more dramatic interventions. The intervention exercises could also be used to ask students to make justice and role judgments concerning their peers; this might increase possibilities for critical discussion. The teacher who facilitates the intervention situation should routinely motivate students toward honesty by explaining the benefits of trustful, direct talk (e.g., consolidation of grouping and open group mood). Furthermore, individual teacher–student post-discussions are proposed to moderate potential negative experiences caused by the intervention. The compensating category, in which the intervention was perceived impersonally, as potentially useful for others, could be raised in these discussions. Underlining the intervention as a conceptual examination of group work might also help to offload a personal negative experience. In sum, the resulting themes can help teachers prepare themselves for the task of facilitation and for reactive post-intervention activities.

The review of experiences in Section 6.5 suggested that students may perceive the significance of the reported themes differently: lack of concrete observable effects out of the intervention may be emphasized, although "softer" outcomes such as an eased atmosphere in the group were identified. An implication for practice is that teachers could provoke discussion among students on what constitutes well-being in groups at the beginning of the target course. This might allow students to think holistically about their group situation from the start. The authors also think that a guided per-group discussion could occur during the latter half of the project and focus on clarifying the differences in the students' experiences of the intervention. This might increase students' sensitivity to reading their peers' positions in the group and cause students to regard the intervention as a needed professional practice.

7.2. Reflections from the psychoanalytic perspective

The results are interpreted to follow the notion of a group establishment. Students valued a safe and open environment in the intervention discussions (see Section 6.1.3), which can be seen to explain both the condition needed and the teacher's challenge with intervening in the reactionary domain in group life. A personal role conflict interpreted as a defensive reaction also aligns with the idea of group establishment, particularly in light of the primitive fears associated with the analytic investigations of groups (see Section 2). Theoretical sampling is needed to investigate whether the mild reserved evaluations (such as "not personally necessary") are in effect withdrawals from sensitive discussion and therefore manifestations of the group's establishment. Relatedly, a hypothesis was posed that the views of a well-performing group may relate to an establishment that hinders group analysis (see Section 6.2.3). Furthermore, students argued that intervention was needed from outside the group, which interestingly bespeaks the existence of a group illusion that is difficult to demolish as an insider.

It seems probable that the use of intervention exercises primed a work group mode (in Bion's terminology: see Section 2), and therefore facilitated honest discussion, as seen, for instance, in the students' valuation of exercises in Section 6.1.4 and the clarification-related themes and the liberating effect in Section 6.4.1. This is supported by historical reflection: in the pre-form of the intervention, a teacher tried to evoke group discussions without providing exercises, which was observed to yield, more often than not, a highly reserved atmosphere. The hypothesis is that a basic assumption group mode (in Bion's (2003) terminology) often took command from the start of the session. This historical comparison suggests that the evocation of the work group mode provides useful scaffolding for discussing sensitive matters. This hypothesis merits further empirical research in both educational and professional group work settings.

Yet another reflection concerns the roles of intervention participants. Asking students to work on intervention exercises allows a teacher to listen silently, probe, and endeavor to offer analytic summaries and interpretations. If a student group working on the exercises has immersed itself in "recepting" and "musing", an analogy with a therapeutic setting as an inter-subjective process becomes available (Bollas, 1987, pp. 269–273). This analogy

is supported by the student-favored safety and encouragement in the intervention circumstance (Section 6.1.3). In other words, a teacher, together with a supportive circumstance, can be understood as a detoxifying container. Similarly, the intervention evaluated as a possibility for individual confessions (see Section 6.4.1) supports viewing the group as a detoxifying container for an individual student. The conclusion here is that an educational intervention such as the present one can be associated with a group therapeutic session, and participants can be guided accordingly.

The evaluation results convey that students conceptualize the present group situation—for instance, they had had thoughts about their position in the group before the intervention, while the intervention clarified, revealed, and confirmed their views about the group's situation and was liberating (see quotations in Section 6.4.1). However, without an intervention coming from outside the group, their group's situation tended to remain unaddressed (see Section 6.1.2). Linking this with Bollas (1987), the authors conclusively formulate that group work is impeded by a "thought unaddressed" (our characterization) because of the "unthought known" (Bollas' terminology: see Section 2). What is referred to here is a condition in which group members are contemplating group situations and their thoughts are awaiting to be revealed, while the group establishment is inhibiting this revelation.

