

Facilitation practices of learning assistants in synchronous hybrid college courses

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Abstract

Learning environments are vastly different across in-person and remote instruction. In undergraduate STEM courses, learning assistants (LAs) have been working in both settings, however, little is known about how the affordances and constraints of each setting influence LA facilitation practices in small group interactions. Thus, in our study, we explore the ways different contextual factors act as drivers of LA actions in both contexts of a hybrid course, and how these LA actions influence student in-the-moment learning. To do so, we recorded LA-student interactions and conducted interviews with the professor and LAs of a hybrid general chemistry course. We used a sociocultural perspective to provide an explanatory account for the drivers of action on LA facilitation practices and student learning, which revealed the following: When LA purposes/goals and social context were the same, but the conditions and means by which they could enact these purposes/goals were different between the in-person and remote conditions, LAs took different actions in each setting resulting in differences with respect to student in-the-moment learning. With our examples, we present evidence that there are multiple conditional factors that drive LA actions during LA-student interactions. Implications for theory and reform of practice will be discussed.

Problem. Unprecedented disruptions in our world have led to drastic and sudden changes in how science education is implemented and created new challenges to provide students with equitable learning environments. At the onset of the COVID-19 pandemic, universities and institutions across the globe were forced to adapt to emergency remote instruction, which exemplified the inequities present in higher education (Hodges et al., 2020). In the time that has followed, many universities have brought students back to campus and have implemented synchronous hybrid learning (SHL), which can be defined as learning that occurs face to face and remotely (e.g., on Zoom) simultaneously (Bülow, 2022; Raes et al., 2019). This method of instruction has been shown to offer more equitable access to students, including those who are constrained due to geographical location or personal matters (Bower et al., 2015; Cunningham, 2014). While SHL environments offer more equitable access to a more diverse body of students, they also provide different learning conditions to students who attend in-person versus students who attend remotely, and this requires instructors to adjust to those conditions, further emphasizing the need for continuous reform of practice (Bower et al., 2015; Bülow, 2022; Cunningham, 2014; Park & Bonk, 2007). For interactive college STEM lecture courses, these adjustments do not only pertain to the professor who is teaching the class, but to the entire instructional team, including near-peer instructors such as learning assistants. Learning assistants (LAs) are advanced undergraduate students who help facilitate discussions between students in small groups during active learning (Otero et al., 2010). While implementing LAs in in-person classes generally leads to increased student learning outcomes (Barrasso & Spiliotis, 2021), especially for marginalized students (Van Dusen & Nissen, 2020), it was challenging to adopt the LA model for emergency remote instruction (Emenike et al., 2020; Hite et al., 2021; Martin & Davidyan, 2021). Concurrently, LAs productively supporting hybrid courses provides another challenge that has not been explored in depth.

While studies in hybrid settings have shown how the different contexts and technological tools are perceived to impact student learning by instructors and students (Prieß-Buchheit, 2020; Raes et al., 2019), and that LAs can help with technological concerns, assist in course adaptation, and foster connections between students and the instructional team in remote settings (Emenike et al., 2020), not much is known about how the affordances and constraints of in-person versus remote conditions in SHL actually impact the

ways LAs facilitate student learning. Thus, in our study, we use LA-student interaction data and interviews with LAs and professors to explore the ways different contextual factors act as drivers of LA actions in both contexts of a hybrid course, and how these LA actions influence student in-the-moment learning.

Theoretical Framing. To achieve this goal, our study was guided by sociocultural theory (Vygotsky, 1978), specifically cultural historical activity theory (CHAT) (Engeström, 1999) in combination with two other frameworks that were used to guide specific analysis of components within the overall activity system.

