CHAPTER 1

Introduction: Collaborative Active Learning—Strategies, Assessment and Feedback

Chan Chang-Tik

Student engagement is the product of motivation and active learning. It is a product rather than a sum because it will not occur if either element is missing.

Elizabeth F. Barkley, 2009

Introduction

The last decade saw rising interest in the way universities employ active learning pedagogical strategies. It has been suggested that active learning promotes higher-level cognitive skills such as critical thinking (Wiggins et al., 2016) and enjoyment of or engagement in activities (Muehlenkamp et al., 2015). Additionally, pedagogies that focus on student learning

C. Chang-Tik (✉)
Monash University Malaysia, Subang Jaya, Malaysia
e-mail: chan.chang.tik@monash.edu

C. Chang-Tik et al. (eds.), *Collaborative Active Learning*,
https://doi.org/10.1007/978-981-19-4383-6_1

increase the level of collaboration with peers and connect students to an emerging global network (McLoughlin & Lee, 2008). If so, this opening chapter attempts to make a case for active learning as practised by lecturers in the classrooms or outside in the informal learning spaces. Specifically, given the popularity and numerous definitions of active learning in research and practice (Schneider & Preckel, 2017), it is important to critically check the attributes of active learning. To this end, this chapter provides an overview of the socio-constructivist framework for active learning that opens up group-based learning of which collaboration is the nexus.

There remains, however, a degree of uncertainty regarding how students collaborate in a group-based learning environment. Since collaboration is already—and will continue to be—an integral part of group-based learning, lecturers should consider integrating collaborative skills into the assessment component with a pedagogical basis. Further, collaboration plays an essential role in propagating higher levels of participation among group members since it encourages negotiation of shared meanings as well as enhancing elaboration through mutual explaining and reasoning (Hakkinen et al., 2004). Therefore, in this chapter and subsequently in the book, active learning is discussed in the context of a group of students who collaboratively engage in purposeful discussion and reflection in order to attain co-constructed mutual understanding. Henceforth, active learning is synonymous with collaborative active learning (CAL).

In what follows, this chapter provides a description of CAL attributes and strategies to gain more insights into the process of student learning thereby the focus has been consistently on the nature of assessment and feedback for learning. If so, according to Zimmerman (2013) self-assessment is an important element in two phases (i.e., performance and self-reflection) of the student self-regulated learning (SRL). To this end, Panadero and Alonso-Tapia (2013) concur that students need to monitor and evaluate their progress in order to regulate their work, therefore, self-assessment plays an integral part in SRL. In order to support self-assessment, students use rubrics to obtain information from dialogue, demonstration and observation in ways that enhance their assessment for learning practices. In relation to that, rubrics bring the transparency of the assessment criteria to the students, thus they are more likely to have positive perceptions of the assessment tasks leading to positive impact of their learning (Jonsson & Panadero, 2017). According to this perspective,

self-assessment has great potential to facilitate learning experiences, and that potential should be utilised even though it is not a common practice, to form a staff-student partnership through the co-assessment initiative. According to Deeley and Brown (2014) this partnership may result in students becoming more active and self-regulated learners.

It is noteworthy that many universities are pushing ahead with online teaching and learning not because of COVID-19 but more so due to the course suitability of being developed into an online delivery mode and also there is a growing acceptance of this mode of teaching by the students and lecturers. Further, in line with the assessment for learning practices, students are placed in small groups or Zoom Breakout Rooms to collaborate and to peer instruct. For students who are too shy to talk they can use Wiki or Chat to provide peer feedback that can be either audio or video recorded so that students can revisit as many times as necessary because they perceive digital recordings as detailed, personalised and usable (Ryan et al., 2019). In what follows, given the plethora of technology available, lecturers have to acquire both technological and pedagogic knowledge so that they can pick the right technology to enrich student learning experience (Avidov-Ungar et al., 2018) and also be wary of the promises of potentiality that surround the technology. In this context, Dawson and Henderson (2017) conclude that technology interventions need to be guided by clear goals, need improvements in assessment and feedback designs, and need to address organisational matters.

In spite of all the strengths and opportunities of CAL, there remain challenges in terms of student resistance and to a certain extent, lecturer resistance too which are discussed in detail in Chapter 3 (Chang-Tik, this volume). Indeed, today's learning environment in general—CAL in particular—is facing many challenges like the physical layout of the classroom, class size, social web platforms and even the lecturer's authority. Therefore, this chapter begins with an examination of the attributes of CAL, followed by the strengths, opportunities and challenges of CAL. Subsequently, the author discusses the socio-constructivist theory and CAL strategies, assessment and feedback. Finally, the chapter concludes with the design and implementation of CAL lessons.

Attributes of Collaborative Active Learning (CAL)

The term active learning is used very loosely by lecturers who believed they practised it in the classroom. The following are verbatim of what lecturers think active learning entails:

- Active learning is a technique where students engage in some activities like writing, reading, discussion and problem solving.
- Active learning techniques being practised are demonstration, discussion, oral presentations, formative quizzes, problem-based learning and case-based learning.
- I apply a variety of active learning methods to enhance learning and teaching experiences. They are think-pair-share, muddies-point, fishbowl, role playing and student presentations.

According to Schneider and Preckel (2017), there are many definitions of active learning but they all agree on getting students to learn by doing something to manage and develop their learning (Fu et al., 2009) other than passively listening to recorded lectures, watching videos, readings, homework and even tests (Johnson & Aragon, 2003). The key words here are 'doing something' and based on the verbatim above, the students are doing something, but are they into active learning? It is important to take a look at especially theoretical counter-arguments against this definition of active learning. For instance, the theory behind active learning is socio-constructivism that posits people build knowledge by acting on the world around them and reflecting on their experiences (Wright et al., 2019). Additionally, Niemi and Nevgi (2014) state that in the context of active learning, constructivist, self-regulated and collaborative processes are crucial to support learning. Further, active learning requires a high degree of student engagement in the learning process and not just simply to read, listen to and review the didactic materials (Hamouda & Tarlochan, 2015). To illustrate, the construction of knowledge begins with self-reflection of the situations in order to mentally construct meaning based on their prior knowledge. This mental image is then presented to the peers for their feedback and comments. It is through the processes of arguments, challenges, elaboration and negotiation that they co-construct from the ones presented earlier. If they can agree on the shared co-constructed meaning, then it gets accommodated and changes their knowledge and understanding of the situations

and information. Otherwise, the shared meaning is assimilated, that is, the new information is integrated into the prior knowledge but it does not contribute as new knowledge (Cress & Kimmerle, 2008). Therefore, back to the term of 'doing something' and the examples presented in the verbatim, it is reasonable to state that the lecturers are not practising active learning. This is because there is no evidence of collaborative activities being used to co-construct knowledge in the majority of the methods or techniques. In the similar vein, if self-reflection existed in the methods mentioned, then it could be very minimal.