7.3. Considerations for SE education

Graziotin et al. (2018), who reported on consequences of (un)happy software developers, anticipated that "developers' [...] job conditions are often overlooked" (p. 45). The present study draws attention to student developers' well-being in a group setting as to how tensions (cf. establishments) may be relieved at a group and individual level. In these respects, the condition or tension formulated above as "group work is impeded by a thought unaddressed because of the unthought known", affecting the group's well-being, would be interesting to study further in both educational and industry settings.

Relatedly, let us consider the situation in which we make SE students aware of the group establishment perspective and expose them to interventions that they observe to influence their group situations. The important question then concerns the possibility of promoting resistance identities by which SE students are subsequently able to take action from inside a group to address a problematic group illusion and promote justice. Thus, the question reads: Can we educate developers who possess courage to address group illusions as insiders? The present results showed that students started to envisage the intervention as a professional practice that could be used in the future, but this aim is interestingly challenged by the psychoanalytic perspective in Section 2.

A framework of pros and cons of differing educational actions on improving students' group work would be helpful for SE educators who implement group projects. This framework should incorporate the incentives of the actions as well as the theories that explain the actions. As a starting point, it is interesting to compare dishonesty as fear of consequences (see Section 6.2.1) with the aspects of dishonesty raised in conjunction with peer-assessment. With the latter, dishonesty has signified biases arising from social relations and even cartels (see Magin, 2001). Furthermore, one might question the possibility of fostering an open group mood (see Section 6.4.2) through anonymous peer assessments or, the other way around, the possibility of achieving the present evaluations if numeric grading was imposed on the course setting. In particular, the authors welcome qualitative studies on individual student perspectives from Marques and Ochoa (2014), who prompted student groups to independently dissect their group situation when problems emerged, and from Kamau and Spong (2015), who educated students about group difficulties—this would allow detailed comparisons between the educational actions that have similar aims. Regarding the former, it would be interesting to know if students considered prompting from the educators necessary (cf. the needed from outside theme in the present study) and how individual students participated in discussing the group problem.

8. Conclusions and future work

An intervention that aspired after regulated group work for fair group settings was presented and evaluated. Drawing on the results and the discussion above, the main conclusions are as follows: overall, the intervention provided a setting for a teacher to empower student groups to improve their own group work condition during projects; the intervention supported feelings of fairness and collectivism; individual students' pressures were relieved by the honest group discussion—explanation of how the intervention improved well-being in groups; the use of exercises was imperative to increase students' participation in group analysis; dialogic group analysis needed to be initiated from outside the group; and, psychoanalytic theory was informative for understanding the intervention. Moreover, the study indicated an encouragingly positive overall evaluation and a benefit for all groups, although the quantification of individual themes does not warrant strong generalizations.

A multitude of follow-up studies are available. Subsequent studies can operationalize the resulting themes and investigate their relative importance. First, research should examine how much significance students attribute to the different effects. This goal is encouraged by the comparison between individual students' experiences in Section 6.5. Second, it should be investigated whether individual students recognize a particular effect in their group and to what degree they do so (e.g., on a Likert scale). These proposals lead to yet another research goal of systematically investigating what background factors influence particular experiences of the intervention. This calls for post-course interviews in which participants are asked to identify reasons underlying their experiences.

From the psychoanalytic perspective, interviewing students regarding why they argue that the intervention is needed from outside the group is a fascinating research target. This would potentially reveal if students refer to a phenomenon that is difficult to describe, something that Hoggett (1998) outlined metaphorically. What is referred to here is not, for instance, if discussing about justice is considered difficult. The focus of research would be the possibility of initiating serious discussions about groups from within the group. A related research target would be to study if some individuals are more capable of this initiation than others, and what, then, are the characteristics of those capable individuals. Longitudinal research is needed to study if interventions during education encourage students to take critical action in problematic group situations in working life.

It is hoped that the qualitative insights and the reflections provided in this study encourage SE educators, as well as professionals who coach groups, to design and implement interventions by which collectivism and fairness can emerge. To scaffold students' preparation for professional software development, students' learning possibilities in group settings should not be left to occur accidentally.

CRediT authorship contribution statement

Ville Isomöttönen: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Emmi Ritvos:** Investigation, Writing - original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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