



Collaboration: Skill development framework

2ND EDITION

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Collaboration: Skill development framework. 2nd edition.

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1. What are essential skills?

There is a growing number of constructs (skills, attributes, characteristics, values, and dispositions) considered important for students' holistic development. Additionally, numerous theoretical frameworks have emerged that cluster and categorise these constructs in relation to student learning outcomes. For schools and educators teaching an existing curriculum, the increased emphasis on a growing number of '21st century' skills can be challenging. Educators may find it difficult to develop an understanding of such a wide range of constructs and obtain sufficient pedagogical training to embed these into the classroom.

Rather than focusing on the quantity of skills and competencies students may need, it is more feasible for education systems and educators to prioritise the essential skills that will have the highest impact on students' learning. To this end, the Australian Council for Educational Research (ACER) focuses on skills which are:

- **essential for learning:** central to the development of student learning
- **teachable:** able to be fostered and nurtured through intervention and pedagogical strategies
- **measurable:** able to be demonstrated through observable behaviours in assessments and monitored in a consistent way across contexts.

ACER's skill development frameworks define five essential skills: critical thinking, creative thinking, collaboration, communication, and self-regulation (Figure 1). Further information about ACER's essential skill development frameworks is outlined in the overview document: [Essential skills for learning](#).



Figure 1 ACER's essential skills for learning

This document presents the ACER skill development framework for collaboration. It provides a general definition of collaboration and describes this construct as it applies in classroom-based learning. It then breaks down collaboration into its component 'strands' and 'aspects'. At the level of 'aspects' the ACER framework describes the observable behaviours or qualities of collaboration. The aspects provide foci for teaching and form the basis of assessment. For example, educators can write assessments to measure specific aspects of collaboration or integrate teaching of separate aspects into a lesson, knowing what and how much of the skill they are addressing at any given time.

2. The need for a framework of collaboration

The definition of any skill or construct is essential in order to assess, teach, or develop pedagogical resources related to that skill. This ACER skill development framework supports researchers and educators with a clear definitional model on which to base their understanding of collaboration.

In this framework, collaboration is specifically considered in the context of learning. Accordingly, the framework assumes that collaboration is *goal-directed* – that the employment of the skill is driven by some purpose, and towards an end. This definition of collaboration is based on the premise that there is purpose and necessity to employing the skill.

The effective teaching or assessment of collaboration demands a robust understanding of what the skill involves and how it develops. This skill development framework addresses the challenges associated with teaching and assessing collaboration. While there are many definitions of the skill, few provide a means to operationalise collaboration in a way that is suitable for the classroom. This framework synthesises and harmonises existing theory and research on collaboration and provides a holistic yet practically-applicable perspective. It outlines collaboration processes by defining its strands and aspects, which are informed by a sound evidence base. The aspects contained within this framework are malleable: they can be taught and they can be learned. The framework is therefore designed specifically to provide foci for teaching and assessment. This ACER skill development framework supports researchers and educators to better understand the skill of collaboration by:

- defining the skill conceptually
- breaking down the skill into the various strands and aspects that comprise it
- presenting the aspects as observable behaviours in learners
- identifying different levels of proficiency in the skill.

The skill development framework describes collaboration as a generally applicable set of competencies. However, the teaching and assessment of the skill is necessarily context-specific and must take place within a learning area. The strands and aspects within the framework are applicable across a broad range of learning areas. Embedding collaboration as a skill within learning areas gives context to its application, ensures it is relevant to existing curriculum, and that it can be sustainably integrated in a classroom context. An intended benefit of this framework is that it provides consistent terminology to describe the skill of collaboration, and its associated aspects and levels of proficiency, within and across learning areas, schools, and systems. It allows educators within any given learning area to directly map their assessment items to the aspects in the framework, or to integrate the aspects into their lesson plans.

3. The importance of collaboration

There is increasing demand to work well with others and to work globally (O'Neil et al., 2004). Consequently, collaboration skills that allow effective working in groups have been identified as increasingly important for success in school and work environments (Singh-Gupta & Troutt-Ervin, 1996). Collaboration has been shown to enhance learners' cognitive development (Webb et al., 1998; Zhang, 1998) and has been demonstrated to have advantages in encouraging learners' accountability, ability to ask questions and justify responses, flexibility in problem-solving and reflective skills (Baghaei et al., 2007; Soller, 2001; Webb et al., 1998).

