Adaptive Emotional Support for Groups

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ABSTRACT

When faced with a difficult situation, searching for emotional support is one of the most natural things to do. Being supported not only helps regulating the negative emotions, but it also promotes coping skills and psychological adjustment to stressful situations. However, not all emotional support attempts are effective and always available. The increasing usage of technology may offer a solution by providing an emotional support virtual agent, capable to deliver support via smartphone or computer, anytime and anywhere. Such agent may adapt to one's characteristics and situation, providing supportive feedback tailored to the needs. In my thesis, I will focus on how to provide emotional support to groups of students. Emotional support will be adapted to the stressors that students typically encounter, and to the challenges linked to working in groups. I will study how people adapt emotional support statements to both individual and situational factors, and investigate how this can be implemented in a virtual agent.

CCS CONCEPTS

• **Human-centered computing** → **HCI theory, concepts and models**.

KEYWORDS

emotional support, groups, personalization

1 CONTEXT AND MOTIVATION

When encountering a stressful situation, it is common practice to search for support from caring others. Emotional support includes expressions of care, concern and interest [8]. The primary aim is to help another coping with negative emotions by expressing encouragement, appreciation and respect [4, 5]. Provision of emotional support promotes the recipient's self-esteem and coping skills [4, 19, 26, 33, 42], and is linked to positive health outcomes [17, 20, 33, 45]. However, not all support efforts are experienced as helpful by the recipient. Well-meaning but inept attempts can

exacerbate negative emotions, increase stress levels and inhibit problem-solving skills [1, 10, 11, 27, 35].

Therefore, it is extremely important to find new ways to deliver effective emotional support to distressed individuals, to support well-being and promote long-term coping skills. But what makes an emotional support message effective? People naturally adapt support messages to the recipient and source of stress [13, 41], suggesting that an effective emotional support message requires adaptation to an individual's characteristics and context.

Nowadays, the increasing use of technology opens new ways to provide emotional support: a virtual agent that delivers support messages via smartphone or computer. People interact with technology every day, creating a unique opportunity to support them anytime and anywhere - especially when one's social circle is not available. A virtual agent can be tailored to the individual and the specific needs of the moment, and it may even encourage a more open, disclosing communication compared to a human-to-human conversation [28].

My thesis will focus on how to provide emotional support to University students working in *groups*. Students typically face several life changes, together with new educational demands, which cause stress and vulnerability to mental health issues [2, 21, 34]. Among the new educational challenges, group projects are a common feature of many courses. Group projects are typically started at the beginning of a course, and they require students to work together to create a final product (a project presentation or research article, for example). They can be a precious opportunity to learn communication and interpersonal skills [7], but they can also cause conflicts and frustrations [3]. Targeting a group of students allows us to address issues related to group work (which may be issues that are specifically caused by group work but also more general issues that affect group work). An emotional support virtual agent may do so by monitoring groups; keeping track of both individual and group variables. This agent may then combine such data, and give supportive feedback accordingly, to the individual and to the groups. This thesis will investigate how to create such an agent.

2 RELATED WORK

To gain insights into how to create an adaptive algorithm for emotional support, several studies explored how people tailor support messages to individual and situational factors.

Individual factors encompass stable characteristics of the recipient, such as personality and culture. Personality has a crucial role in delivering emotional support: it determines the quantity and type of emotional support messages, as supported by Smith et al. [41]. The personality traits of Conscientiousness and Neuroticism, in particular, have a primary role in determining its delivery [13, 14, 41].

Together with personality, cultural differences can influence the way the support is received. Sidi-Ali et al. [37] explored this aspect, showing that people adapted support feedback according to the culture of the recipient.

Situational factors are typically determined by the cause of the distressing situation. In this line of research, emotional support messages in target population have been studied. Dennis et al. [12] and Kindness et al. [24] explored how to adapt emotional support messages to the stressors that community first responders encounter. Similarly, Smith et al. [41] adapted them to the source of stress that carers experience. Additionally, Dennis et al. [13, 14] found that people adapt support to learners based on the grade that they received and their personality.