Inspired by Kaptelinin's (2005) activity theoretical conceptualization, where the influence of motives on a subject's activity is understood as being further driven by the social context and the conditions and means, we conceptualized that the influence of LAs' purposes/goals on LAs' actions is further driven by the social context and the conditions and means (Fig. 1). Further aspects of Engeström's (2001) third generation CHAT allowed us to understand specific aspects of the social context as experienced by the instructor and the LAs, i.e., the rules (principles

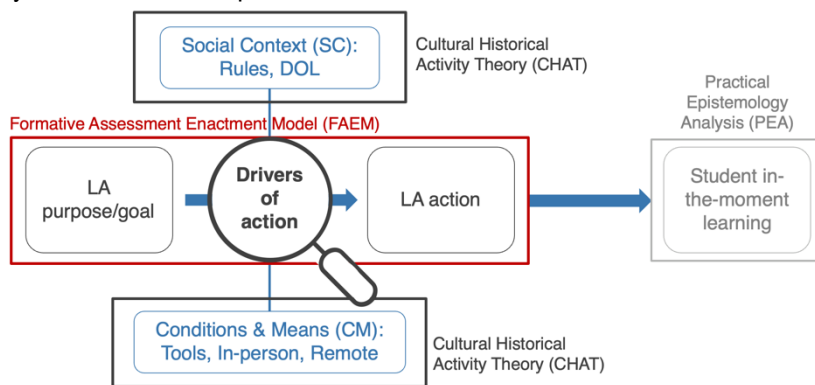


Figure 1. Flow chart demonstrating our theoretical framing through the combination of different frameworks. Adapted and extended from Kaptelinin (2005). (DOL = division of labor).

and agreements that govern how things may occur in an activity) and the division of labor (DOL) (different roles and distribution of authority in an activity). The conditions we compared in our study were in-person versus remote and CHAT provided a frame to capture the means as the different tools present within each condition that subjects use to obtain their goals (Fig. 1).

The two additional frameworks used were the Formative Assessment Enactment Model (FAEM) and Practical Epistemology Analysis (PEA). FAEM is based on the assumption that instructors actions are driven by their purposes/goals (Dini et al., 2020) and has been adapted for the LA context (Carlos et al., 2023), thus it was a suitable framework to layer on top of the activity-theoretical conceptualization. It then allowed us to characterize the actions the LAs take more specifically as either narrowing and directing or opening and responding. Narrowing and directing actions can be explaining, guiding students towards the correct answer, or checking for correctness. Opening and responding actions can be clarifying, prompting for elaboration, or giving students the space to think through their ideas further (Dini et al., 2020).

To further conceptualize how LA actions affected student in-the-moment learning, we extended the scheme adopted from Kaptelinin (2005) (Fig. 1) to include this feature. We then framed student in-the-moment learning through PEA, which conceptualizes learning as "how meaning changes through discourse" (Wickman & Östman, 2002, p. 601). PEA observes learning through a dialectic pair of opening/noticing gaps and filling gaps, where a gap is a need to make something intelligible in order to progress in an activity, and this need can be expressed explicitly by asking a question or implicitly by being filled. Gaps do not represent conceptual gaps in knowledge, rather, they are based upon what students feel they need to make intelligible in order to move forward (Wickman, 2004). PEA informed both how in-the-moment learning progressed and the ways in which LAs and students contributed to this, specifically through its ability to track who is opening/noticing and filling gaps (Walsh, 2022).

Design of Study. Data for this case study (Yin, 2013) was collected as a part of a larger project focused on the facilitation practices of LAs. The course used for our analysis was an LA-supported, synchronous hybrid, general chemistry 1 course at a public, highly diverse university in the Northeast, USA. For three lectures, LAs (who chose self-selected codenames, LA Ghost and LA Orange) video recorded their interactions with

students. During each lecture, LAs had 3-4 interactions with groups of students, and the two LAs would rotate between in-person facilitation in one lecture and remote facilitation in the next lecture. Following each recorded lecture, retrospective semi-structured interviews were conducted with LAs and instructors. Interview protocol questions were generally informed by the three frameworks of this study. Follow-up questions were asked specifically when participants mentioned in-person or remote factors, and participants were asked to reflect explicitly on the two contexts during their final interview. All interaction and interview data were transcribed for analysis.

To achieve our research goal, we triangulated the different data sources (Fig. 2). To learn about the LAs' purposes/goals and their actions, interaction videos and LA interview data were the primary data source.

To gather information about the social context, conditions, and means, instructor and LA interviews were the primary data source, and interaction data were used as a secondary source to identify additional information not explicitly addressed in the interview. To capture student-in-the moment learning, interaction video data were analyzed.

