

Support for feedback and reflection in online group learning: The FROCOLE app

Karel Kreijns, Maartje Henderikx
Open Universiteit
karel.kreijns@ou.nl
maartje.henderikx@ou.nl

General abstract: One often used active learning pedagogical technique is group learning where group members collectively work on a joint task to achieve certain learning outcomes that benefit all members. However, group members can only achieve their goals when the group learning is structured in a way that facilitates productive social interaction which, in general, cannot be taken for granted. Productive social interaction means on the one side that the dialogues, argumentation and reasoning of the group members is epistemic and transactive and on the other side that group members should be able to regulate their own and each other's learning as well as that of the group as a whole. The FROCOLE app was specifically developed by the Open Universiteit to support these latter types of regulation activities by means of feedback and reflection in online group learning. In this roundtable, we discuss the theoretical foundation of the FROCOLE app, its design and implementation, and how it was deployed in several pilots. We hope that the discussion will give us hints and tips to improve the FROCOLE app and its deployability in education.

Keywords: group learning, collaborative learning, feedback and reflection, pedagogical agent, FROCOLE app

Introduction

One often used active learning pedagogical technique is group learning where group members collectively work on a joint task to achieve certain learning outcomes that benefit all members (Johnson & Johnson, 2018). However, group members can only achieve their goals when the group learning is structured in a way that facilitates productive social interaction which, in general, cannot be taken for granted, especially when the group learning is happening online (Kreijns et al., 2022). Dillenbourg (1999) already argued that although learning in groups “describe a *situation* [italics by Dillenbourg] in which particular forms of interaction among people are expected to occur, which would trigger learning mechanisms, [it is] no guarantee that the expected interactions will actually occur” (p. 5). Therefore, Johnson and Johnson (2018) put forward Social Dependence theory and Structure-Process-Outcome theory to provide a solution for this problem. Social Interdependence theory (Johnson & Johnson, 2003) informs designers of group learning ways for structuring the social interaction, namely via positive interdependence, the situation in which group members perceive that they can reach their goals only if the other group members also reach their goals. Once perceptions of interdependency exist, productive social interaction may arise; the desired social interaction may be in the form of dialogs, argumentation, or reasoning that is epistemic and transactive. Epistemic means that group members generate new ideas and concepts, elaborate on them and explain why they are important to consider (Ohlsson, 1996) whereas transactive means that group members build upon each other's ideas or react on each other's comments, thereby enhancing learning (Popov et al., 2017). Johnson and Johnson (2018) have further developed Social Dependency theory to include four other elements (next to positive interdependence), namely individual and group accountability, promotive interaction, interpersonal and small group skills, and group monitoring for structuring social interaction. While indeed structuring social interaction for group learning can solve the problem, it may not be sufficient. Structure-Process-Outcome theory (Watson & Johnson, 1972) reminds us that processes of interaction directly determine the learning outcomes and that structuring group learning only does so indirectly; hence, structuring may possibly still not entail a complete solution. Indeed processes of interaction are prone to

certain influences that are detrimental for the group learning such as losing track of group progression with regard to the group product and negative group dynamics caused by group conflicts that are a result of free-riding of some group members. Therefore to remain productive, group members have to regulate their own and each other's learning as well as the learning of the group as a whole. These regulation processes need (peer) feedback and reflection (Panadero et al., 2016; Kim & Lim, 2018). Hereby, the peer-feedback should not only deal with the subject matter but should also inform students how the group learning progresses (educational dimension) and how the group dynamics develop (socio-emotional dimension). The latter implies that the regulation processes involve the regulation of the socio-emotional processes, usually referred to as the regulation of emotion and motivation to keep the group dynamics healthy (Järvenoja et al., 2013). However, here too all these regulation processes cannot be taken for granted because they require awareness about their importance for group success, the explicit inclusion of feedback and reflection episodes while working and learning together, and interpersonal and small group skills. As a solution and based on the work of Phielix (see Kirschner et al., 2015), the FROCOLE (=Feedback and Reflection in Online COLlaborative LEarning) app was specifically developed by the Open Universiteit to support feedback and reflection processes in online group learning so that group members can regulate themselves (self-regulation), the other members (co-regulation) and the group as a whole (group regulation). This FROCOLE app will be the subject of the roundtable. We discuss the theoretical foundation of the FROCOLE app, its design and implementation, and how it was deployed in several pilots. We hope that the discussion will give us hints and tips to improve the FROCOLE app.

The FROCOLE app

Design and availability

We decided that FROCOLE should be an app both for Apple IOS and Android mobile devices to be independent of any specific electronic learning environment (Blackboard, Canvas, Brightspace) so to encourage broad use of the app (see Figure 1). Subsequently, the app is made available through the Apple App Store and Google Play Store for free and can be accessed by everyone. Furthermore, the interface of the FROCOLE is based on the principle of direct manipulation interfaces (Shneiderman, 1983). A direct manipulation interface means that students can enter their judgments directly by dragging a slider by means of their fingers thereby avoiding to enter their judgement textual via lists that have to be scored. Finally, the source code of the FROCOLE app will have the GNU GPLv3 license and an README file for full documentation. The source code and README file is made accessible in github.com. Both the accompanying user manual and teacher guide will have the Creative Commons license CC-BY.