Together with individual and situational factors, effective reception of emotional support may be influenced by message characteristics and modality (e.g. animated vs. no visual agent). Smith et al. [40] found that empathetic, person-centered messages were highly rated, in line with the importance of person-centered messages according to Burleson [4], and that sympathy with the situation affects the quantity and support provided. According to the result of Smith et al. [38], people rate the emotional support message worse when it comes from a virtual agent, compared to a human. The effect of modality was investigated by Nguyen and Masthoff [32]. Their results suggest that anthropomorphic features, such a human-like representation of a virtual agent, create expectations of empathy, in line with Smith and Masthoff [39] and Go and Sundar [16].

Since the current intervention will focus on groups of students, another relevant work is the one of Janssens [23], where the most common stressors among Dutch students are collected and validated in stressors categories; the resulting categories can be seen in Table 1.

Findings from these researches frame my research in several ways. Personality will be considering a moderating factor when exploring group issues, and emotional support messages will be delivered using the categories of Kindness et al. [24] as a theoretical framework. Stories about group issues will be created following the methodology of Smith et al. [38]. The design of emotional support messages and the medium of delivery will be based on [32, 38–40].

3 RESEARCH QUESTIONS AND APPROACH

First, I will investigate what are the main relevant issues in a group work:

RQ1. What are the main issues in group work that require emotional support?

To answer RQ1, the literature will be triangulated with findings from focus groups and interviews, building on the work from [44] (on attributes to assess issues in group work) and [23] (on more general student stressors). The main issues students experience in a group (both due to their own stressors and stressors caused by team members, see examples in Table 2) will be validated into group issue categories similar to the stressor categories in [25].

RQ2. How can group work issues (including their severity) be reliably assessed, as

RQ2.1. Experienced by individuals in the group (also taking into account the moderating factor of personality)?

RQ2.2. Caused by one person in the group (aggregating individual assessments about that person)?

RQ2.3. Experienced by the group as a whole (including dealing with conflicting opinions)?

To answer RQ2, the literature will be triangulated with findings from focus groups to inspire initial peer assessment designs. These will be evaluated in a field study, where they are used in a course and students and teachers provide feedback. In particular, I will study the best way to motivate students to complete the assessments and answer them honestly, and what aggregation methods are regarded most appropriate and informative by students and teachers.

To reflect on issues found in the assessment to an individual or group, I need a way to summarize them. Additionally, for the initial investigations into how to adapt emotional support to group work issues (see RQ4), I need a validated way to portray such issues including different severity levels (e.g. a team member can do slightly less than expected, a lot less than expected, nothing at all). This leads to the research question:

RQ3. How can group issues and their severity levels be reliably portrayed?

An issue may arise because of one person or multiple, and one or multiple issues can be experienced (see examples in Table 3), leading to the following sub-questions:

RQ3.1. How to portray an issue and a severity level: (a) with one person, (b) with multiple people?

RQ3.2. How to portray multiple issues and their severity level: (a) with one person, (b) with multiple people?

To answer RQ3, stories depicting the issues will be created for each issue category. First, stories will focus on one issue with one person for different severity levels. In a user study, I will validate that these stories correctly depict the issue and the severity level (by letting users select the stressor category and severity level). Second, these will be used to create stories about one issue with multiple people. As an issue with multiple people may impact the perceived severity level, the severity levels will be re-validated in a user study, and possible changes made to ensure I have a range of severity levels. Third, stories will be created about multiple issues with one person. This includes investigating the best way to combine different severity levels (first through focus groups and later through a user study). Fourth, stories will be created about multiple issues with multiple people (same approach as before).

The previous research questions lay the foundation for the main research question of this thesis:

RQ4. What is the best emotional support to provide taking into account both the issues experienced and things that went well?

RQ4.1. What emotional support to provide to an individual given the assessment they provided of their team members and themselves?

RQ4.2. What emotional support to provide to an individual given the assessment their teammates provided of them and they provided of themselves?