Analysis and Findings. To answer the research question of

how drivers of action in a hybrid setting influence LA actions and student in-the-moment learning, we first analyzed the data with the three frameworks that guided this study separately, and then moved to triangulation. Guided by CHAT, transcripts of both professor and LA interviews were coded for rules, DOL, tools, and in-person vs. remote conditions. Guided by FAEM and alternating between LA-student interaction recordings and LA interviews, we wrote holistic narratives that described how LA purposes/goals were connected to the specific actions they took. While we described the actions LAs took very specifically in these narratives, we further coded them as either more narrowing and directing or more opening and responding. Guided by PEA, transcripts of interactions were analyzed for how in-the-moment learning progressed throughout interactions. We identified which gaps were noticed, how these gaps were filled, and who was responsible for noticing and filling the gaps. To assure reliability, all analyses were performed by two coders, who discussed their coding until 100% consensus was reached.

Comparing and contrasting (Saldaña, 2012) between the two different LAs and their purposes and actions in in-person vs. remote conditions, two starting points for combining the analyses emerged: (1) Some contextual factors seemed salient for both LAs when they compared the in-person and remote conditions. Two of these contextual factors that alluded to the two examples provided in the findings below were the time constraint for LA-student interactions that occurred when the professor transitioned from small group to whole class discussions and the visibility of student work, or the lack thereof. (2) Both LAs had very similar purposes/goals and both employed mainly narrowing and directing actions, meanwhile, there were explicit differences in how they enacted these moves specifically. Going back and forth between all data sources (Fig. 2) and all separate analyses, we then constructed schemes guided by our theoretical conceptualization (Fig. 1) that provided an explanatory account for LA actions and student in-the-moment learning centered around the salient points described above in (1) and (2). This analysis revealed the following finding: When LA purposes/goals and social context were the same, but the conditions and means by which they could enact these purposes/goals were different between the in-person and remote conditions, LAs took different

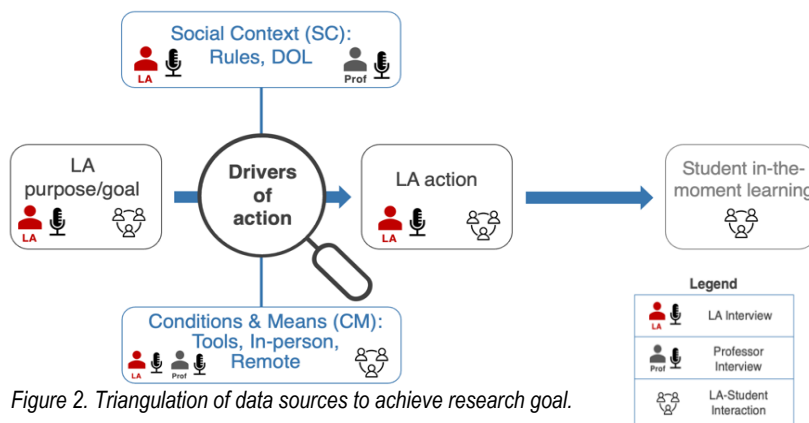


Figure 2. Triangulation of data sources to achieve research goal.

actions in each setting resulting in differences with respect to student in-the-moment learning. In what follows, we will outline two examples of how this finding manifested in the data.

In the first example (Fig. 3), both LAs' purpose/goal was to make sure students knew how to solve the problem before they finished the small group discussion. This purpose was related to the time and the transition between small group and whole class discussion because the LAs' goal

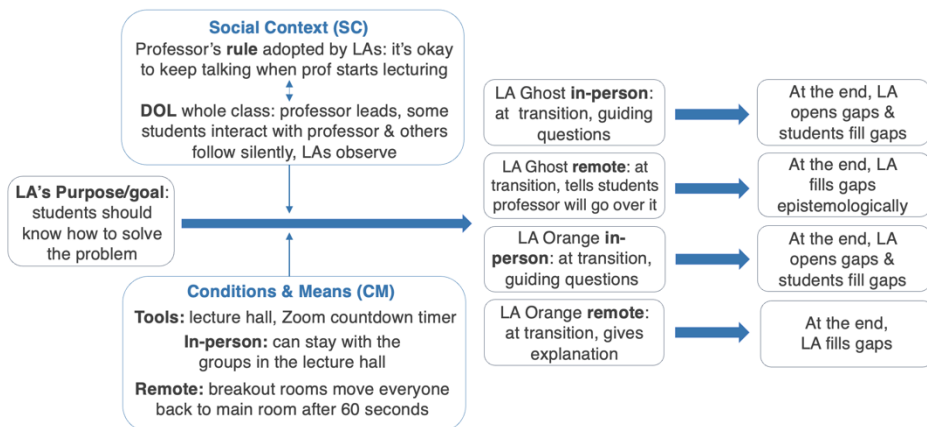


Figure 3. Flow chart showing drivers that led to different LA actions and student in-the-moment learning during the transition of small group to whole class discussions. (DOL=division of labor)

