ABCDE: An Action-Oriented Framework for Collaborative Activities

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Abstract: Although group work is a common classroom practice, understanding how students collaborate during these activities remains complex. In this paper, we introduce the ABCDE framework, which outlines five essential actions learners can take—and teachers can encourage—to foster an inclusive environment for sharing ideas and deepening understanding. Specifically, A represents agreeing, B represents building on ideas, C represents chatting, D represents differing perspectives, and E represents eliciting responses or actions. We demonstrate the framework's application in two distinct scenarios: one with high schoolers participating in a data science activity, and the other with adults involved in a team-building survival exercise. The framework successfully revealed distinct interaction patterns in these activities.

Introduction

Educators across multiple disciplines have recognized the importance of group work and collaboration. Some see collaboration as part of 21st century skills (Geisinger, 2016; Thornhill-Miller et al., 2023), while others deem it as a durable human skill essential for the digital economy (JWEL Workforce Learning, n.d.; Ouellette et al., 2020). Learning sciences has also long recognized its importance (Kirschner, 2002). Collaboration is essential from multiple perspectives; students have the potential of learning the academic content more deeply and constructively in collaborative settings (Roschelle & Teasley, 1995; Teasley et al., 2008), and students can develop collaboration skills that can be transferable to other future environments and settings.

Given the benefits collaboration can have on student learning, there is a need for readily accessible frameworks to help educators and researchers conceptualize and measure how students converse with one another in collaborative learning situations such as small group discussions. Many coding schemes may be particularly specific to the discipline under investigation (e.g., Nguyen, 2021 for science discussions), while others may be focused on theory building or applied to a group level (e.g., Grau et al., 2018).

In this paper, we introduce and propose the practical ABCDE framework, which highlights essential *actions* students can take in a small group discussion that will promote deeper thinking and collaboration. We highlight and review evidence supporting the various components and connecting them to collaboration. We also illustrate the framework in action by applying it to two different collaborative contexts.

A is for Agreeing

In this framework, we define agreement as any utterance that explicitly expresses concurrence with another speaker in the team. While acknowledging a group member's statement can indicate attentiveness, we distinguish between acknowledgement and true agreement following the work of Ogata (1999).

Agreement is essential in group work for two main reasons: effective decision-making and group cohesion. First, consensus enables groups to make and implement decisions that propel them forward, while at least some level of agreement or acceptance is needed to avoid stagnation (Boje & Murnighan, 1982). Second, agreement fosters group cohesion and a positive team spirit, essential elements for meaningful collaboration. Given that humans are inherently social beings, with an evolutionary predisposition toward sociality and collaboration, agreement is not only a practical mechanism but also a reflection of deeper psychological tendencies (Tomasello, 2014). Even infants show a tendency to re-engage in collaborative tasks when a partner disengages, demonstrating that cooperation has deep evolutionary roots (Warneken et al., 2006).

Throughout human development, maintaining group cohesiveness remains critical for effective social interactions. Various consensus-building exercises show how structured agreement can lead to stronger trust, improved decision quality, and alignment on shared goals (Johnson & Johnson, 1991). High levels of agreement in group discussions increase participant satisfaction and support constructive rethinking of ideas, underscoring agreement's positive effects on group collaboration (Stromer-Galley & Muhlberger, 2009). In essence, agreement in groups builds affinity and signals common ground, supporting our innate desire for connection (Brown &

Levinson, 1987; Tomasello, 2014). Ultimately, by promoting a cooperative atmosphere, agreement serves both as a social glue and as a foundation for progress in small group discussions.

B is for Building On

In small group discussions, we refer to "building on" as the process of extending a peer's contribution by adding new information, providing more evidence, or offering further explanation to co-construct knowledge. This practice, also known as "elaboration," is critical for deep learning. Research in educational science has consistently highlighted how this collaborative elaboration allows participants to co-construct knowledge, especially in classroom and team settings. For instance, Nguyen (2022) demonstrates that high school students involved in group discussions with conversational agents tend to build on prior ideas through claim-making and reasoning, leading to enhanced learning outcomes. Similarly, Paulus et al. (2018) emphasize the importance of collaborative ideation, explaining how cognitive elaboration among group members stimulates creativity, particularly in diverse teams. The ability to extend a peer's contribution through active listening, as seen in these studies, underscores why "building on" is essential for successful group work.