RQ4.3. What emotional support to provide to the group as a whole?

RQ4.4. How to adapt this emotional support to user characteristics (e.g. personality traits, cultural dimensions)?

Table 1: Stressors categories collected and validated in [23].

Abbr.	Category	Stressor
Lo	Loneliness	Because of the different courses every period, there are different people every time in lectures. That makes it really hard for John to get to know his fellow students. That makes him feel alone, even during lectures.
Phy	Physical demand	John is an intern at the hospital; he has to run around helping patients.
Me	Mental demand	John is going through difficult study material that is very hard to understand.
In	Interruption	While John is studying for his exam, his mother calls.
So-Em	Social-emotional demand	John feels he has to put up a nice smile and be cheerful during activities at his student association, even though he does not feel like it.
Te	Temporal demand	John feels the time pressure of deadlines.

RQ4.5. How to adapt this emotional support to the issues in the group in previous assessments and the support provided then?

To answer RQ4, first the User-as-Wizard method will be used [31], in which participants will play the role of the teacher and decide what emotional support to provide given certain group issues. The issues experienced will be portrayed using the scenarios created and validated in RQ3. Based on the outcomes of these studies, an algorithm will be produced to provide emotional support given group issues experienced. This algorithm will be tested in field studies, where students in courses will assess their team members and themselves (using the assessments developed in RQ2), and will receive automated support (as well as follow-on support by a teacher where needed)[2]. The perceived effectiveness and appropriateness of the emotional support will be assessed to further refine the algorithm.

4 RESULTS AND CONTRIBUTION TO DATE

In work with a master student [44], we explored which are the most common issues that a group experience and how these can be reliably assessed via a peer-assessment survey. The following group problems were identified:

- *Social loafing:* Social loafing occurs when a group member consistently contributes less to the group task than others, resulting in an individual being less productive in a group than working alone [22, 36].
- *Communication problems:* Poor communication has been linked to worse performance, while positive communication improves creative problem-solving of a group [6, 29].
- *Differences in attitude:* Attitudes and expectations can determine the desired grade and the behaviour of group members. Clashing attitudes may result in increased conflicts [30].
- *Diversity:* While some kinds of diversity are known to encourage creativity within a group [9], diversity in authority or social power (also defined as disparity [18]) can cause competition and resentment in group members [15, 43].

Five measurable group attitudes were used to assess the presence of group problems, namely: Quality of Cooperation, Quality of Contribution, Production, Reliability, and Friendliness. These attributes have been deemed suitable to signal group problems by both students and teacher in a field research study.

Additionally, a first exploration of emotional support to individuals reporting issues was performed. After a participant answered the survey, a robot called E-Mate automatically generated a text reflecting on participant answers. The agent was designed as a robot in order to prevent human-like expectations about the empathic feedback [16, 39]. We investigated two styles of aggregation in feedback: the first was Attribute-Centered, reflecting on the results of each attribute one at the time; the second was Individual-Centered, where results were discussed per group member (an example can be seen in Table 4. According to the overall score (using an initial version of an aggregation function), the E-Mate also displayed a happy or sad face when providing its summary (see Fig. 1). Most participants liked the Person-Centered feedback more, reporting it as more honest, clearer, more natural, and more adapt to mention an issue with a problematic member. While some members reported the E-Mate as a nice personal touch, some others did not feel like it contributed much, and some did not think it was useful at all. This needs to be put in context of there not being many group issues in the course in which the field study took place, and the E-Mate not yet providing much emotional support beyond reflection and sympathy. This work is currently under review for a conference.

5 DISSERTATION STATUS, LONG-TERM GOALS, AND NEXT STEPS

In this first year of my PhD I have gained knowledge about which group issues more commonly affect students, how to assess them, which types of emotional support are suitable to them, and how emotional support should be adapted to stressors and personality based on the literature. This will result in a literature review. I have also done the first steps towards assessing group issues and the automated generation of emotional support. I am currently following a course on Natural Language Generation, which will be useful to make this automated generation more sophisticated and to also use state-of-the-art approaches for evaluating such messages. The first long-term goal of the thesis is to make a strong contribution to knowledge on how group issues can be assessed and how emotional support in groups can be provided automatically and tailored to issues experienced and the characteristics of the group members (and the group as a whole). The second long-term goal is to produce a working implementation that has been used in real classrooms, and been shown to provide support to students working in groups, making it easier for teachers to use group work.