Unfortunately, active learning methods that carry the same names are implemented in different ways by different lecturers and even researchers (Turpen & Finkelstein, 2009). They may differ on variables like size, individual accountability, degree of interdependence, and duration. Accepting this 'infidelity of implementation' problem, Chi (2009) highlighted the need to classify the active learning methods and Stains and Vickrey (2017) called for a standardised system to measure how faithfully the principles of active learning methods are followed. To this end, Chi (2009) classifies the methods as passive, active, constructive or interactive. Specifically, passive means students do nothing more than listen to a lecture without taking notes. However, once students start to take notes on lectures, then it is classified as active. In this regard, there are many methods in the verbatim that fall under these two classifications. Consequently, constructive and interactive methods are more in line with socio-constructivist theory. After all, the constructive method requires students to create new knowledge by building meaningful mental models based on their prior knowledge. They count on the shared mental models to share-regulate themselves to achieve group goals using common strategies to control challenges together (Hadwin et al., 2010). It follows that the interactive method needs two or more students to co-construct knowledge together. Given all the insights above, the distinction between active learning and 'actively learning' or what is known as active method under Chi's classification, is much clearer now.

Theoretically speaking, socio-constructivism that provides the framework for active learning opens up group-based learning of which collaboration is the nexus. According to Arvaja et al. (2007), collaboration is defined as a shared knowledge construction where participants build on others' ideas and thoughts and not just accumulate them Mercer (1996). The main activities of collaboration are negotiation of shared meanings,

elaboration, mutual explaining, and reasoning. In this respect, Dillenbourg and Jermann (2006) design structures known as collaboration scripts (micro and macro) to facilitate and engage students' knowledge construction in interactive collaborative activities. The micro-scripts give students detailed guidance to achieve the collaborative activities outcomes, whereas the macro-scripts focus more on the general ideas of setting up environments conducive for collaboration. It is important to note that collaboration scripts are instructional sequences and they are not designed to interfere with interactions which are too complex to be regulated with predefined scripts (Stahl, 2006).

It is believed that challenges and even conflicts are unavoidable in human interactions and thus also in collaborative active learning (CAL). During collaboration, students negotiate for shared meanings through arguments, challenges, reasoning, debate and elaboration. These activities may lead to socio-cognitive conflicts which are advocated as essential for the cognitive growth of individuals (Buchs et al., 2004). In this regard, Van den Bossche et al. (2006) justify that it is the collaborative activities that students used to elaborate different viewpoints made visible through the conflicts that facilitate learning. However, the academic low achievers tend to avoid socio-cognitive conflicts in order to attain a cordial learning environment (Chang-Tik & Goh, 2020). In what follows, they argue less and agree more, they ask questions for clarifications and not elaborations and they seldom challenge one another. However, in most circumstances, when students are challenged out of their comfort zones, socio-cognitive conflicts are likely to give rise to socio-emotional conflicts (Naykki et al., 2014) and students have to learn how to regulate these conflicts. This is because these forms of conflict can be destructive for effective interaction and learning due to off-task disagreement within groups (Garcia-Prieto et al., 2003).

Furthermore, to develop richness of knowledge elaboration in groups, Curseu et al. (2017) provide empirical evidence that minority dissent and social acceptance are positively associated with group cognitive development. Specifically, it implies that minority dissent is the driving force for cognitive differentiation that stimulates divergent thoughts and triggers cognitive conflicts (Nemeth et al., 2001). Eventually, social acceptance establishes the links for knowledge integration in the group. Therefore, it is important to have an open and accepting group climate that allows for minority dissent.

In summary, the pertinent features of CAL are as follows:

- Self-reflection to mentally construct meaning based on prior knowledge
- Social interactions to construct shared meaning through collaborative activities
- Socio-cognitive conflicts, minority dissent and regulation of socio-emotional conflicts.

Collaborative Active Learning Challenges, Strengths and Opportunities

The perceived challenges to implement active learning in large classes are well-documented, they are among others, insufficient class time and strategy to effectively implement active learning (Miller & Metz, 2014). In addition, socio-emotional challenges can act as obstacles in different phases of collaboration (Jarvenoja & Jarvela, 2009). Generally, lecturers complain it takes more time to teach using active learning strategies than the traditional lecture style. This is because students are not used to group-based learning. As a result, even to get them into groups may take a while, let alone to participate in the learning activities. Consequently, lecturers are worried they may need more time to complete the course syllabus. Beebe and Masterson (2003) agree it takes longer to work in a group than to work alone, but the time spent usually results in better outcomes. If so, some creativity and innovations in the delivery may ameliorate the problem. First, reorganise the course learning outcomes as students can achieve some of them through carefully designed group-based graded assignments posted as post-class activities. Second, spend some time and effort to design pre-class activities that are captivating and engaging as well as dangle a carrot (marks) to catch students' attention. Once they come prepared for the in-class activities the lesson will progress smoothly and effectively. Of course, it implies that the pre-class and in-class activities have to complement each other and in coordination with the assessment components.

In terms of the implementation of CAL strategies in large classes, the author discusses the challenges in conjunction with the physical layout of the classroom. To this end, lecturers rightfully claim there are physical hindrances, like the room is too small to conduct group-based learning which is ubiquitous in CAL. According to Carvalho et al. (2021), the layout of the classroom, high number of students per class and lack

of resources are the main barriers to the successful implementation of active learning strategies. Still though, what matters most here is student learning which can take place outside the classroom. Therefore, to mitigate the problem of classroom physical layout and size that may impede the implementation of CAL strategies, lecturers can conduct the lesson in the informal learning spaces for more than 150 students. According to Harrop and Turpin (2013), informal learning spaces are non-discipline specific and they are used for self-directed learning activities. Specifically, they are physical spaces like café, library collaboration spaces, concourses and any other conducive spaces spread across the campus. On top of that, lecturers can post the learning materials to the virtual spaces like Moodle and aided by other learning technologies like HTML5 Package (H5P), Video Essay, Google Doc. and live Google Chat. The catch here is in the design of the learning activities to support CAL, and the cognitive support for the academic low achievers, particularly in self-regulation and collaborative skills (Chang-Tik & Goh, 2020).

Furthermore, in small classes there are different types of challenges in executing active learning. For instance, the class size may drop to below 10 due to students dropping the class midway through the semester and other reasons, when it happens then it will be difficult for students to engage and interact in group-based collaborative activities. In addition to class size, there is another significant problem related to classroom dynamic. When the group is small, any issues positive and negative may get magnified turning them into incidents that may disturb the emotional climate in the classroom. For example, a few talkative students interfering with the flow of discussions, overzealous social interactions leading to emotional conflicts, and extremely shy students holding up their contributions to the group work. According to Naykki et al. (2014), a proper balance in the emotional expressions is required to sustain engagement in collaborative learning.

From the lecturer authority perspective, CAL which allows students space to reflect and challenge their peers' views including that of the lecturers' may lead to a negotiation of new roles for all members of the classroom community (Weimer, 2002). This new challenge in the lecturers' authority may result in them publicly acknowledging that learning is a joint constructive endeavour between students and the lecturers. To this end, Frykedal and Hammar Chiriac (2018) argue lecturers should refer students to their group for cognitive support, instead of coming to them directly and bypass the group. In consequence, students will be

granted authority to collaborate and to take greater responsibility for the group collective work. In other words, the students' roles have changed where the onus of learning is now on them. To this end, the role shift for students may result in disdain for collaborative learning, particularly, when students still see lecturers and texts as the sole sources of authority and knowledge (MacGregor, 1991). Additionally, students' learning styles and personalities may affect their contributions to group work as some students prefer to work alone rather than in group. According to Nicol et al. (2018), students with different knowledge and learning style may engage with the material at a different pace and therefore, working in a group may not be conducive for them. Furthermore, evidence from cultural psychology has identified learning style (Joy & Kolb, 2009) and thinking style (Lun et al., 2010) as individual learning differences in terms of motivation and cognitive processes (Millar et al., 2013) as well as the ways in which individuals process information (Evans & Waring, 2009).