Social interaction or awareness during cognitive tasks such as problem-solving has been considered beneficial for some time. Several prominent researchers highlighted the learning benefits to the individual of interaction with other humans suggesting that placing learners in a social context is a core strategy for developing complex cognitive skills such as problem-solving competency (Glaser, 1992; Vygotsky, 1986; Wittrock, 1989). When learners work collaboratively to solve problems, they think through the problem and the processes more explicitly during their interaction with others. This leads to a greater conceptual understanding and leads learners to manage tasks more effectively (Darling-Hammond, 2003).

Research suggests that learners process information differently when they work in groups compared to working independently (King et al., 1997). Social interactions make learners' understanding explicit, and learners can improve their comprehension through discussion, elaborating, and negotiating with others to reach shared understanding (Van Boxtel et al., 2000). Collaborative tasks such as asking questions, peer mentoring, and providing feedback can help learners to solve problems or finish tasks they may have otherwise not been able to complete and therefore allow them to move towards higher levels of proficiency (King et al., 1997). Social interaction while working through complex tasks can provide additional ideas and shared meaning that an individual would not achieve without communicating with others (OECD, 2017).

4. What is collaboration?

Collaboration plays a part in theoretical and technological developments in educational research (von Davier & Halpin, 2013). Much of the research in the field of collaboration has focused on collaborative learning, problem-based collaboration, or computer-based collaborative learning. The definition of collaboration is much more complex than simply working with others. The literature has shifted from a simple definition of working in groups, to defining collaboration as an action where two or more learners pool knowledge, resources and expertise from different sources in order to reach a common goal. The distinction between interdependence and independence provides some insight into the nature of collaboration. The focus of team or group work literature has been on independent teams where learners work in relative isolation. Interdependent teams rely on the actions of others and cannot perform the task independently (von Davier & Halpin, 2013). Collaboration is related to the latter. There is shared responsibility and an active division of labour. For example, a marching band or sports team are highly dependent on the interrelated actions and communications of the various members of their group.

Dillenbourg (1999) highlighted that collaboration consists of symmetry of knowledge, symmetry of status and symmetry of goals but that the roles and tasks for each person in the collaboration may be different. Symmetry of knowledge suggests that all participants have different perspectives but their application of respective knowledge is required. Symmetry of status refers to collaboration between peers as opposed to hierarchical supervision. Symmetry of goals in collaboration refers to participants having common goals rather than differing or opposing goals. Dillenbourg (1999) also highlighted the difference between cooperation and collaboration. Cooperation depends upon symmetry of action with learners working on parallel tasks and eventually bringing both parts together as one. Collaboration requires learners working together on the same task where the division of labour is intertwined and therefore requires interdependent tasks (Lai, 2011).

In an educational context, collaboration is when learners work together to achieve a common goal in a shared learning environment (Underwood & Underwood, 1999). Theorists such as Vygotsky (1986) and Piaget (1983) have had a large impact on research into collaboration as they suggest that social interaction facilitates learning. Vygotsky's socio-cultural perspective highlighted that social interaction is internalised, triggering change and new understanding. His zone of proximal development (ZPD) theory identifies the distance between what a learner can achieve individually and what they can achieve with the help of a mentor, usually an adult such as a teacher or parent. Piaget's socio-constructivist approach identifies developmental stages of children's cognitive skills. It also highlights cognitive conflict, where learners recognise a discrepancy between their cognitive understanding and new information, as crucial to triggering growth. This discrepancy is most common when we compare and discuss our own knowledge or understanding with others who have different levels of ability than us (Piaget, 1983). Therefore, generally, the nature of collaboration tends to focus on ability to learn from the interactive situation (O'Neil et al., 2004).

What are the key components of collaboration?

A framework developed by Hesse et al. (2015) identified three essential components of collaboration specifically within a problem-solving context: participation, perspective taking and social regulation. Participation refers to learner engagement with the task, the extent to which they persevere to solve the problem and how well they interact with others. Perspective taking focuses on the quality of the interaction between learners during collaborative problem-solving such as how learners respond and adapt to one another. Social regulation refers to how learners navigate the collaborative space and includes negotiating and resolving differences, evaluating their self and their peers and taking responsibility for the solving of the problem.