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[2]Appropriate ethical processes will be followed to ensure students participate in the research voluntary, whilst all will get teacher support

Table 2: Examples of different kind of group issues with one person

Main issue types	Issue category	Examples
Issues experienced by a member due to another member (John)	Friendliness	John is unfriendly
	Productivity	John contributed very little
	Quality	The quality of John's contribution is poor
	Cooperation	John cooperated poorly
	Reliability	John is unreliable
Issues experienced by a member called Peter that are not directly due to another member	Loneliness	Peter feels lonely in the group
	Physical Demand	Peter feels sick and it affects his work in the group
	Social-Emotional Demand	Peter is upset because of his private life, but feels he has to act happy in the group

Table 3: Example of possible issues in a group. Issues may affect one person or multiple people, and they may be only one or multiple.

How many issues?	With whom?	Examples
Single issue	One person	John does not contribute at all to the project.
	Multiple people	John and Mary do not contribute to the project.
Multiple issues	One person	John is unfriendly and does not contribute to the project.
	Multiple people	John does not contribute to the project, and Mary is unfriendly.

Table 4: Comparison between Attribute-Centered feedback and Person-Centered feedback. In this example, a group member reported positive scores for every attribute for all members, except for one, named Mario. Mario received a neutral score on quality of cooperation and production, and a negative score in reliability.

Attribute-Centered feedback	Person-Centered feedback
It sounds like things are quite amazing between you guys! I am glad that most of the other members are cooperating well with you. It's great that you think everybody is providing a high-quality contribution to the project. Happy to hear that most of the other members are productive. Glad to hear most of the other members are easy to rely on, although I am sorry to hear that Mario is not so reliable. Similarly, I'm so glad to hear you get along with everybody. Getting along makes things always better. Should any problem arise, let us know, because it's very important that the teachers are aware of any problems in your group. Keep up the good work!	It sounds like you guys make quite an amazing team! It's great that things are so nice with most of the team members. You guys seem to cooperate well, to provide good quality contribution and to be very productive together. It's also great that you are getting along and relying on each other: this is of great importance while working together. With most of the work going so well, it's a pity that you are still experiencing some minor issues. I'm sorry to hear that things could use some improvement with Mario. Should any problem arise, let us know, because it's very important that the teachers are aware of any problems in your group. Keep up the good work!

Table 5: Example of sentences describing severity levels for Quality of contribution.

"Someone has told you that the quality of Peter's contribution is…"			
slightly less than expected	less than expected	considerably worse than expected	completely lacking
a bit poor	poor	very poor	extremely poor
below average	worse than expected	considerably worse than expected	terrible
somewhat less than expected	lower than expected	notably lower	completely insufficient
not very good	bad	very bad	awful
not great	low	very low	extremely low

As my next steps, I plan to make progress on RQ2, RQ3 and RQ4 for the simple case of feedback to one individual regarding an issue with one other individual. First, I will investigate how to reliably portray the severity of group issues. Several formulations have been constructed and will be validated in an online study, to establish which better portray severity levels of issues. An example related
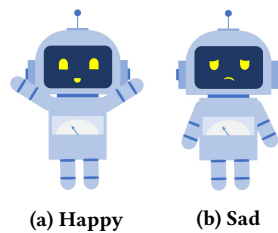
(a) Happy   (b) Sad

Figure 1: Possible E-Mate visual expressions.

to the Quality of Contribution can be seen in Table 5. Second, I will run User-as-Wizard studies to investigate what emotional support people think ought to be provided given a particular issue of a particular severity with one individual. Third, I will run another such study, but then also including the personality of the recipient of the emotional support.

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