From students' learning perspective, collaborative active learning requires them to acquire collaborative skills, which incidentally are assumed even though they are not self-evident (Kirschner et al., 2006). According to Johnson and Johnson (2002, 2013), in order to maximise the collaborative potential of groups in accordance with the Social Interdependence Theory, there is a necessity for (a) positive interdependence, (b) individual accountability, (c) face-to-face promotive interaction, (d) interpersonal and small group skills, and (e) group processing. Lacking in any one of these elements may result in students failing to reap the benefits of collaborative learning. They do not build on each other's views, but they accumulate them. In other words, they tend to cooperate rather than collaborate. According to Hammar Chiriac (2014), they work *in a group* and not *as a group*. Even though lecturers develop active learning strategies to promote students' interaction and engagement, if they are not taught how to carry out collaborative activities and to accept that conflicts (cognitive and emotional) are inevitable in collaboration, they will continue to work *in a group*.

In order to achieve a more balanced view of the challenges students face in CAL, it is noteworthy to consider collaboration in the social web platforms (e.g., Blogs, Wikis, forums, virtual communities and social networks). Nevertheless, in an online environment according to ChanLin (2012), students have to spend more time and effort helping the learning community and to self-manage the learning activities. In addition, there is a lack of personal contact and interaction among classmates and the

lecturer (Nam, 2014). To add to the problems, students may perceive an asymmetric collaboration in the online environment, leading to frustration and lower levels of engagement and performance (Capdeferro & Romero, 2012). Given all the insights above, it is reasonable to state that lecturers have a key role to play in the online environment. They can use the social web tools to facilitate interactions with the students, to provide technical support and pedagogical guidance (Lee et al., 2011) and to help group members work in harmony, have fun as they learn and to avoid internal tensions (Molinillo et al., 2018).

In terms of the strengths and opportunities of CAL, the results are mixed. On one hand, active learning can improve students' performance in every subject and at every academic level from grade school to graduate school, and it has special benefits for the academically weak students (Haak et al., 2011). On the other hand, there are concerns about extra time involved in learning new strategies and redesigning courses, student resistance, violating departmental norms and the strategies may not work as advertised (Kober, 2015). Nevertheless, four meta-analyses of hundreds of studies point towards significant increases in the average grades of STEM students who participated in any kind of active learning (Freeman et al., 2014). Other studies indicate that active learning is beneficial for students with high cognitive ability, better preparation and good prior knowledge (Thomas & Philpot, 2012), including no overall gender differences (Haak et al., 2011). In conclusion the strengths of CAL approaches in small classes include among others, greater use of active learning strategies, more oral feedback, more prompt responses to students' written work, and inclusive teaching to be attuned to student diversity (Wright et al., 2019).

Socio-constructivist Theory and Collaborative Active Learning (CAL) Strategies

The theory behind active learning is based on the socio-constructivism that posits students construct meaning by acting and reflecting on the learning activities. Subsequently through social interaction, they co-construct meaning by analysing, synthesising and evaluating collaboratively. This interaction results in deep learning, deep understanding, and eventually conceptual change (Bereiter, 2002). Furthermore, social

interaction is the key factor that influences CAL. Within the context of interactions, it is important to consider the effect of social presence (Fu et al., 2009) in the Community of Inquiry (CoI) framework developed by Garrison et al. (2000). To illustrate, the first component of social presence is open communication. In a group where students do not know one another, the element of trust may be missing, which consequently may impede open communication. Therefore, one possible way out of this predicament is to allow students to choose their group members. Alternatively, lecturers can assist, if it is not already initiated by the students, by introducing popular social media like Facebook, YouTube, Instagram, Messenger, WhatsApp, WeChat, and Discord, to the students. The main purpose is to promote social interaction, getting to know one another and to build friendship.

The second component of social presence is group cohesion. In this regard, the task-related and team-related models may hold the key to support and coordinate group-based activities. Specifically, the task-related model comprises information on materials and strategies required to successfully complete the task (Fransen et al., 2011). Meanwhile, the team-related model focuses on the team functioning as a whole and the expected behaviours of individual members. To this end, in terms of group cohesion and social interaction, students share their responses to the activities in Padlet, Google Jamboard or other collaborative devices. This is because the social constructivist theory states that learning is a social phenomenon that requires sharing with and teaching to others (Powell & Kalina, 2009). It may be worthwhile to note that socially oriented anxiety may negatively affect students' engagement with the active learning environment due to their weak sense of self-efficacy (Hood et al., 2021). Therefore, there is a need to have a hospitable learning space which is a psychological safe space for lecturers to challenge and support students in their learning and also for students to feel curious and inquire without the risk of being judged (Kolb & Kolb, 2017).

Consequently, it is appropriate to discuss two promising CAL strategies that are suitable for a majority of disciplines presented in this book. The first strategy is known as the Team-based Learning (TBL) which is a defined interactive instructional method by Sweet and Michaelsen (2012). The procedures begin with the students completing a brief quiz known as an Individual Readiness Assurance Test (iRAT). Based on the outcomes of iRAT, students are placed in teams of five to seven students. Subsequently, in a team, they negotiate to reach a group consensus before answering

the same quiz questions again (Team Readiness Assurance Test, tRAT). Upon completion of tRAT, the students receive immediate feedback to which they can make an evidence-based appeal to the lecturers if they think they have a case to defend for responses the lecturer considers inadequate. Following the readiness assurance process, students move on to the concept application stage where they are provided opportunities to apply the knowledge and to address significant real-world problems.

In the next CAL strategy, collaborative learning is shifted to outside the classroom, that is, to the informal physical and virtual learning spaces. After all, according to Roberts and Weaver (2006, p. 97) learning is "leaving the classroom". To illustrate in a study conducted by Chang-Tik and Goh (2020), students interact with the learning activities in spaces such as the 'Lepak' Café, Library Collaboration Space, the Hive, and the Idea Link. The activities are also posted to Moodle and aided by other learning technologies like HTML5 Package (H5P), Video Essay, Google Doc. and live Google Chat. This CAL strategy is known as the Collaborative Learning in Informal Spaces (CLIS), (Goh, Chapter 5 this volume) and it is suitable for a large cohort of students (more than 150 students). There are three phases, namely pre-CLIS, CLIS session and CLIS presentation. This strategy runs in a cycle of two weeks, that is, one week each for the pre-CLIS and CLIS session (in informal spaces) and another one for the presentation (in a tutorial room). It is recommended to implement it for at least two cycles.