The OECD's Programme for International Learner Assessment (PISA) outlined a framework to support their assessment of an innovative domain: collaborative problem-solving. Three collaborative processes were identified: establishing and maintaining understanding, taking appropriate action to solve a problem, and establishing and maintaining team organisation (OECD, 2017). Establishing and maintaining understanding refers to a learner's ability to identify the knowledge and perspectives of others and establish a shared understanding of the problem. Within these strands learners must have a good understanding of their own and others' capabilities and knowledge so they can work towards mutual understanding. Taking appropriate action to solve a problem refers to a learner's ability to identify the appropriate steps and strategies in order to solve the problem. This includes developing a plan and executing and monitoring the outcomes of the actions. These processes require strong communication skills such as negotiation and explaining complex information in an appropriate way for others. Establishing and maintaining team organisation refers to learners' ability to understand their role and teammates' roles and organise their team structure to the task. This includes adhering to their role, managing the organisation of the group, successfully navigating obstacles in communication and ensuring the problem is solved under optimal conditions.

Although there are different definitions of collaboration presented in the literature, similar components can be identified in each. For example, due to the nature of collaboration, the participation of each learner and their level of engagement with a task directly impacts on the effectiveness of the collaborative group as a whole. Some teamwork models align learner ability to take responsibility with their ability to lead (O'Neil et al., 2004), although collaboration does not require one learner to take sole responsibility or leadership for the task – there must be a distribution of responsibility.

Shared, or collective, responsibility refers to a situation in which the responsibility for the success of the group is distributed among all members, rather than being placed on one individual or leader (Scardamalia, 2002). By definition, collaboration includes the assumption of shared responsibility during collaborative work (Trilling & Fadel, 2009). If learners do not adopt shared responsibility they may disengage from the task, which is likely to impact the overall performance of the group (Hesse et al., 2015).

Initiating cognitive responsibility is critical in collaboration. Cognitive responsibility refers to learners taking responsibility for knowing what needs to be known and ensuring that others know what needs to be known (Scardamalia, 2002). Therefore, learners need to take responsibility for understanding the progress of the task and staying cognitively aware of tasks as they happen. Zhang et al. (2009) identified that collaboration results in more collective cognitive responsibility than group work. This suggests that the distribution of information encourages more collective contributions from learners. Jennings and Mamdani's (1992) findings suggest that for collaborators to take responsibility, there has to be identification of a common problem, recognition of the need for joint action and setting of common goals.

Studies have shown that learners' motivation to share responsibility for a task is impacted by whether:

- their contribution is valued (Williams et al., 1981)
- their shared task is aligned (Barron, 2000)
- they have access to resources (Avouris et al., 2003),
- reciprocal feedback is presented (Johnson & Johnson, 2003).

Therefore, learners' willingness to take shared responsibility for the task may depend on how successful the joint planning process was. Committing to shared responsibility can be influenced by learners' belief in their ability to achieve the goal, as an individual or as a group (Hollenbeck & Klein, 1987). In order to enhance shared responsibility, some researchers have informed the learners that the task provided to them, based on their ability, is achievable (Huber, 1985). Care et al. (2015) found that in online collaborative tasks, learners who were more collaborative tended to take more responsibility for their group and ensured that the tasks necessary for task success were completed by both themselves and their partner. This was assessed through learners reporting their tasks to others as they progressed through a task. Highly proficient learners reported specific information on their progress and tasks.

Communication in the group is an essential component of collaboration and involves learners sharing understanding and information with one another (Loxley, 1997). Communication could be interpreted as the foundation of many other subskills required for collaboration since learners will need to interact with one another in order to successfully coordinate in subsequent processes (Crowston et al., 2006). For example, listening effectively is a core competence highlighted in frameworks addressing collaborative skills (Mickan & Rodger, 2000; Stevens & Campion, 1994; Trilling & Fadel, 2009). Wilczenski et al. (2001) identified that learners who performed more facilitating communications such as drawing another person into the discussion, asking a clarifying question, or communicating a problem-solving strategy completed collaborative tasks with more effectively. The PISA collaboration framework specifically identifies purposeful communication with group members, regarding the actions to be performed. It highlights that learners should be communicating important information in order to establish common ground or shared understanding, which leading to successful communication (OECD, 2017). Clarifying the problem or task for others is a crucial element of regulating a group (O'Neil et al., 2004) and to do this someone needs to understand other group members' perspective of the task. Learners should identify whether others' understanding of the task requires clarification and provide this where necessary.

Communicating purposefully also includes sending important information about progress and prompting others to communicate and perform their own tasks (OECD, 2017). According to Hesse et al. (2015), the most proficient individuals are those who initiate communication and prompt others to respond. Those learners who are highly responsive to their partner are those who listen to their suggestions or contributions and follow through in implementing them (Care et al., 2015).