Furthermore, building on others' contributions is more than a cognitive exercise—it fosters a sense of respect and strengthens group bonds. As Chuene et al. (2023) discuss, exploratory talk consisting of active listening and elaboration in group settings encourages students to critically engage with each other's ideas, refining their understanding of complex concepts. Barker (2015) adds that elaboration helps students respond meaningfully to their peers' contributions, extending discussions and deepening their understanding. Together, these studies suggest that critically engaging with other members' ideas is essential for generating better ideas and may foster a collaborative learning environment where all members' contributions are recognized and valued. By incorporating these findings into educational settings, both the learning process and group dynamics are enriched, showcasing the multifaceted importance of building on others' ideas.

C is for Chatting

Chatting is defined here as the social interactions and informal conversations that occur during small group discussions. Although these social chats may initially appear off-task to teachers, students frequently alternate between socially oriented and academically or cognitively focused conversations in group work (Bennett & Dunne, 1991; Osuna & Munson, 2024). Social interactions are a fundamental component of collaborative tasks, as they support group dynamics and facilitate smoother teamwork (Bennett & Dunne, 1991; Osuna & Munson, 2024). Decades of research in organizational settings underscore the importance of affect-based trust for effective collaboration, with this trust often built on informal, social exchanges and activities (Chowdhury, 2005; Gill et al., 2024; McAllister, 1995; Schaubroeck et al., 2011).

In classroom settings, fostering collaborative work—particularly in computer-supported collaborative learning—requires attention to social interactions. Kreijns et al. (2003) argued that teachers should not take social interaction for granted or restrict it solely to cognitive exchanges. For students to collaborate effectively, they must feel comfortable sharing potentially critiqued ideas; thus, they must first establish trust and a sense of belonging within the group (Kreijns et al., 2003; Rourke, 2000). If teachers overlook the role of non-cognitive interactions and limit social exchanges or community-building efforts, they risk undermining the effectiveness of collaborative learning (Kreijns et al., 2003).

D is for Differing Perspectives

Though it may seem antithetical to Agreement, offering different perspectives in group collaboration is equally important and necessary for overall group success. Despite its importance, sharing different perspectives and building the social capacity to do so may be more challenging for group members because it requires overcoming the concurrence seeking, the tendency for people to avoid disagreements and emphasize agreeableness in interpersonal communication (Johnson & Johnson, 1991; Smith et al., 1981). Even still, it is important to develop and have this capacity for disagreement because decades of research have shown how groupthink, or the deterioration of mental efficiency, reality testing, and moral judgments due to group pressures, can result in limited ideas and, in worse case, dangerous outcomes from group decisions (Janis, 2008). For instance, the Cuban Missile Crisis, which catalyzed the research that coined groupthink, demonstrates the perils of this phenomenon on group decision making. In this instance, a group of political experts and advisors ignored and tempered their dissenting opinions about a group decision and succumbed to social cohesion and conformity. As a result, lives were lost. This crisis was characteristic of groupthink, in which members of a decision-making group avoided being too harsh in their judgment of others' ideas, avoided conflict, and prioritized concurrence or agreement (Janis, 2008).

Research has continuously explored the role of groupthink in many global crises, political disasters, and business decisions (Sims, 1992).

Given the importance of sharing different perspectives in groups, empirical research on team work and small group discussions has also indicated the facilitative nature of doing so. Disagreement in groups, and specifically in education settings, has been shown to increase discourse which enhances group members' understanding of topics and overall learning (Chen, 2020) as well as member acceptance and sense of support (Johnson & Johnson, 1991; Smith et al., 1981). However, too much disagreement can be associated with decreased group performance and satisfaction (De Dreu & Weingart, 2003). The research on group collaboration makes it clear that a balance between both agreement and disagreement may be essential for teams to support strong decision-making while maintaining group cohesion.

E is for Eliciting Responses

The A, B, and D components of the framework largely respond to others' ideas, whereas the E component actively encourages team members to solicit each other's opinions, a process shown to foster meaningful discourse, critical thinking, and equity in group interactions. Eliciting responses through direct or subtle questioning enhances cognitive processing and brings diverse perspectives to light, as illustrated by Chin & Osborne (2010), who show that questioning promotes co-construction of knowledge. In online learning, Choi et al. (2005) found that varied questions (clarifications, counter-arguments) prompt meaningful peer interactions, reflection, and knowledge revision.