In the pre-CLIS session, students interact with the learning activities individually outside the classroom. Based on the research findings (Chang-Tik & Goh, 2020), the academic low achievers need extra assistance from the lecturer (live chat on specific days and times) and they should work in groups rather than individually so that they can mutually corroborate one another's understanding. During the CLIS session, students gather in the predetermined informal learning spaces to collaborate on their pre-CLIS responses. Consequently, they are provided with collaborative macro-scripts to set up conditions to negotiate a co-construction of knowledge. Specifically, they should feel free to speak up, have opportunities to openly discuss and challenge, lack fear of making mistakes, and do not take offense when challenged. After all, according to Hailikari et al. (2021) lack of challenge may result in students adopting an unreflective approach to learning and they added that constructively aligned teaching has the potential to support and encourage these students to take an active role and to challenge themselves to reach higher

levels of understanding. Most importantly, students should accept that conflicts are ingrained in CAL, they have to embrace cognitive conflicts and regulate emotional conflicts. Finally, at CLIS presentation a maximum of five groups of students (six students per group) gathers in a tutorial room at one time to share their group findings derived from the CLIS session. Each group is allocated five minutes to present and after that, it is opened for intergroup debates and deliberations. The lecturer will step in to sum up and conclude the discussions.

Collaborative Active Learning Assessment and Feedback

Traditionally, assessment is used primarily to evaluate the effectiveness of teaching with heavy emphasis on grades and to a lesser extent on student learning. However, in the context of CAL, the focus is shifted to how to use assessment to provide evidence for use by students and lecturers to improve learning, particularly, to identify the learning gaps and how to narrow them. To achieve this new focus on assessment, lecturers have to learn how to guide the learning towards the intended goals using activities that also function as forms of assessment (William, 2011). In other words, while students attempt the activities, they are being assessed and the assessment itself is part of learning. Specifically, this form of active learning assessment is known as assessment for learning, which according to Klenowski (2009), is part of everyday practice by students and lecturers to enhance ongoing learning process through information obtained from dialogue, demonstration and observation. If so, then it is theoretically plausible to embed in the assessment processes co-assessment of students' oral presentations, where each student self-assesses his/her own presentation before agreeing on a final grade with the lecturers after critical discussion (Deeley, 2014). In order to assist them in self-assessment, Echo360 or Panopto is used to record the oral presentations. According to Murphy and Barry (2016) the recordings are helpful for students' self-assessment and conducive for co-assessment with the lecturers.

Using assessment for learning alone as a means of teaching would not necessarily lead to a positive result in the learning process. To achieve effective results in the CAL environment, there is a need to utilise feedback as a process to acquire evidence to close the learning gaps rather than as a tool to point out mistakes and to provide correct answers. But research has shown that students do not always use feedback to impact

subsequent work (Sadler, 2010), some may not retrieve written feedback at all (Sinclair & Cleland, 2007) while others focus solely on the grades (Weaver, 2006). To this end, Crooks (2011) recommends allowing students another chance to resubmit their work if it does not meet the desired standard initially. In doing so, students are likely to act on the feedback provided in order to improve. In the context of assessment for learning, it is a positive move as it enables students to reflect upon and act on the feedback and thus enhances learning. In terms of technology, lecturers can use Camtasia, a software for audio–video screen casting to provide socio-constructivist feedback on students' written group-based assignments. Consequently, they are given some time to collectively act on the feedback and resubmit their work indicating how they use the feedback for improvements.

Accepting the collaborative active learning perspective, it is reasonable to introduce socio-constructivist feedback in the group-based CAL environment. This variant of feedback is independent of academic disciplines and the lecturers' choice of feedback model depends on the instructional approach used. Lecturers who favour a student-centred approach tend to pick socio-constructivist feedback instead of cognitivist feedback. To achieve student learning, lecturers provide constructive epistemic and suggestive feedback (Alvarez et al., 2011) to a small group of five students to act as a stimulus for them to collaborate and collectively construct a shared understanding. Specifically, this model of feedback known as feedback for learning is more sustainable than the one that requires lecturers to continually generate information to meet the learning needs of the students. According to Boud and Molloy (2013), the focus of the sustainable feedback, which is very much in line with the CAL milieu, is on the design of learning environments to sustain interactions with and between students and lecturers through a sequence of tasks developed over time. Further, constructive feedback plays an essential role in enhancing student self-efficacy which helps to reduce social anxiety in group interactions (Hood et al., 2021). Additionally, according to Yildiz Durak (2022), group studies and group dynamics may contribute positively to the development of academic self-efficacy during learning activities with the support of group members. In conclusion, lecturers have to provide opportunities for them to engage in dialogue about monitoring their own work, plan their own learning (Carless et al., 2011) as well as negotiate and mutually explain task-related information by building on one another ideas and formative feedback.

Collaborative Active Learning (CAL) Lesson—Design and Implementation

The purpose of this section is to provide general guidelines on the design and implementation of a collaborative active learning (CAL) lesson. The author hopes to provide the readers a sense of theoretical and empirical assertions (as discussed in the earlier sections) supporting these guidelines from two perspectives. The first perspective addresses the preparation procedures that include the design of learning activities, feedback and assessment. The second perspective deals with the implementation procedures touching on the facilitation, and student cognitive and social interactions.

CAL Preparation Procedures: Design of Learning Activities

- Apply the Explanation strategies (DeMonbrun et al., 2017) to explain the purpose, the course/unit expectations, and the activity expectations. Lecturers can either explain the purpose and expectations directly to the students or engage them in reflection and discussion in order to discover for themselves. According to Tharayil et al. (2018), this strategy resulted in greater participation, less distraction and more positive course evaluation.
- Make sure the activities are interdependent to encourage engagement among students either in the online or offline mode. If it is a blended learning strategy, then ensure these two modes of activities are blended and not run concurrently. Specifically, provide students with detailed collaboration micro-scripts to guide them through the activities by asking thought-provoking questions or constructing arguments to achieve the expected learning outcomes (Hamalainen & Hakkinen, 2010).
- Apply the collaboration macro-scripts to set up conditions in which collaborative activities such as mutual explanation, elaborative questioning, and analytic reasoning can occur either online or offline. The focus of the macro-scripts is on the interaction process that relates to the mutual engagement and shared knowledge construction (Lipponen, 2001). To this end, it is crucial to note that the scripts are instructional sequences and they do not interfere with detailed interactions, which are too complex and unpredictable to be regulated by a predetermined script (Stahl, 2006).

- Outline any problems you face in the preparation stage so that it can be recorded for analysis and improvements. To illustrate, discuss in detail
  - The nature of the problems (time constraint, strict curriculum requirements, physical and virtual layouts, etc.).
  - The cause of the problems (lack of skills and training, support from the management, recognition of effort and work done, etc.).
  - All other related issues.

CAL Preparation Procedures: Student Feedback

- In the process of designing learning activities, bear in mind that feedback is also a form of activity that supports collaborative active learning. In this context, the nature of feedback is not to correct mistakes, but to induce social interactions resulting in shared construction of knowledge. The main purpose of feedback is to stimulate students' self-regulation as a means to increase their capability in making judgments and acting upon them. Therefore, at this preparation stage, it is pertinent to decide how to provide feedback to students in group-based activities. According to Wiltbank et al. (2019), students deemed feedback as 'helpful' on three conditions, (1) when they get alerted to their perceived knowledge gap, (2) when they are assured of their existing state of knowledge and (3) when they acquire new information.
- It is noteworthy that peer formative feedback can be beneficial to students as it requires them to actively consider the assessment criteria (Huisman et al., 2019). In addition, peers may introduce students to ideas and arguments from different perspectives and expose them to an array of alternative approaches (McConlogue, 2015). This form of feedback is particularly useful for a large cohort of students as peer feedback can be available in greater volume and with greater immediacy compared to lecturer feedback (Cho & MacArthur, 2010). However, students need training on how to provide effective peer formative feedback (refer to Chang-Tik, Chapter 3 this volume for details). Hence, it is advisable to seriously consider how to incorporate peer formative feedback in the course design.