A fundamental component of collaboration is being able to recognise that others may have a different perspective. Gaining insight about that perspective can:

- have a positive impact on maintaining a shared understanding of a problem or task (Roschelle, 1992)
- allow roles and their respective responsibilities to be appropriately assigned among group members (OECD, 2017)
- lead to adjusting communication to suit the receiver (Clark & Murphy, 1982).

Horton and Gerrig's (2005) findings suggested that learners begin forming their understanding of others as they work towards 'common ground' or shared understanding and compare circumstances. Some research suggests that identifying that others have alternative perspectives, and as a result tailor communication appropriately, is an incredibly complex skill (Horton & Keysar, 1996; Jucks et al., 2007). However, there is research to support that learners can be scaffolded into this behaviour, finding that younger learners who wrote letters that included clear problem statements and explicit requests for help indicated good audience awareness (Fussell & Krauss, 1989; Kroll, 1984; Strange, 1988). The ability to adapt communication style for others is also based upon learner awareness of other's communication ability, style and needs (Hesse et al., 2015).

Once differing perspectives are identified they need to be managed. Manninen and Korva (2005) identified that differing perspectives was one of the major contributing factors to emergent conflicts, along with pressure from peers, poor management of resources, and excessive trialling. Deutsch (2003) suggests that learners can view conflict as a problem for collaborative progress and that this, if managed constructively, can increase productivity. Diversity can be a positive encounter when learners know how to harness it (van Knippenberg et al., 2004). Learners who have good social regulation and negotiation skills should be able to harness positivity and learning experiences from the diversity of the collaboration (Thompson et al., 2010). Teamwork frameworks have recognised that conflicts are not necessarily negative but may provide a learning opportunity to learners. Stevens and Campion (1994) suggested that learners should learn to recognise useful conflict and employ conflict resolution strategies when they are not useful. Learners may need to make necessary compromises to accomplish the common goal (Trilling & Fadel, 2009); resolution of conflict should lead to a positive atmosphere in the collaborative team (O'Neil et al., 2004).

5. ACER's collaboration framework

This ACER skill development framework describes collaboration within strands (core elements) that are then further qualified as aspects (sub-elements). A strand refers to the overarching conceptual category for framing the skills and knowledge addressed by collaboration assessments, while an aspect refers to the specific content category within a strand. Specifically, the ACER skill development framework for collaboration comprises three strands, with each strand containing three or four aspects as summarised in Figure 2 and described in the following sections. The aspects encompass the set of knowledge, skills and understanding held in common by the range of definitions of collaboration discussed previously.

Accordingly, ACER's definition is:

Collaboration refers to the capacity of an individual to contribute effectively in a group. This involves perseverance, contributing to team knowledge, valuing contributions of others and resolving differences. Effective collaboration involves a division of labour with participants who are engaged in active discourse that results in a compilation of their efforts.