Various strategies can be used to elicit responses, promoting inclusive engagement, meaningful interaction, and the constructive exchange of ideas. For example, structured prompts play a crucial role in fostering high-level discourse (Xun & Land, 2004). Reciprocal questioning, demonstrated in King's (1990) research, encourages responses that delve deeper than superficial levels. Additionally, Tsan et al. (2018) underscore that effective elicitation involves not only requesting responses but also actively acknowledging and discussing them, creating a collaborative dialogue where ideas are critiqued and evaluated. Through this process, members build shared understanding by critically engaging with diverse perspectives. Finally, strategies for promoting equitable group work call for students to actively ask each other questions to ensure everyone's thoughts and questions are heard, that differing perspectives are explored, that the group's work is summarized by identifying connections and checking for consensus, and that efforts are made to help the team move forward collaboratively (Stoeckel & O'Shea, 2024).

Thus, "E" represents more than simply asking for opinions; by asking questions or directly involving others, it fosters an inclusive environment where members feel valued, and where dialogue helps to navigate different perspectives toward a shared understanding.

Small Group Collaboration Analysis: Exemplars

To demonstrate the ABCDE Framework and its versatility, we applied the framework to different small group discussion scenarios.

Collaboration contexts

The first scenario draws from a small group activity during a 5-day data science workshop with high school students. We have obtained parental consent and student assent for this IRB approved study. In this particular activity, three students (two female students in 11th grade and one male 10th grader) engaged in group work alongside an AI agent named Oscar to construct boxplots from data collected from workshop participants.

The second example applies the analytic/coding framework to a team consensus building exercise with two adults and one AI-powered conversational agent named Red Morgan. Their task was to rank a list of items to salvage in a sinking ship scenario (see Johnson & Johnson (1991) for team-building survival scenarios). Although this study was IRB-exempt, we still obtained consents from all participants. The group conversations for both studies were recorded, transcribed, and cleaned for analysis.

Coding and reliability

An initial codebook for ABCDE was developed, where codes are to be applied to each line on the transcript. A line is defined by an utterance by a speaker before another participant spoke. Consequently, some lines–by more verbose speakers–may be much longer than other lines. The data science workshop activity transcript contained 176 lines, and the survival scenario transcript had 82 lines.

After three researchers independently applied the codes to 25% of the transcripts from the data science workshop, we refined the codes using the social moderation process (Shaffer, 2017). Using the refined codebook,

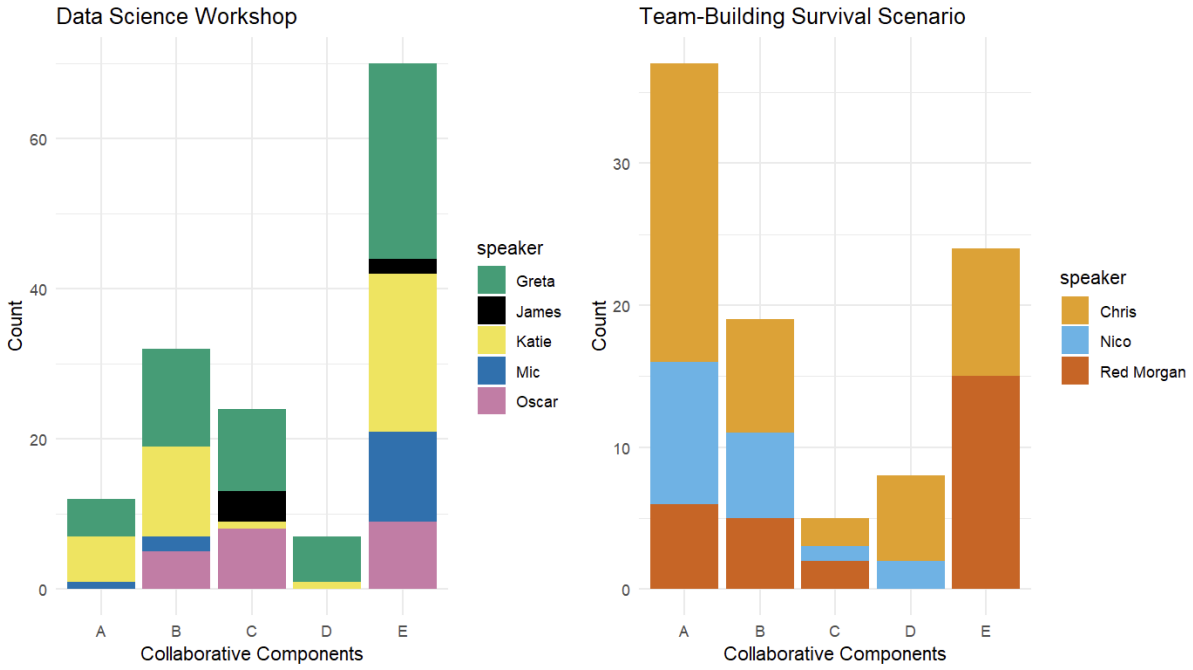
the primary coder proceeded to independently code through the remaining transcripts from the afore-described scenarios. The remaining two researchers acted as the reliability coders. One coded another 44 lines (25%) of the data science transcript, and another coded the survival scenario transcripts. For the data science scenario, the interrater reliability was acceptable for components A (kappa = 0.78), C (kappa = 0.86), D (kappa = 0.88), and E (kappa = 0.81). The kappa for B was not acceptable in this round, so the researchers engaged in additional discussion and clarifications of the code. The reliability coder then proceeded to code through the rest of the transcript for this component, achieving acceptable reliability at last, kappa = 0.78. For the survival scenario, reliability was excellent (kappa > 0.90) for all components except C, where the kappa indicates acceptable agreement at 0.74.