- Consequently, in online settings the effectiveness in formative processes requires feedback to take the form of constructive dialogue (Gikandi & Morrow, 2016). In other words, it implies that students have to construct their own meaning from the feedback received. In this context, students are expected to play an active role in their learning, to self-regulate and to take responsibility for their learning. On the other hand, lecturers can guide them on how to engage constructively, and reinforce peer formative feedback to stimulate their thinking and foster uptake of peer feedback (Gikandi & Morrow, 2016). Consequently, in an online environment, lecturers have to exchange ideas with students in order to get the feedback message across. Additionally, they can weave the online discussion threads in ways that enriched the discourse with feedback in the forms of ideas, examples and summaries.

CAL Preparation Procedures: Student Assessment

- In the context of CAL, assessment and learning are blended, that is, students are assessed while they learn and the assessment components can also function as learning activities. Therefore, it is practically plausible to expect assignments designed as learning activities. In doing so, there is an added advantage of encouraging students to attempt the activities as marks are awarded for the assignments. In what follows, it is important to tie these activities with socio-constructivist feedback to enhance ongoing learning. According to Swaffield (2011), lecturers developing assessment for learning should carefully interpret students' responses and misconceptions, frame questions to support learning and decide how best to help students move their learning forward.
- It is evident that self-assessment is a key component of student self-regulation, which in turn is an essential element of CAL. Self-assessment refers to students making judgments about their work in relation to established standards to determine their stance (Boud, 1986). Lecturers can assist students learn self-assessment through models of exemplary performance, reflection, feedback from others and self-questioning. Therefore, it is reasonable to develop students' self-assessment skills that serve as a link between lecturer feedback and students' actions to improve their work.

- The concept of assessment for learning can be extended to the online environments. Specifically, lecturers can utilise the online quiz as a learning platform by setting higher-order questions that reflect future lessons. The focus here is to draw students into mutual explanations, arguments, elaborations and negotiation for shared responses to the questions. In other words, students are engaged in knowledge construction activities that are deliberately designed to facilitate collaborative social interactions.

CAL Implementation Procedures: Facilitation

- Apply the Facilitation strategies (DeMonbrun et al., 2017) to promote engagement and to keep the activities running smoothly in a face-to-face classroom. These strategies include:
  - Walk around the room—walk and stop to check on students' work, to ask them questions, and to help them get back on the right track and on task.
  - Approach non-participants—to understand why students are not participating and offer assistance for them to move forward.
  - Assume an encouraging demeanour—develop a classroom climate that makes students feel at ease and comfortable to ask questions and to make them understand that assistance is available if they ask.
  - Invite questions—strongly encourage students to ask questions even when the questions may seem bizarre. Lecturers have to create this 'safe' environment so that students know they will not be laughed at.
- Effective online facilitation starts with the design of a course that engages students with authentic learning activities (assessment and feedback are activities too) and with relevant tasks based on measurable learning outcomes. Importantly, do not simply convert a teacher-centred course and deliver it online using video recordings of lectures, online readings and quizzes. According to Merrill (2003), online facilitation includes the following strategies:
  - Online cognitive interactions
    - Always maintain a student-centred approach and post relevant guiding questions

  - Engage students in their learning and support them with constructive feedback
- Online social interactions
  - Create a safe learning environment that supports interactive group discussion and collaboration
  - Empower students by encouraging peer and self-learning
- Course management
  - Share with students the entire course organisation and point to them appropriate resources
  - Develop clear assignment guidelines and assessment rubrics
  - Pace learning and assessment tasks appropriately to avoid overload
- Technical issues
  - Provide assistance to students on technical issues related to tools and features of the LMS
  - Interact with students using a variety of communication techniques and media (text, graphics, video and audio).

It is important to take a look at peer facilitation in online forum discussions, which according to Szabo (2015), positively improves student forum participation. However, to increase the quality of discussion, lecturers have to monitor the initial discussion prompts. In what follows, students need training to equip them with skills and knowledge to conduct peer facilitation.

CAL Implementation Procedures: Students' Cognitive Interactions

From the lecturer's perspectives based on observations and from the students' perspectives based on focus group interviews and questionnaire, describe the following:

- restriction to speak freely
- opportunities to discuss openly
- take offence when challenged
- negotiate of shared meanings
- mutual explaining and reasoning
- agree more than argue in discussion
- ask questions for clarifications rather than elaborations.

CAL Implementation Procedures: Students' Social Interactions

From the lecturer's perspectives based on observations and from the students' perspectives based on focus group interviews and questionnaire, describe the following:

- climate for collaborative learning
- dominance or intimidation
- outperforming each other
- ability to regulate emotion
- personality clashes and frustration
- overly polite and not willing to challenge misconceptions
- certain degree of trust (group formation)
- distribution of group tasks
- norms and guidelines to engage socially and emotionally.

Conclusion

In this book, the term collaborative active learning (CAL), which is based on the socio-constructivist theory, is taken to begin with students' self-reflection in order to mentally construct meaning based on their prior knowledge. Subsequently, through social interactions they co-construct shared meaning. These collaborative interactions together with minority dissent constitute socio-cognitive conflicts, which are encouraged as they support learning. However, there is a need to regulate socio-emotional conflicts that inadvertently may happen. Further, student self-regulation plays an essential role in the active and collaborative group-based participation because it encourages group peer learning. Even so, the less effective learning group students tend to cooperate in search of answers rather than collaborate to co-construct knowledge (Chang-Tik & Dhaliwal, 2022).

There are many challenges impeding the implementation of CAL ranging from the physical layouts of the classroom to social interaction among students where the effect of social presence is paramount. Nevertheless, these impediments create opportunities for educational innovations that move both the students and lecturers away from their comfort zones in search for effective learning and teaching strategies aided by technologies. In other words, the new paradigm for undergraduate education is to move from teaching to learning. Therefore, the

focus is not instruction but rather that of producing learning by whatever means work best (Hunt et al., 2012). In a similar vein, McLoughlin and Lee (2008) spell out the principles of pedagogy 2.0 that integrates Web 2.0 tools to support peer-to-peer networking, sharing of knowledge, and greater learning autonomy through the socio-constructivist approaches.

In the context of CAL, it is reasonable to accept assessment and feedback as learning activities. Specifically, while students are interacting with the activities they can be assessed and lecturers can easily convert assignments into learning activities. At the same time, during collaborative interactions, socio-constructivist feedback is the key to enhance learning and it is an important learning activity that should not be overlooked. Similarly, lecturers can use educational technologies to assist them in providing constructive feedback and the students can use them to enhance peer and self-assessment.

Further, to facilitate readers in the design and implementation of the collaborative active learning lesson, the author provides general guidelines that discuss the design of learning activities, student assessment and feedback, the online and offline facilitation as well as the student cognitive and social interactions. They serve the purpose of realising personally meaningful and educationally worthwhile teaching and learning endeavours.