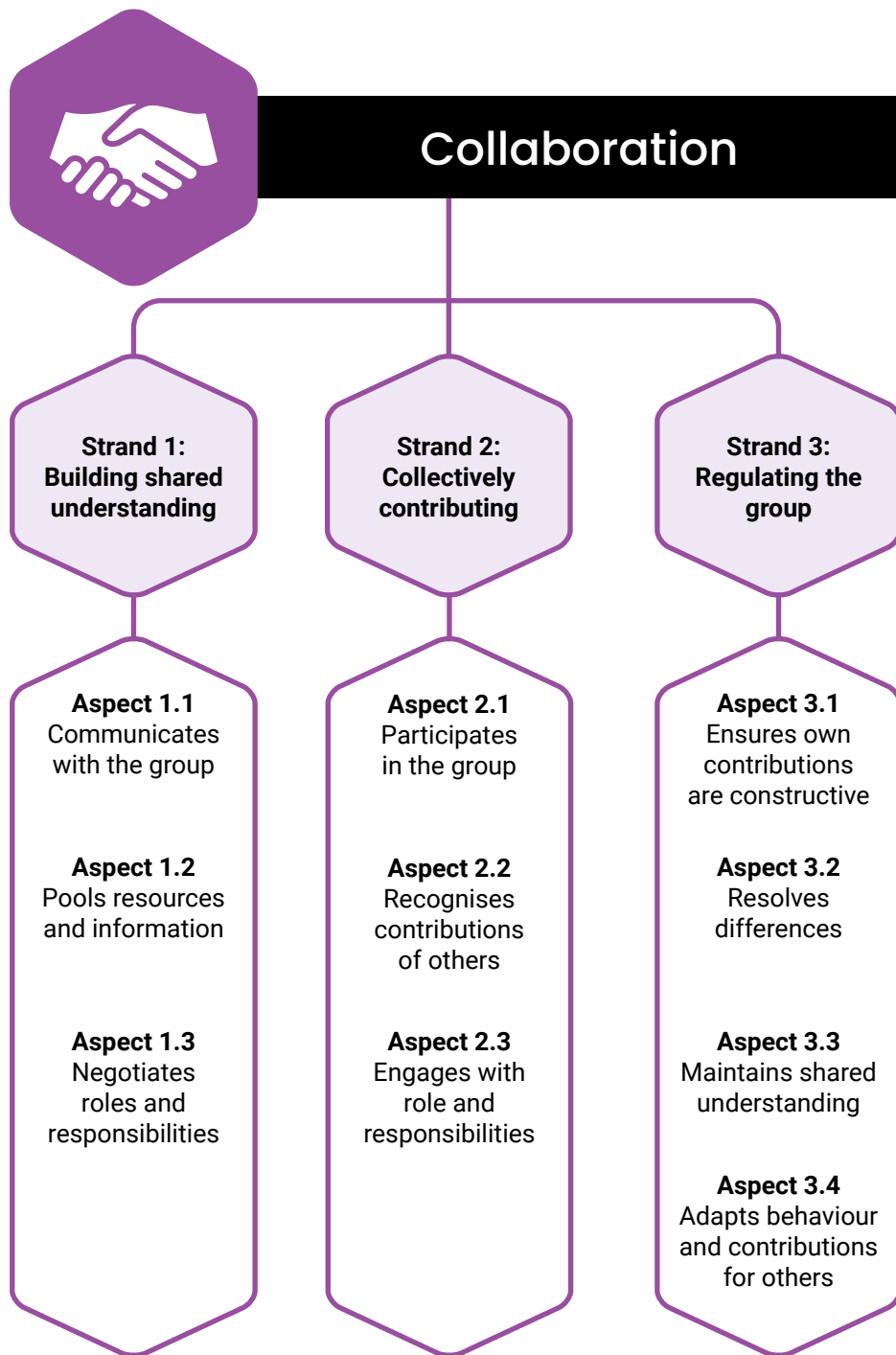


Figure 2 ACER's skill development framework for collaboration

Strand 1 Building shared understanding

Strand 1 relies on learners building a shared understanding of the goal or problem presented to them. This involves establishing a group dynamic. Learners engage with and explore the problem or goal in order to build an understanding of the task. Their actions with both the task and their role could guide their understanding of the importance of their own working with others. The ability to interact with others and recognise the importance of that interaction will also contribute to their success. Learners' understanding and awareness of others is likely to evolve as the collaborative relationship progresses. They will need to pool information from the task space and one another, and identify gaps in their understanding. They will then need to manage resources, send information to each other, request information, and integrate resources to build their mutual understanding and identify what is required to complete their task or task.

Aspect 1.1 Communicates with the group

Usually communication serves a specific purpose, for example, to exchange information or to convey attitudes and values. The purpose of communication in a collaborative context, then, is to reach a common goal through the building of shared understanding (Loxley, 1997). Learners may ask questions or for clarification, they may also respond to other requests or questions. Collaborators should communicate about the related task and respond efficiently to others (OECD, 2017). Proficient collaborators will also initiate communication with others and in some cases facilitate communication between others, identifying that good communication is necessary to build a shared understanding (Wilczenski et al., 2001). Communication in this sense is not about individual communication but the individual's communication to the group or group members. It is communication within the group for the benefit or goal of collaboration.

Aspect 1.2 Pools resources and information

In collaboration, learners need to recognise that they and other group members may not individually have all of the resources required and realise the importance of sharing resources throughout the task (Avouris et al., 2003). Resources refer to information, skills, knowledge, expertise, or tangible resources that each learner brings to, or is provided by, the task. When working in groups, learners who are engaged and active understand that interacting with their group will be beneficial. To this end, proficient collaborators pool their resources and information in order to generate a larger repository and build a shared understanding (Larson & Christensen, 1993). Learners are able to recognise and bring together different pieces of information and identify how to optimally use their pooled resources.

Aspect 1.3 Negotiates roles and responsibilities

Effective collaboration requires clearly defined roles and the appropriate division of responsibilities (Husting, 1996). Resources and information for a task need to be distributed between learners to encourage active participation from each group member. In order to build a shared understanding of the group task, a learner must realise that their participation is required and their contribution is essential. Proficient collaborators negotiate these roles and their associated responsibilities to ensure that there is the best match to the expertise, information, or skills held by the allocated group member. Group members can work together on finding ways that will help them achieve their common goal by making a plan to approach the task collectively through defined roles with associated responsibilities and (Zagal & Rick, 2006).