Figure 1: The FROCOLE app on an iPhone showing the start screen when it is opened

Feedback

Basically, the FROCOLE app encompasses two kinds of radar diagrams, one for the self- and the co-regulation (referred to as Individual Performance Feedback Radar Diagram IPF-RD; see Figure 2 and 3) and one

for the group regulation (referred to as Group Performance Feedback Radar Diagram GPF-RD; see Figure 4). Each axis of both radar diagrams represents an indicator; an indicator may refer to some aspect from the educational dimension (e.g., Engagement) or from the socio-emotional dimension (e.g., Enjoyment) that has to be judged by the group members. In case of self-regulation (Figure 2), the IPF-RD is concerned with how a student perceived his/her own performance in the group (the student judges her/himself on each indicator — this is shown in the IPF-RD as a solid magenta line; student Marit is judging herself) versus how the group perceived the performance of that student (a mean is calculated using the judgements of the other students about that student on each indicator — this is shown in the IPF-RD as a yellow opaque area). In case of co-regulation (Figure 3), the IPF-RD is concerned with how a student perceived the performance of another student in the group (the student judges the other student on each indicator — this is shown in the IPF-RD as a solid magenta line; student Marit is judging her fellow student Murni) versus how the group perceived that student (a mean is calculated using the judgements of all students on each indicator excluding (of course) the self judgement of the respective student — this is shown in the IPF-RD as a yellow opaque area). It is also possible that the judging student sees in the same IPF-RD the self-judgement of that other student (shown in the IPF-RD as a solid cyan line). Seeing this self-judgment is, however, based on reciprocal permissions: both students must have given each other permission to see their self-judgements. In case of group regulation (Figure 4), the GPF-RD is concerned with how a student perceived the group (the student judges the group on each indicator — this is shown in the GPF-RD as a solid magenta line; Marit belongs to the group Lions and is judging the group) versus how the other students perceived the group (a mean is calculated using the judgements of the other students on each indicator — this is shown in the GPF-RD as a yellow opaque area).

In fact, the two radar diagrams IPF-RD and GPF-RD align with Johnson and Johnson’s (2009) basic element of individual and group accountability respectively. According to these scholars, “*Individual accountability* exists when the performance of each individual member is assessed and the results are given back to the individual and the group to compare against a standard of performance” and “*Group accountability* exists when the overall performance of the group is assessed and the results are given back to all group members to compare against a standard of performance.” (p 368).

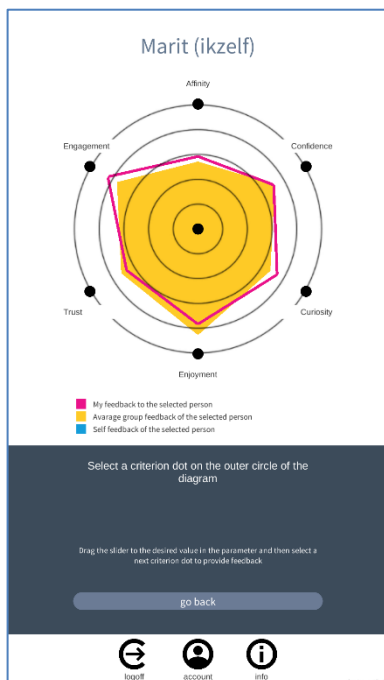


Figure 2: Individual Performance Feedback Radar Diagram (self-regulation)



Figure 3: Individual Performance Feedback Radar Diagram (co-regulation)

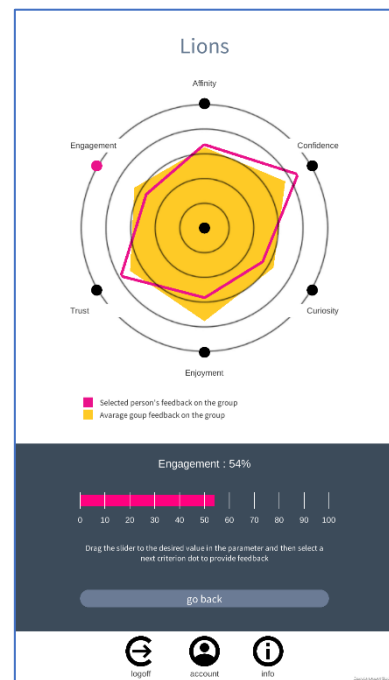


Figure 4: Group Performance Feedback Radar Diagram (group regulation)

Note that the FROCOLE app is not restricted to be used in online groups per se but can be used in every educational setting that uses group learning, even in face-to-face collaborative learning as long as students have mobile devices at hand.