Findings and Discussion

For the coded utterances in the data science high schooler conversation, the breakdown of the types of talks is 12 (8.3% of identified codes) A, 32 (22.1% of identified codes) B, 24 (16.6% of identified codes) C, 7 (4.8% of identified codes) D, and 70 (48.3% of identified codes) E. In contrast, the breakdown of the ABCDE talk is 37 (39.8% of identified codes) A, 19 (20.4% of identified codes) B, 5 (5.4% of identified codes) C, 8 (8.6% of identified codes) D, and 24 (25.8% of identified codes) E. See Figure 1 for the breakdown by speakers in the two scenarios. As Figure 1 illustrates (1), the most prevalent collaborative component in the data science workshop was E for Elicit. In contrast, while the participants in the team-building survival exercise also elicited each other's' opinions and asked questions, the most dominant component was "A" for agree.

Figure 1

Breakdown of Collaborative Components by Speaker and Scenarios



Note that the graphs present raw frequencies, and the y-axes for the two graphs are set to different scales due to the differing total number of utterances in the two scenarios. Despite this, bar charts effectively illustrate the prevalence of various components within each scenario. To accommodate space constraints, we have chosen to display the graphs side by side.

What was also of interest is that disagreement appeared almost half as frequently in the high school data science group than it did in the survival scenario (4.8% vs. 8.6%), and the students had proportionally three times more social interactions (as exemplified in the 16.6% C code) as the adults did in the survival scenario.

Discussion – Data Science Workshop

The differences revealed by the framework can be due to the nature of the activities as well as the norm in the social groups. In the data science workshop, the students hardly knew each other and were tasked with creating a

boxplot. Consequently, there was a lot of uncertainty, with many speakers seeking confirmation from other members or asking clarifications. For example, Katie (2) asked "So Q1 would be equals median of uh. B2 to and then median is. 32. 16. 15. Uh B15. Right?" Confirmation such as Katie's "right?" was a common occurrence in the data science group. Additionally, because the group was collaborating on making a graph together, they had to coordinate their actions, as demonstrated in the following exchange:

Greta	What are you doing?
Katie	I'm trying to get the comma out.
Greta	You do the colon.

The action of each member may not be immediately visible in the online Google sheet format. Consequently, we see Greta asking Katie what she is doing (coded as an "E" for eliciting) and then prompting Katie to take further action (also coded as an "E" for eliciting) to keep the task moving forward.

Potentially because the group members did not know each other, we also observed them making small social talks:

James	What grade are you in?
Greta	We're both juniors.
James	Oh, okay.
Greta	What are you.
James	I'm a sophomore.