Collaboration requires shared responsibility for the task (Scardamalia, 2002). Those responsibilities need to be communicated back to the group as a whole so that joint execution of the plan can be maintained. If learners do not adopt shared responsibility learners may disengage from the task, which is likely to impact the group's overall performance.

Strand 2 Collectively contributing

Once a shared understanding of the group, task and roles has been established, each group member needs to contribute their agreed responsibilities to the group, and recognise the contributions of others, for sufficient collaboration to occur.

Aspect 2.1 Participates in the group

Participation in the group relates to the extent to which a learner is active during the collaborative task. Learners may participate when asked or in part of the task. Proficient collaborators will participate throughout the task, and see it through to the end goal or solution (DiCerbo, 2014). This focuses on the longevity and tenacity of the participation rather than the specific tasks they participate in (this is reflected in aspect 2.3). The extent to which a learner perseveres with the task can indicate their level of participation in the group. Proficient collaborators take multiple attempts at group tasks and try alternative strategies to reach the end goal even during difficult situations or problems (Scoular & Care, 2020).

Aspect 2.2 Recognises contributions of others

Understanding another person's perspective of the problem or task is a critical skill in maintaining a shared understanding throughout collaboration. Further, comprehending how another person's perspective can contribute to the greater good of the group is important for effective collaboration (Trilling & Fadel, 2009). Proficient collaborators acknowledge that others may have a different perspective, which may be beneficial to the group as a whole. Listening to, acknowledging, and comprehending others' perspectives can impact on individual behaviour leading to acceptance, rejection or incorporation of contributions (Horton & Gerrig, 2005).

Aspect 2.3 Engages with role and responsibilities

Effective collaboration requires clearly defined roles and responsibilities and appropriate allocation (as addressed in aspect 1.3). The actions learners take during a collaborative task is the foundation of successful collaboration and demonstrates the willingness and readiness to be involved in the group (Jennings & Mamdani, 1992). The extent to which each group member successfully carries out the responsibilities associated with their allocated role will relate to the overall success of the group as a whole. Proficient collaborators take responsibility for the actions determined by their role and understand the role of others in the task. Further, they will stick to the rules of engagement that the group has established, such as a shared strategy or plan, and monitor role engagement of others to ensure joint execution (OECD, 2017).

Strand 3 Regulating the group

Ongoing regulation of the group dynamic and of an individual's contribution to the group is important for effective collaborative working. Proficient collaborators will ensure their contributions are relevant and helpful to the task, as well as ensuring the shared understanding is maintained throughout. This may require checking in or reporting back to other group members, ensuring differences are resolved, and adapting behaviour and contributions to support others' roles, understanding or perspective for the greater good of the group.

Aspect 3.1 Ensures own contributions are constructive

In collaborative tasks, learners should work together by sharing information, knowledge and resources in order to make relevant contributions to group knowledge and outcomes. By ensuring the quality and relevance of their own contributions, learners can regulate how well they are contributing to the group, whether that be through monitoring the quality of their communication, actively participating, integrating others' ideas, or engaging with their responsibilities.

Reflecting on one's own contribution to the group can be a critical element in identifying ones' own strengths and weaknesses in relation to the progress of the group task (Flavell, 1976). Learners who are proficient in evaluating themselves and their progress may also be better placed to monitor and regulate the collaborative space (Ohland et al., 2012).

Aspect 3.2 Resolves differences

Effective collaboration is distinguished by the quality of interactions. The interaction between collaborators should influence thinking and test negotiation skills to maintain a common understanding. Discussing differences of opinion or perspective, and negotiating how to use these, may improve learning as it encourage learners to explain and justify their understanding, providing more depth to their knowledge and perspective.

The presence or absence of negotiation skills becomes apparent when conflicts arise among group members. When working collaboratively learners need to find effective ways of resolving any differences or conflicts that arise when trying to reach the common goal. Learners bringing different opinions to bear need to navigate the collaborative space but with careful consideration of the views of others. Optimal collaboration requires that learners negotiate debate and argue their views so that perspective can be transferred (OECD, 2017).

