New directions for understanding collaborative learning: the importance of social regulation of learning

There has been increasing interest in medical education regarding the importance of regulation of learning since it extends understanding about the process of learning beyond the essential cognitive- and motivation–related activities. The cognitive–related activities include the range of different knowledge and skills, especially the strategies and techniques, required for learning. The motivation–related activities include the variety of approaches required for learning, including increasing self-confidence and reducing unhelpful emotions. However, effective learning also requires learners to be actively engaged in a process of metacognitive regulation. This process requires constant planning, monitoring, adaptation and evaluation of their choice of cognitive and motivation–related activities to ensure that these activities are optimal for achieving their learning goals.

The predominant interest in medical education about regulation of learning has been the individual learner, which is often called self-regulation. This interest has increased our understanding of individual differences in learning and also informed new approaches for facilitating learning, including the provision of developmental feedback for improving regulation. However, there has been little similar interest in understanding the regulation of collaborative learning when more than one individual is undertaking a given task. This is surprising since there has been an increasing focus on collaborative learning in group or team-based situations across undergraduate, postgraduate and continuing medical education. Collaborative learning can occur in many situations; some can be structured, such as problem based learning groups and in clinical simulation training, but others may be less structured, such as online peer-led networks and in clinical teams. In all of these situations, collaborative learning occurs through social interaction between learners.

In this Personal View, we recommend that medical educators should begin to shift their attention from individual to social regulation during collaborative learning. Our current understanding of regulation during collaborative learning, and its potential application to

medical education, has been informed by the extensive research in other fields of education, including computer supported collaborative learning and pre-school children engaged in collaborative learning (Panadero and Järvelä 2015; Hadwin et al. 2018).

Regulation during collaborative learning is complicated since both individual and social regulation, which includes co-regulation and shared regulation, may be occurring simultaneously and-all of these types of regulation evolve over time. Firstly, individuals will continue to self- regulate their own learning but secondly, an individual learner may commence social regulation by engaging in co-regulation (Bransen et al. 2020). This occurs when there is recognition of the need to receive or give regulation between one or more other learners. Thirdly, there is also shared regulation of learning with collective social regulation between all learners in the group. Research suggests that shared regulation is essential for effective collaborative learning. However, co-regulation is also an important process since it often acts as a "kick start" to stimulate shared regulation, especially at the beginning of collaborative learning or to initiate a new sequence of social interaction. In both co-regulation and shared regulation, the essential cognitive and motivation –related activities are regulated for optimal learning but there is an additional regulation of social-related activities. These social-related activities include raising awareness about the social interactions by asking questions to other or all learners. Table 1 summarises the main features of individual (self) regulation, co-regulation and shared regulation during collaborative learning.

INSERT TABLE 1 HERE

Several methods have been used in other fields of education to identify regulation of during collaborative learning (Volet and Vauras 2013). Observation has been the main method to identify social regulation (co-regulation and shared) of learning. The use of self-report methods, such as semi-structured questionnaires or interviews, can provide greater understanding of individual and social regulation, especially individual perceptions of their contribution to each type of regulation. Finally, trace data collected

from a computer, such as logs of interaction over time, can be analysed to identify each type of regulation during collaborative learning. This method is probably the most reliable and we identified one study in medical education for online problem based learning (Lajoie et al. 2015).

We have become aware of several major challenges that will face medical educators who are keen to pursue our proposed future direction for understanding regulation during collaborative learning and its application to inform developmental feedback. Observation methods can offer an assessment of social regulation during collaborative learning within simulation or clinical settings but no valid or reliable instrument is currently available in medical education. In other fields of education, observation assessment tools of social regulation during collaborative learning have relied on the structured analysis of transcribed video-recorded episodes but a more practical method is required in medical education. A major challenge for assessment, and the subsequent provision of developmental feedback, is cognitive overload for the recipient, but also the provider of the information (Volet and Vauras 2013). The cognitive overload is related to the number of processes that are occurring simultaneously during collaborative learning that need to be monitored. These include (a) the three types of regulation (individual, co-regulation and shared), (b) the phases within each type of regulation takes place (planning, monitoring, adaptation and evaluation) and (c) the three learning activities (cognitive, social and motivation-related). One practical suggestion is that the collaborative learning session could be video-recorded and only shorter episodes chosen for analysis and feedback. These episodes could be key points in collaborative learning, such as initial problem identification in a problem-based learning task or coordination of cardiopulmonary resuscitation during a cardiac arrest simulation, or at times when the collaborative learning group or team appears to be struggling.

We also consider that there will be an additional implementation challenge to integrate assessment and developmental feedback on social regulation during collaborative learning with current practice. This integration challenge is likely to require medical educators increasing their awareness of the importance of social regulation of learning,

including how it extends their understanding of collaborative learning beyond the current behavioural checklists of group participation.

Our research and practical application interest in regulation of learning is now taking a new direction towards social regulation during collaborative learning and we encourage other medical educators to also join us on this journey. The priority area for future research is the development of practical, valid and reliable observation and self-report assessment methods and instruments that can inform developmental feedback for improving the effectiveness of collaborative learning in groups and teams. We have an exciting future vision in which social regulation of learning can begin to be regarded as of equal importance to the extensive research and application of self-regulation of learning in medical education.

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Notes on contributors

John Sandars is professor of medical education, Edge Hill University Medical School, Ormskirk, UK

Dario Cecilio-Fernandes is a researcher in the Department of Medical Psychology and Psychiatry, School of Medical Sciences, University of Campinas, Brazil.

Roghayeh Gandomkar is assistant professor, Department of Medical Education, Tehran University of Medical Sciences, Tehran, Iran

Rakesh Patel is clinical associate professor of medical education, University of Nottingham, UK and honorary consultant nephrologist, Nottingham University Hospitals NHS Trust, UK

Table 1: Types of ~~Social~~ regulation of learning during collaborative learning

Learning activities	Individual (self) regulation	Co-regulation	Shared regulation
Cognitive-related	Optimal knowledge and skills applied by only one learner	Optimal knowledge and skills provided and /or received between one or more learners	Optimal knowledge and skills shared between all learners
Social-related	No social interactions by the individual learner	Optimal social interactions provided and /or received between one or more learners	Optimal social interactions shared between all learners
Motivation-related	Optimal motivation applied by only one learner	Optimal motivation provided and /or received between one or more learners	Optimal motivation shared between all learners