The simple exchange allows students to get to know each other more. Through these social exchanges, Greta shared that she had taken AP statistics, allowing her to engage in what Bennett and Dunne (1991) describe as a "social negotiation" of authority.

Discussion – Survival Scenario

In the sinking boat survival scenario, the task is to build consensus on the rank order of the items. The following excerpt illustrates not only how the group members built consensus with one another (coded "A" for agree) but also how they built on each other's ideas by offering more insights and explanations.

Chris	. . .So what I think my next highest one was actually the mirror Because—
Nico	Yes
Chris	Oh, nice. Okay
Nico	Yeah, I don't know. I miss. I missed that. But yeah, the mirror is also very helpful <unintelligible> like to flag down ships--
Chris	Right
Nico	--like a makeshift player in the middle of the night
Chris	Exactly. That's yeah. Cause we can get their attention.
Nico	Yes
Chris	with the reflection.
Red Morgan	The shaving mirror is indeed a smart choice. . .

In this consensus building exercise, reaching agreement is the ultimate goal. The prevalence of the "A" code is therefore expected. In fact, it supports the credibility of the framework by demonstrating that it effectively captures the intended collaborative behaviors.

General Discussion, Limitations, and Concluding Remarks

Through the exemplars, we aim to demonstrate how the framework can identify and encourage various collaborative actions that learners can take in small group activities. Because actions such as Agree, Building on ideas, Chatting, offering Differing perspectives, and Eliciting responses are observable, the framework can also help teachers emphasize skills essential for effective group collaboration.

The ABCDE framework is intended as a guideline for researchers and practitioners to think about group collaboration, though it is not without limitations. For example, in coding for "Agree," we focused on true agreement and omitted ambiguous acknowledgments such as "yeah," which might merely signal attentiveness, and cases of "acceptance" without clear agreement (Kahai & Cooper, 1999). The "Building on" code proved the most challenging in terms of establishing inter-rater reliability, due in part to distinctions in the literature between

"building on self" and "building on others" (e.g., Nguyen, 2021). Here, we prioritize "building on others" to capture how individuals actively listen to and extend their peers' ideas, rather than focusing on dominant learners who may simply build on their own ideas. Furthermore, while we highlight "Chatting" as critical for establishing belonging and group norms, especially early on when students are unfamiliar with one another, excessive off-task chat can impede learning progress. Additional work needs to be conducted to find the optimal level of social chats. We recognize that how we operationalized the framework may not be applicable to all researchers. Researchers may thus choose to adapt these elements based on their own focal areas, allowing for varied interpretations and applications (in the spirit of *D*iffering opinions and perspectives).

Even though the emphasis on the active utterances may impart the impression that the framework disregards silent periods or participation, we acknowledge that silent periods in group work can be valuable, offering students time to reflect and process information and may be the preferred mode for those who may be less confident in their skills (Remedios et al., 2008). In our data science exemplar scenario, James could be considered the silent participant. However, this did not mean that he was offloading the tasks to others or not paying attention. Indeed, James tried to get to know the other two members better and even volunteered to present for the group. We caution that the absence of something (in this case, utterances) does not always indicate that the student is not trying to learn or contribute to the group work.

In addition to the importance of silent participation, we also note a limitation on our exemplar: the absence of defined learning outcomes for the two groups. While it may be of interest to see how the patterns from the five collaborative components may relate to group performance on the tasks, we were more interested in the process of achieving the task rather than if the groups managed to finish the task or how well they did. Future work should examine how the different collaborative components may relate to learning outcomes for both the group and individuals.

Finally, we acknowledge that the presence of a conversational AI agent in both of our data sources (Oscar in the Data Science workshop and Red Morgan in the Survival Scenario) may be unconventional. Although it is uncertain whether the AI agent influenced the group collaboration patterns, its presence did not affect the development of the ABCDE framework itself. Future research should examine whether interaction patterns differ in the presence or absence of an AI agent to better understand the potential impacts of conversational agents on collaborative dynamics.

Ultimately, we believe the ABCDE framework provides a practical lens through which researchers and practitioners can observe and promote effective and inclusive collaborative behaviors.

Endnotes

(1) Graphs are generated using R version 4.4.1 "Race for Your Life." We used the ggplot2 and patchwork packages as well as the Obake-Ito color palette that are suitable for individuals with color vision deficiency.

(2) All names presented in this paper are pseudonyms.

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