Learners working collaboratively present with varying expertise, knowledge and resources and learners who can regulate differences and conflict can fully exploit the benefits of diversity that their collaborators bring to the task (van Knippenberg et al., 2004). If conflicts do arise, skilled collaborators can address them efficiently by ensuring they are resolved. Learners developing this skill may be able to comment on differences but are unable to resolve them. Learners who have not yet developed this ability may not be aware of any differences or may choose to ignore them, leading to complications in communication and planning execution.

Aspect 3.3 Maintains shared understanding

Proficient collaborators understand the importance of maintaining a shared understanding throughout the task. By doing so they monitor group progress, request regular updates from group members, and provide updates on their own progress and reflections on the process. Learners' contributions to the task involves a commitment to following the rules of engagement which includes providing important information about progress and prompting others to communicate and perform their own responsibilities.

Given that these environments are complex and dynamic it is reasonable to expect that learners need to be adaptable and flexible in their effort to work together (Oser et al., 1999). Roles may need to be renegotiated to adjust for changes in the group dynamic, individual needs, or to improve effectiveness. Learners may need to adapt their approach to enable the group effort to succeed despite unexpected complications (Scardamalia, 2002).

Aspect 3.4 Adapts behaviour and contributions for others

Learners' understanding of their group members can facilitate better collaboration. They should be able to identify an appropriate style and level of complexity relevant to their group members and be able to adjust their communication, behaviour, and contributions to suit other group member's needs. For example, learners are unlikely to deliver the same information in the same manner to their classmates as they are to their teacher. Commonly referred to in the literature as receiver awareness, it is a valuable skill for coordinating mutual tasks (Dehler Zufferey et al., 2011).

Proficient collaborators tailor one's behaviours and contributions to suit others based on their interpretation of their understanding. Less proficient learners may require feedback from others or explicit requests before they modify their communication style or behaviour. Learners who do not have a good awareness of others may not take into consideration other learners' comprehension of the task and this could lead to misunderstandings, issues in planning and execution, and may develop conflicts (Scoular & Care, 2020). Learners can benefit from the collaboration when other learners support to fill gaps in their knowledge or understanding.

6. Skill development levels

ACER's perspective of skills in the application of knowledge centres on and emphasises the notion of growth. Skills can be defined from a growth perspective, can be improved through teaching and intervention, and can be measured.

Levels of skill development describe how growth in collaboration can be demonstrated, and how learners move from early, to more advanced application and understandings. The levels of skill development are not linked to specific years in schooling. Their intended use in assessment and pedagogy is underpinned by an understanding that learners of the same age and in the same year of school can be at very different points in their learning and development. When assessments provide information about where learners are in their understanding at the time of assessment, they also provide a basis for monitoring individual progress over time (Waters, 2018). Assessments of progress are an alternative to judging success only in terms of year-level standards.

While progress can be described in a general way – what a highly proficient collaborator demonstrates compared to a less proficient collaborator for example – the application of the skill is still dependent on the domain context. The level of application in one learning area will not necessarily transfer equally to another learning area.

The ACER skill development levels for each strand of collaboration are provided in Table 1. The levels of skill development support understanding of the skills and how they develop. They can also support educators to identify gaps in learning, where some learners may require further assistance. Learners at a low skill level often exhibit a passive approach to learning, relying heavily on external guidance and feedback high skill level. At a medium level they exhibit a more active approach to learning, taking greater responsibility for their progress and outcomes, while learners at a high skill level exhibit a proactive and reflective approach to learning, consistently striving for improvement and achieving high levels of learning success. To ensure an evidence-based approach, these levels are validated and corroborated through comparison with assessment data.