References

Alvarez, I., Espasa, A., & Guasch, T. (2011). The value of feedback in improving collaborative writing assignments in an online learning environment. *Studies in Higher Education, 37*(4), 387–400. https://doi.org/10.1080/03075079.2010.510182

Arvaja, M., Salovaara, H., Häkkinen, P., & Järvelä, S. (2007). Combining individual and group-level perspectives for studying collaborative knowledge construction in context. *Learning and Instruction, 17*(4), 448–459. https://doi.org/10.1016/j.learninstruc.2007.04.003

Avidov-Ungar, C., Leshem, B., Margaliot, A., & Grobgeld, E. (2018). Faculty use of the active learning classroom: Barrier and facilities. *Journal of Information Technology Education: Research, 17*, 495–504. https://doi.org/10.28945/4142

Beebe, S. A., & Masterson, J. T. (2003). *Communicating in small groups*. Pearson Education Inc.

Bereiter, C. (2002). *Education and mind in the knowledge age*. Lawrence Erlbaum Associates.

Boud, D. (1986). *Implementing student self-assessment*. Higher Education Research and Development Society of Australia (HERDSA) Green Guide No. 5.

Boud, D., & Molloy, E. (2013). Rethinking models of feedback for learning: The challenge of design. *Assessment & Evaluation in Higher Education, 38*(6), 698–712. https://doi.org/10.1080/02602938.2012.691462

Buchs, C., Butera, F., Mugny, G., & Darnon, C. (2004). Conflict elaboration and cognitive outcomes. *Theory into Practice, 43*(1), 23–30. https://doi.org/10.1207/s15430421tip4301_4

Capdeferro, N., & Romero, M. (2012). Are online learners frustrated with collaborative learning experiences? *The International Review of Research in Open and Distributed Learning, 13*(2), 26–44. https://doi.org/10.19173/irrodl.v13i2.1127

Carless, D., Salter, D., Yang, M., & Lam, J. (2011). Developing sustainable feedback practices. *Studies in Higher Education, 36*(5), 395–407. https://doi.org/10.1080/03075071003642449

Carvalho, A., Teixeira, S. J., Olim, L., de Campanella, S., & Costa, T. (2021). Pedagogical innovation in higher education and active learning methodologies—A case study. *Education + Training, 63*(2), 195–213. https://doi.org/10.1108/ET-05-2020-0141

Chang-Tik, C., & Dhaliwal, J. (2022). Collaborative learning approach to teach computer coding in informal spaces. *Learning: Research and Practice*, *8*(1), 5–24. https://doi.org/10.1080/23735082.2021.1953571

Chang-Tik, C., & Goh, J. N. (2020). Social and cognitive dimensions of collaboration in informal learning spaces (CLIS): Malaysian social science students' perspectives. *Interactive Learning Environments*. Advance online publication. https://doi.org/10.1080/10494820.2020.1799029

ChanLin, L. J. (2012). Learning strategies in web-supported collaborative project. *Innovations in Education & Teaching International, 49*(3), 319–331. https://doi.org/10.1080/14703297.2012.703016

Chi, M. T. H. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science, 1*(2009), 73–105. https://doi.org/10.1111/j.1756-8765.2008.01005.x

Cho, K., & MacArthur, C. (2010). Student revision with peer and expert reviewing. *Learning and Instruction, 20*(4), 328–338. https://doi.org/10.1016/j.learninstruc.2009.08.006

Cress, U., & Kimmerle, J. (2008). A systemic and cognitive view on collaborative knowledge building with wikis. *Computer-Supported Collaborative Learning, 3*(2), 105–122. https://doi.org/10.1007/s11412-007-9035-z

Crooks, T. (2011). Assessment for learning in the accountability era: New Zealand. *Studies in Educational Evaluation, 37*(1), 71–77. https://doi.org/10.1016/j.stueduc.2011.03.002

Curseu, P. L., Schruijer, S. G. L., & Fodor, O. C. (2017). Minority dissent and social acceptance in collaborative learning groups. *Frontiers in Psychology, 8*(458), 1–9. https://doi.org/10.3389/fpsyg.2017.00458

Dawson, P., & Henderson, M. (2017). How does technology enable scaling up assessment for learning? In D. Carless, S. M. Bridges, C. K. Y. Chan, & R. Glofcheski (Eds.), *Scaling up assessment for learning in higher education* (pp. 193–207). Springer Nature.

Deeley, S. J. (2014). Summative co-assessment: A deep learning approach to enhancing employability skills and attributes. *Active Learning in Higher Education, 15*(1), 39–51. https://doi.org/10.1177/1469787413514649

Deeley, S. J., & Brown, R. A. (2014). Learning through partnership in assessment. *Teaching and Learning Together in Higher Education, 1*(13). https://repository.brynmawr.edu/cgi/viewcontent.cgi?article=1107&context=tlthe

DeMonbrun, R. M., Borrego, M., Finelli, C. J., Prince, M., Henderson, C., & Waters, C. (2017, April). Creating an instrument to measure student response to instructional practices. *Journal of Engineering Education, 106*(2), 273–298. https://doi.org/10.1002/jee.20162

Dillenbourg, P., & Jermann, P. (2006). Designing integrative scripts. In F. Fischer, H. Mandl, J. Haake, & I. Kollar (Eds.), *Scripting computer supported collaborative learning: Cognitive, computational and educational perspectives* (pp. 275–301). Springer.

Evans, C., & Waring, M. (2009). The place of cognitive style in pedagogy: Realising potential in practice. In L. F. Zhang & R. J. Sternberg (Eds.), *Perspectives on intellectual styles* (pp. 169–208). Springer.

Fransen, J., Kirschner, P. A., & Erkens, G. (2011). Mediating team effectiveness in the context of collaborative learning: The importance of team and task awareness. *Computers in Human Behavior, 27*(2011), 1103–1113. https://doi.org/10.1016/j.chb.2010.05.017

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *PNAS Proceedings of the National Academy of Sciences of the United States of America*, *111*(23), 8410–8415. https://doi.org/10.1073/pnas.1319030111

Frykedal, K. F., & Hammar Chiriac, E. (2018). Student collaboration in group work: Inclusion as participation. *International Journal of Disability, Development and Education, 65*(2), 183–198. https://doi.org/10.1080/1034912X.2017.1363381

Fu, F.-L., Wu, Y.-L., & Ho, H.-C. (2009). An investigation of coopetitive pedagogic design for knowledge creation in web-based learning. *Computers & Education, 53*(3), 550–562. https://doi.org/10.1016/j.compedu.2009.01.004

Garcia-Prieto, P., Bellard, E., & Schneider, S. C. (2003). Experiencing diversity, conflict, and emotions in teams. *Applied Psychology: An International Review, 52*(3), 413–440. https://doi.org/10.1111/1464-0597.00142

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*, 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Gikandi, J. W., & Morrow, D. (2016). Designing and implementing peer formative feedback within online learning environments. *Technology, Pedagogy and Education, 25*(2), 153–170. https://doi.org/10.1080/1475939X.2015.1058853

Haak, D. C., HilleRisLambers, J., Pitre, E., & Freeman, S. (2011). Increased structure and active learning reduces the achievement gap in introductory biology. *Science, 332*(6034), 1213–1216. https://doi.org/10.1126/science.1204820

Hadwin, A. F., Oshige, M., Gress, C. L. Z., & Winne, P. H. (2010). Innovative ways for using *gStudy* to orchestrate and research social aspects of self-regulated learning. *Computer in Human Behavior, 26*(5), 794–805. https://doi.org/10.1016/j.chb.2007.06.007

Hailikari, T., Virtanen, V., Vesalainen, M., & Postareff, L. (2021). Student perspectives on how different elements of constructive alignment support active learning. *Active Learning in Higher Education* (online). https://doi.org/10.1177/1469787421989160

Hakkinen, P., Arvaja, M., & Makitalo, K. (2004). Prerequisites for CSCL: Research approaches, methodological challenges and pedagogical development. In K. Littleton, D. Faulkner, & D. Miell (Eds.), *Learning to collaborate and collaborating to learn* (pp. 161–175). Nova Science Publishers.