was to accomplish this before the small group discussions were over. In relation to the transition between small group and whole class discussion, and the LAs' ability to achieve their goal, a contradicting rule and division of labor were experienced by the instructor and the LAs. The professor had a rule, which was adopted by the LAs, that it was completely acceptable for the LAs to continue discussing with student groups even when the lecture started again. However, the LAs also expressed the traditional DOL that while the professor is leading, students are mostly listening with a few participating, and LAs are observing silently. While this rule and traditional DOL existed in tension with one another, differing means in the in-person vs. remote condition determined whether the rule or the traditional DOL was more influential in driving LA actions. LAs described the differences between the tools at their disposal, stating that the in-person setting (the lecture hall) allowed for them to physically remain with students once the professor brought students back to the whole class discussion. Whereas in the remote setting (Zoom breakout room), once the professor decided to bring students back, the 60 second timer would appear and LAs would have no choice but to switch to the main Zoom room once the timer ran out. The different affordances and constraints in each setting resulted in both LAs employing narrowing and directing actions similarly to one another in-person, but different remotely, not only from their own practices in-person, but also from each other.

In-person, both LA Ghost and LA Orange stayed next to the student groups they were working with and continued to ask them guiding questions once the professor transitioned to the whole class discussion and started lecturing. They reflected on these actions in their interviews and stated that they ultimately decided to stay because the context afforded them the opportunity to do so, and they were able to successfully finish working through problems with student groups to achieve their purpose. Looking at in-the-moment learning for these student groups, it was seen that LAs were responsible for opening gaps with their guiding questions, and that students filled these gaps as they all continued their discussions. In the remote condition, LA Ghost noticed the timer countdown, and rather than trying to continue asking guiding questions, acknowledged the gaps students were grappling with and told them that the professor will soon go over the answer to the problem, and that this should hopefully answer their questions. While students' gaps were not filled conceptually by LA Ghost, they were filled epistemologically because she acknowledged that the students need will be addressed by the professor. When, LA Orange noticed the timer countdown, she accommodated for this condition differently by quickly explaining how to finish solving the problem. This action led to many LA filled gaps that were opened by both students and LAs throughout the interactions.

In the second example (Fig. 4), both LAs' purpose/goal was to confirm the correctness of students' answers and progress as they worked on problems. This purpose was related to being able to see students work implied by their goal to monitor the work students were doing. In relation to what the LAs

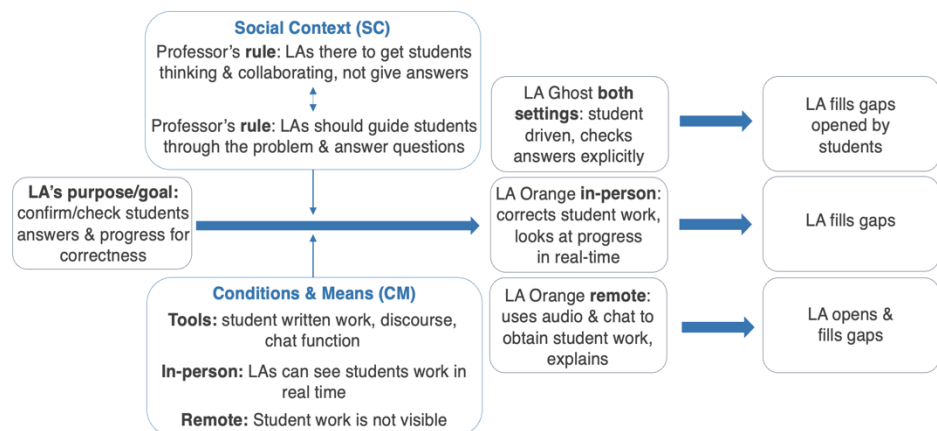


Figure 4. Flow chart showing the drivers that led to different LA actions and student in-the-moment learning in response to the visibility of student work or lack thereof.