Table 1 Levels of skill development for collaboration

Skill level	Building shared understanding	Collectively contributing	Regulating the group
	<p>Aspect 1.1 Communicates with the group</p> <p>Aspect 1.2 Pools resources and information</p> <p>Aspect 1.3 Negotiates roles and responsibilities</p>	<p>Aspect 2.1 Participates in the group</p> <p>Aspect 2.2 Recognises contributions of others</p> <p>Aspect 2.3 Engages with role and responsibilities</p>	<p>Aspect 3.1 Ensures own contributions are constructive</p> <p>Aspect 3.2 Resolves differences</p> <p>Aspect 3.3 Maintains shared understanding</p> <p>Aspect 3.4 Adapts behaviour and contributions for others</p>
High		<p>Learners try alternative strategies to reach the end goal even during difficult situations or problems. (Aspect 2.1)</p> <p>Learners monitor role engagement to ensure execution of a shared strategy/plan to reach the common goal. (Aspect 2.3)</p>	<p>Learners share information, knowledge and resources in order to make relevant contributions to group knowledge and outcomes. They ensure the quality and relevance of their own contributions, regulating how well they are contributing to the group. They regulate the collaborative space to ensure group cohesion and reflect on constructiveness of group contributions. (Aspect 3.1)</p> <p>Learners resolve differences, explaining and justifying their understanding, leading to optimal collaboration. (Aspect 3.2)</p> <p>Learners continuously monitor group progress, requesting regular updates from group members, and provides updates on their own progress and reflections on the process. Learners are adaptable and flexible, renegotiating roles or strategy, and acting to repair shared understanding where necessary. (Aspect 3.3)</p> <p>Learners identify an appropriate behaviour and communication style and level of complexity relevant to their group members. (Aspect 3.4)</p>
Medium–High	<p>Learners facilitate and maintain relevant and effective communication within the group throughout the task. (Aspect 1.1)</p> <p>Learners pool and review/ explore all resources and information available to the group. (Aspect 1.2)</p> <p>Learners negotiate roles that best match the expertise, information, or skills held by group members. Learners utilise role allocations to propose strategy/plan to meet the common goal. (Aspect 1.3)</p>	<p>Learners participate throughout the task, and see it through to the end goal or solution. They make multiple attempts at group tasks. (Aspect 2.1)</p> <p>Learners take responsibility for the actions determined by their role and understand the role and benefit of others in the task. They encourage shared responsibility for the task. (Aspect 2.3)</p>	<p>Learners address conflicts by negotiating, debating, and arguing their views. (Aspect 3.2)</p> <p>Learners provide updates on their own progress and the progress of the group when asked to do so. They make suggestions to renegotiate roles or strategies where appropriate and identify flaws in shared understanding. (Aspect 3.3)</p> <p>Learners adapt their contributions for others and tailor their communication to suit other group member's needs. (Aspect 3.4)</p>

Skill level	Building shared understanding	Collectively contributing	Regulating the group
Medium	Learners ask for justification of responses or perspective provided. (Aspect 1.1)	Learners acknowledge that others may have a different perspective, and that based on these perspectives', others' contributions may be beneficial to the group as a whole. They understand and incorporate the contributions of others into their own work. (Aspect 2.2)	<p>Learners identify own strengths and weaknesses in relation to the progress of the group task as whole. (Aspect 3.1)</p> <p>Learners make constructive but unsuccessful attempts to resolve differences. (Aspect 3.2)</p> <p>Learners act to maintain shared understanding such as by reiterating or finalising goals, strategy, and roles in more complex tasks. (Aspect 3.3)</p> <p>Learners require feedback from others or explicit requests before they modify or tailor their communication style or behaviour. (Aspect 3.4)</p>
Low–Medium	<p>Learners ask questions or seek clarification from others. They will communicate about the related task and respond to contributions of others. (Aspect 1.1)</p> <p>Learners identify that they may not have all of the information required and pool some resources and information with others. (Aspect 1.2)</p> <p>Learners negotiate roles but without considering the expertise, information, or skills held by other group members. (Aspect 1.3)</p>	<p>Learners participate in all necessary tasks throughout the task. Learners maintain a single strategy throughout. Learners collaborate successfully to achieve a straight forward goal. (Aspect 2.1)</p> <p>Learners understand that others may have an alternative perspective. They listen to and acknowledge the perspective of others. (Aspect 2.2)</p> <p>Learners show a willingness and readiness to be involved in the group. They take responsibility for some of the actions determined by their role and provide feedback on their individual tasks. (Aspect 2.3)</p>	<p>Learners reflect on quality and relevance of their own contributions. (Aspect 3.1)</p> <p>Learners discuss differences of opinion or perspective with others and give careful consideration of the views of others. They comment on differences but are often unable to resolve them. (Aspect 3.2)</p> <p>Learners act to maintain shared understanding through reiterating goals, strategy, and roles in basic tasks. (Aspect 3.3)</p>
Low	<p>Learners' communication is limited to responding to others' requests or questions. (Aspect 1.1)</p> <p>Learners share their resources or information with others when asked. (Aspect 1.2)</p> <p>Learners accept role and associated responsibilities provided to them. (Aspect 1.3)</p>	<p>Learners take action in the task but may not reach the end of the whole task. (Aspect 2.1)</p> <p>Learners acknowledge the role of others in the task. (Aspect 2.2)</p> <p>Learners fulfil responsibilities associated with their role, such as following simple explicit instructions. (Aspect 2.3)</p>	Learners can identify their own contributions. (Aspect 3.1)

7. References

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