Hamalainen, R., & Hakkinen, P. (2010). Teacher's instructional planning for computer-supported collaborative learning: Macro-scripts as a pedagogical method to facilitate collaborative learning. *Teaching and Teacher Education, 26*(4), 871–877. https://doi.org/10.1016/j.tate.2009.10.025

Hammar Chiriac, E. (2014). Group work as an incentive for learning – Students' experiences of group work. *Frontiers in Psychology*, *5*, 558. https://doi.org/10.3389/fpsyg.2014.00558

Hamouda, A. M. S., & Tarlochan, F. (2015). Engaging engineering students in active learning and critical thinking through class debates. *Procedia—Social and Behavioral Sciences, 191*, 990–995. https://doi.org/10.1016/j.sbspro.2015.04.379

Harrop, D., & Turpin, B. (2013). A study exploring learners' informal learning space behaviors, attitudes and preferences. *New Review of Academic Librarianship, 19*(1), 58–77. https://doi.org/10.1080/13614533.2013.740961

Hood, S., Barrickman, N., Djerdjian, N., Farr, M., Magner, S., Roychowdhury, H., Gerrits, R., Lawford, H., Ott, B., Ross, K., Paige, O., Stowe, S., Jensen, M., & Hull, K. (2021). "I like and prefer to work alone": Social anxiety, academic self-efficacy, and students' perceptions of active learning. *CBE Life Sciences Education, 20*(1), ar12. https://doi.org/10.1187/cbe.19-12-0271

Huisman, B., Saab, N., Van den Broek, P., & Van Driel, J. (2019). The impact of formative peer feedback on higher education students' academic writing: A meta-analysis. *Assessment & Evaluation in Higher Education, 44*(6), 863–880. https://doi.org/10.1080/02602938.2018.1545896

Hunt, L., Huijser, H., & Sankey, M. (2012). Learning spaces for the digital age: Blending space with pedagogy. In M. Keppell, K. Souter, & M. Riddle (Eds.), *Physical and virtual learning spaces in higher education: Concepts for the modern learning environment* (pp. 182–197). IGI Global.

Jarvenoja, H., & Jarvela, S. (2009). Emotion control in collaborative learning situations: Do students regulate emotions evoked by social challenges? *British Journal of Educational Psychology, 79*(3), 463–481. https://doi.org/10.1348/000709909X402811

Johnson, S. D., & Aragon, S. R. (2003, Winter). An instructional strategy framework for online learning environments. *New Directions for Adult and Continuing Education, 2003*(100), 31–43. https://doi.org/10.1002/ace.117

Johnson, D. W., & Johnson, R. T. (2002). Learning together and alone: Overview and meta-analysis. *Asia Pacific Journal of Education, 22*(1), 995–1005. https://doi.org/10.1080/0218879020220110

Johnson, D. W., & Johnson, F. P. (2013). *Joining together: Group theory and group skills* (11th ed.). Allyn and Bacon.

Jonsson, A., & Panadero, E. (2017). The use and design of rubrics to support assessment for learning. In D. Carless, S. M. Bridges, C. K. Y. Chan, & R. Glofcheski (Eds.), *Scaling up assessment for learning in higher education* (pp. 99–111). Springer Nature.

Joy, S., & Kolb, D. A. (2009). Are there cultural differences in learning style? *International Journal of Intercultural Relations, 33*(1), 69–85. https://doi.org/10.1016/j.ijintrel.2008.11.002

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Klenowski, V. (2009). Editorial: Assessment for learning revisited: An Asia-Pacific perspective. *Assessment in Education: Principles, Policy, and Practice, 16*(3), 263–268. https://doi.org/10.1080/09695940903319646

Kober, N. (2015). *Reaching students: What research says about effective instruction in undergraduate science and engineering*. National Academies Press.

Kolb, A. Y., & Kolb, D. A. (2017). *The experiential educator: Principles and practices of experiential learning*. Experience Based Learning Systems.

Lee, S. J., Srinivasan, S., Trail, T., Lewis, D., & Lopez, S. (2011). Examining the relationship among student perception of support, course satisfaction, and learning outcomes in online learning. *Internet and Higher Education, 14*(3), 158–163. https://doi.org/10.1016/j.iheduc.2011.04.001

Lipponen, L. (2001). *Computer-supported collaborative learning: from promises to reality*. Unpublished doctoral dissertation, University of Turku.

Lun, V.M.-C., Fischer, R., & Ward, C. (2010). Exploring cultural differences in critical thinking: Is it about my thinking style or the language I speak? *Learning and Individual Difference, 20*(6), 604–616. https://doi.org/10.1016/j.lindif.2010.07.001

MacGregor, J. (1991). *Collaborative learning: Reframing the classroom. Essays on teaching excellence*. A publication of The Professional and Organizational Development Network in Higher Education (Pod Network). https://podnetwork.org/content/uploads/V2-N3-MacGregor.pdf

McConlogue, T. (2015). Making judgements: Investigating the process of composing and re ceiving peer feedback. *Studies in Higher Education, 40*(9), 1495–1506. https://doi.org/10.1080/03075079.2013.868878

McLoughlin, C., & Lee, M. J. W. (2008). Future learning landscapes: Transforming pedagogy through social software. *Journal of Online Education, 4*(5). https://nsuworks.nova.edu/innovate/vol4/iss5/1

Mercer, N. (1996). The quality of talk in children's collaborative activity in classroom. *Learning and Instruction, 6*(4), 359–377. https://doi.org/10.1016/S0959-4752(96)00021-7

Merrill, H. S. (2003). Best practices for online facilitation. *Adult Learning, 14*(2), 13–16. https://doi.org/10.1177/104515950401400204

Millar, P. R., Serbun, S. J., Vadalia, A., & Gutchess, A. H. (2013). Cross-cultural differences in memory specificity. *Culture and Brain, 1*(2–4), 138–157. https://doi.org/10.1007/s40167-013-0011-3

Miller, C. J., & Metz, M. J. (2014). A comparison of professional-level faculty and student perception of active learning: Its current issues, effectiveness, and barriers. *Advances in Psychology Education, 383*(3), 246–252. https://doi.org/10.1152/advan.00014.2014

Molinillo, S., Aguilar-Illescas, R., & Anaya-Sanchez, R. (2018). Exploring the impacts of interactions, social presence and emotional engagement on active collaborative learning in a social web-based environment. *Computers & Education, 123*(2018), 41–52. https://doi.org/10.1016/j.compedu.2018.04.012

Muehlenkamp, J. J., Weiss, N., & Hansen, M. (2015). Problem-based learning for introductory psychology: Preliminary supporting evidence. *Scholarship of Teaching and Learning in Psychology, 1*(2), 125–136. https://doi.org/10.1037/stl0000027