Reflection

The reflection part was also inspired by Phielix (see Kirschner et al., 2015). Yet, rather than using an input screen with prompts to script the reflection process, the FROCOLE app applies a pedagogical agent to streamline this scripting. A pedagogical agent is a character rendered on a screen who is intended to facilitate learning of the presented material (Makransky et al., 2019). Pedagogical agents can be considered as learning companions stimulating social interaction (Kim & Baylor, 2006), may positively affect motivation (Heidig & Clarebout, 2011) and encouraging students to reflect (Beaumont, 2007). The pedagogical agent in the FROCOLE app will elicit reflection processes from the individual and from the group.

Currently, a first functionality of the pedagogical agent is implemented. This function is an alert function that will alert a student when a threshold value on some indicator has been exceeded. A threshold value is a fixed discrepancy between the student's self judgement and the judgement of the group; this discrepancy can be positive (student's self judgement is higher than that of the group) or negative (student's self-judgement is lower than that of the group). A teacher may set threshold values for each indicator and a text to give some information about what the student should do; in most cases, when the discrepancy is positive, the advice will be that the student has to discuss within the group why this discrepancy exists. The alert that is given to a student will only be given once when a preset deadline expires; the teacher may set the deadline (Figure 5). Once the deadline is set, every student will see a message showing the deadline for the judgements to be given (Figure 6). If a student has exceeded a threshold value for a particular indicator of the IPF-RD or GPF-RD, a message will be shown where the preprogrammed advise is given (see Figure 7 for an example message). Alerts will usually start the reflection process.

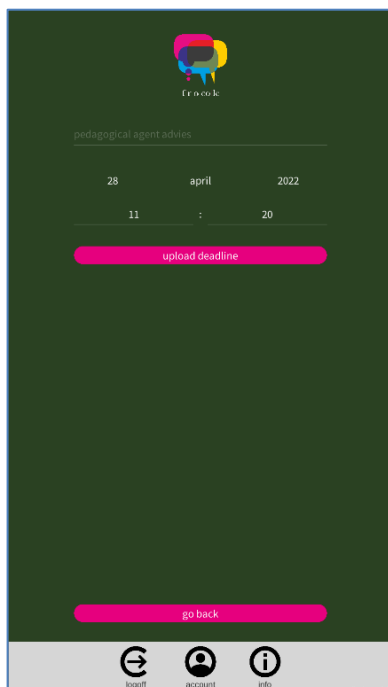


Figure 5: The teacher sets the deadline



Figure 6: The message students will see when a new deadline has been set

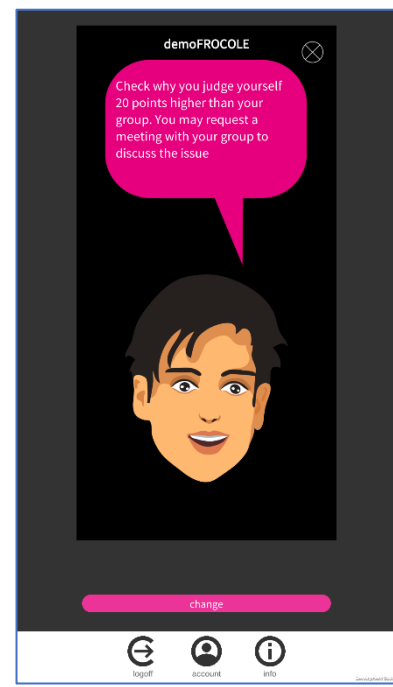


Figure 7: Example message that a student will see when a threshold value is exceeded

First impressions

The feedback part of the FROCOLE app has been tested in several pilots (the reflection part, that the pedagogical agent may elicit by its alert functionality, will be tested later). In one pilot (using a first-year course about Entrepreneurship & Sustainability at a University of Applied Sciences) the app's usefulness (13 questions adapted from de Jong (2017) and usability (the System Usability Scale; see Brooke, 1996) was tested. The results revealed that the students perceived using the app as valuable and found it easy to use for giving feedback. They also indicated that using the FROCOLE app made the reflection process easier. In addition, using the app made them more aware of their performance in the group. Most positive about the app, according to the students, was the ease of use and the way the graphics provided instant insight into the group versus oneself. The second pilot was in an international course on CSCL. This course had an orientation, solo, testing and a collaboration phase. The app was used from the third week of the six-week collaboration phase. The students found that the FROCOLE app was easy to use and did support feedback and reflection among group members but only for those groups that saw the deeper meaning of the FROCOLE app right at the beginning. In contrast, the other groups saw the FROCOLE app more or less as a tool for collecting data for research purposes and, consequently, they used the app infrequent and missed the intended purpose of the app.

Objectives of the session

In this roundtable session we will discuss the theoretical foundation of the current version of the FROCOLE app, its design and implementation, and how it was deployed in several pilots with attention to the feedback part. Participants are encouraged to install the FROCOLE app from the Apple App Store or from the Google Play Store but app is currently only available in Dutch from Dutch app stores. Alternatively, we can provide participants with a secure download link to download an US version of the app. Presenters have prepared a demo FROCOLE course that participants can use to get acquainted with the app.

Clearly, the FROCOLE app is still under development. We hope that the discussion will give us hints and tips to improve the FROCOLE app and its deployability in education.

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