believed they should be doing while working with students, the professor held two beliefs about rules pertaining to the LAs responsibilities that were contradicting. The first was that LAs are not there to give out answers to students, rather, they are there to foster additional student thinking and collaboration, and the second was that LAs should help guide students through problems and answer whatever questions they may have directly. Although these two rules were in tension with one another, the professor communicated both to the LAs throughout the semester, and so we can think of the LAs navigating between these two as a driver of action. Additionally, differing tools were also present in the in-person vs. remote conditions. LA Orange described the difference between tools, stating that in person, LAs could see students written work in real time either in their notebook, or on their laptop/iPad, whereas remotely, the students work was not visible, and the ability to monitor students' progress relied on students sharing in the chat. While both LAs again employed narrowing and directing actions, the different affordances and constraints in each condition for this example resulted in one LAs' specific actions being the same in-person and remotely, while the other LA took different actions in both settings.

In person and remotely, LA Ghost followed student driven needs for progress. In other words, she corrected students work and monitored their progress for correctness on a student-need basis, where she would confirm and inquire further about steps the students had raised questions on. This led to her being able to gauge where the students were in their progress and correct their work in both conditions as it did not rely on the visibility of student work. Ultimately, this led to student opened gaps that were filled by LA explanations in both conditions. However, for LA Orange, the visibility of student work did matter. In person, LA Orange was afforded the opportunity to glance over students' shoulders as they worked on problems and monitor their work in real-time, which led to her correcting steps as the conversation progressed naturally. In this case, most gaps were closed by the LA since she corrected work as she saw it. Remotely, she relied heavily on audio and chat communication to ask students about their progress since she could not see their work, and once students shared, she confirmed their steps and explained answers further. In this case, most gaps were LA opened and then LA closed, as she asked guiding questions to prompt student participation and then provided explanations to confirm student answers.

Conclusions. In this paper, we demonstrate the different ways in which LAs act to work around different affordances and constraints in an SHL course to achieve their goals, which often led to an ability to observe different trends in student learning across both contexts. The two examples above provide insight into some of the ways in which drivers can act in tandem to influence LA actions and student in-the-moment learning. Example one showed how LAs managed to navigate the transition between small group and whole class discussion when they were short on time differently in-person vs. remotely. Example two showed how one LA managed to navigate around the inability to see students work in real time in the remote setting while the

difference between being able to see student work in the in-person vs. remote conditions did not matter for the actions the other LA took.

Contribution and General Interest. While it has previously been studied that LAs can assist instructional teams in in-person and remote courses separately (e.g. (Barrasso & Spilios, 2021; Emenike et al., 2020), this study shines light on how LAs adapt to the two contexts within the same course to achieve their purposes. Instead of relying on how instructors and students perceive differences between in-person and remote conditions in hybrid settings (Prieß-Buchheit, 2020; Raes et al., 2019), our study triangulates interview data with interaction data to investigate how these different conditions alongside LA purposes serve as drivers of actual LA actions that then influence student learning as observable in-the-moment of the interaction. To our knowledge, this study is the first one to carefully combine different theoretical frames and data sources to investigate how different purposes, social contexts, and conditions and means serve as drivers of action for instructors, in our case LAs, and how those actions influence student in-the-moment learning. Focusing on the theme of this year's NARST conference, where the goal is to reflect on reform, additional insight to the affordances and constraints of SHL allows for a more intentional design of these courses in a way that fosters student engagement and learning. This is essential to the future of higher education as a growing number of universities adapt equitable opportunities for students by including remote and SHL course options. Understanding how LAs navigate around challenges to meet their goals and the influence this directly has on student learning in-the-moment provides insight to how impactful LAs can be when facing unavoidable circumstances. Our work also shows that the rules and expectations communicated by the professor directly shape and influence LA facilitation practices, and this in combination with considerations of course design and affordances/constraints can all lead to more informed LA training and professional development for professors across STEM disciplines. Setting-specific training can provide LAs with strategies they can use to navigate constraints no matter their context, and furthermore help LAs learn to be intentional about their actions as student learning will be directly impacted.

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