Murphy, K., & Barry, S. (2016). Feed-forward: Students gaining more from assessment via deeper engagement in video-recorded presentations. *Assessment & Evaluation in Higher Education, 41*(2), 213–227. https://doi.org/10.1080/02602938.2014.996206

Nam, C. W. (2014). The effects of trust and constructive controversy on student achievement and attitude in online cooperative learning environments. *Computers in Human Behavior, 37*, 237–248. https://doi.org/10.1016/j.chb.2014.05.007

Naykki, P., Jarvela, S., Kirschner, P. A., & Jarvenoja, H. (2014). Socio-emotional conflict in collaborative learning—A process-oriented case study in a higher education context. *International Journal of Educational Research, 68*(2014), 1–14. https://doi.org/10.1016/j.ijer.2014.07.001

Nemeth, C., Brown, K., & Rogers, J. (2001). Devil's advocate versus authentic dissent: Stimulating quantity and quality. *European Journal of Social Psychology, 31*(6), 707–720. https://doi.org/10.1002/ejsp.58

Nicol, A. A. M., Owens, S. M., Le Coze, S. S. C. L., MacIntyre, A., & Eastwood, C. (2018). Comparison of high-technology active learning and low-technology active learning classrooms. *Active Learning in Higher Education, 19*(3), 253–265. https://doi.org/10.1177/1469787417731176

Niemi, H., & Nevgi, A. (2014). Research studies and active learning promoting professional competences in Finnish teacher education. *Teaching and Teacher Education, 43*(October), 131–142. https://doi.org/10.1016/j.tate.2014.07.006

Panadero, E., & Alonso-Tapia, J. (2013). Self-assessment: Theoretical and practical connotations. When it happens, how is it acquired and what to do to develop it in our students. *Electronic Journal of Research in Educational Psychology, 11*(2), 551–576. https://doi.org/10.14204/ejrep.30.12200

Powell, K. C., & Kalina, C. J. (2009). Cognitive and social constructivism: Developing tools for an effective classroom. *Education, 130*(2), 241–250. https://link.gale.com/apps/doc/A216181184/ITOF?u=monash&sid=bookmark-ITOF&xid=e2780743

Roberts, S., & Weaver, M. (2006). Spaces for learners and learning: Evaluating the impact of technology-rich learning spaces. *New Review of Academic Librarianship, 12*(2), 95–107. https://doi.org/10.1080/13614530701330380

Ryan, T., Henderson, M., & Phillips, M. (2019). Feedback modes matter: Comparing student perceptions of digital and non-digital feedback modes

in higher education. *British Journal of Educational Technology, 50*(3), 1507–1523. https://doi.org/10.1111/bjet.12749

Sadler, D. R. (2010). Beyond feedback: Developing student capability in complex appraisal. *Assessment & Evaluation in Higher Education, 35*(5), 535–550. https://doi.org/10.1080/02602930903541015

Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analysis. *Psychological Bulletin, 143*, 565–600. https://doi.org/10.1037/bul0000098

Sinclair, H. K., & Cleland, J. A. (2007). Undergraduate medical students: Who seeks formative feedback? *Medical Education, 41*(6), 580–582. https://doi.org/10.1111/j.1365-2923.2007.02768.x

Stahl, G. (2006). Scripting group cognition: The problem of guiding situated collaboration. In F. Fischer, H. Mandl, J. Haake, & I. Kollar (Eds.), *Scripting computer-supported collaborative learning: Cognitive, computational and educational perspectives*. Kluwer-Springer Verlag.

Stains, M., & Vickrey, T. (2017). Fidelity of implementation: An overlooked yet critical construct to establish effectiveness of evidence-based instructional practices. *CBE Life Sciences Education, 16*, 1–11. https://doi.org/10.1187/cbe.16-03-0113

Swaffield, S. (2011). Getting to the heart of authentic assessment for learning. *Assessment in Education: Principles, Policy & Practice, 18*(4), 433–449. https://doi.org/10.1080/0969594X.2011.582838

Sweet, M., & Michaelsen, L. K. (2012). Critical thinking and engagement: Creating cognitive apprenticeships with team-based learning. In M. Sweet & L. K. Michaelsen (Eds.), *Team-based learning in the social sciences and humanities: Group work that works to generate critical thinking and engagement* (pp. 5–32). Stylus Publishing.

Szabo, Z. (2015). Better together: Teams and discourse in asynchronous online discussion forums. *Journal of Psychological and Educational Research, 23*(1), 73–88.

Tharayil, S., Borrego, M., Prince, M., Nguyen, K. A., Shekhar, P., Finelli, C. J., & Waters, C. (2018). Strategies to mitigate student resistance to active learning. *International Journal of STEM Education, 5*(7), 1–16. https://doi.org/10.1186/s40594-018-0102-y

Thomas, J., & Philpot, T. (2012). An inverted teaching model for a mechanics and materials course. Proceedings of the *Annual Conference of the American Society of Engineering Education*.

Turpen, C., & Finkelstein, N. D. (2009). Not all interactive engagement is the same: Variations in physics professors' implementation of peer instruction. *Physical Education Research, 5*(2), 020101. https://doi.org/10.1103/PhysRevSTPER.5.020101

Van den Bossche, P., Gijselaers, W., Segers, M., & Kirschner, P. A. (2006). Social and cognitive factors driving teamwork in collaborative learning environments. *Small Group Research, 37*(5), 490–521. https://doi.org/10.1177/1046496406292938

Weaver, M. R. (2006). Do students value feedback? Student perceptions of tutors' written responses. *Assessment & Evaluation in Higher Education, 31*(3), 379–394. https://doi.org/10.1080/02602930500353061

Weimer, M. G. (2002). *Learner-centred teaching: Five key changes to practice*. Jossey-Bass.

Wiggins, S., Chiriac, E. H., Abbad, G. L., Pauli, R., & Worrell, M. (2016). Ask not only 'what can problem-based learning do for psychology?' but 'what can psychology do for problem-based learning?': A review of the relevance of problem-based learning for psychology teaching and research. *Psychology Learning & Teaching, 15*(2), 136–154. https://doi.org/10.1177/1475725716643270

William, D. (2011). What is assessment for learning? *Studies in Educational Evaluation, 37*(1), 3–14. https://doi.org/10.1016/j.stueduc.2011.03.001

Wiltbank, L., Williams, K., Salter, R., Marciniak, L., Sederstrom, E., McConnell, M., Offerdahl, E., Boyer, J., & Momsen, J. (2019). Student perceptions and use of feedback during active learning: A new model from repeated stimulated recall interviews. *Assessment & Evaluation in Higher Education, 44*(3), 431–448. https://doi.org/10.1080/02602938.2018.1516731

Wright, M. C., Bergom, I., & Bartholomew, T. (2019). Decreased class size, increased active learning? Intended and enacted teaching strategies in smaller classes. *Active Learning in Higher Education, 20*(1), 51–62. https://doi.org/10.1177/1469787417735607

Yildiz Durak, H. (2022). Flipped classroom model applications in computing courses: Peer- assisted groups, collaborative group and individual learning. *Computer Applications in Engineering Education*. Advance online publication. https://doi.org/10.1002/cae.22487

Zimmerman, B. J. (2013). From cognitive modeling to self-regulation: A social cognitive career path. *Educational Psychologist, 48*(3), 135–147. https://doi.org/10.1080/00461520.2013.794676