Understanding influence in collaborative group work: The importance of artifacts

Lesley Dookie, University of Toronto, 252 Bloor St. W., Toronto, Canada, lesley.dookie@utoronto.ca
Indigo Esmonde, University of Toronto, 252 Bloor St. W., Toronto, Canada, indigo.esmonde@utoronto.ca

Abstract: When students work together on collaborative tasks, they typically have unequal influence over group decisions. This paper builds on the Differential Influence framework developed by Engle, Langer-Osuna and McKinney de Royston to consider the powerful role of artifacts in group work. Specially, we argue that if a student has greater influence over a shared artifact developed by the group, then they may have greater Perceived Authority as well as Access to the Conversational Floor and Interactional Space. They may also be able to influence the group’s collaborative decisions despite challenges to the Perceived Merit of their ideas. Based on the impact of the shared learning artifact on these interdependent dimensions, we discuss how a student’s power and influence is perpetuated in collaborative group work.

The construction of influence in mathematical group work

When collaborative group work is used in school contexts, the work is rarely equally distributed. Some students do the bulk of the work while others are left to more peripheral forms of participation. Recognizing the importance of investigating equity issues associated with classroom peer collaboration, Engle, Langer-Osuna and McKinney de Royston (in press) have developed an analytic framework that tries to account for the differential influence that group members have on the group’s ongoing task. Their work is valuable in that it considers the process by which a group makes ongoing decisions related to the task at hand, decisions that may marginalize some group members while supporting the learning of others. Engle et al. elaborate a model for understanding Differential Influence (DI), in which they consider how students’ Access to the Conversational Floor, Access to Interactional Space, Perceived Merit of Ideas, and Perceived Authority, are interdependently implicated in determining a student’s Influence with the rest of their group. (These constructs will be defined in more detail in the body of the paper.)

In this paper, we apply the DI framework to understand an interesting case of group interaction and extend the framework to account for the role of artifacts in constructing influence. Cultural-historical activity theory (CHAT) uses human activity as a unit of analysis (Engeström, 1987; Cole, 1996) and recognizes that when engaged in object-driven activity, people use artifacts to accomplish their emerging goals (Saxe, 2004). As such, artifacts play a central role in mediating activity. In the case we focus on here, three Grade 7 students were working together on an open-ended mathematics task and shared a worksheet, which we came to call the ‘learning artifact.’ Throughout this interaction, one of the students was clearly the group’s influential leader, while another student was just as clearly ignored and silenced. We use this case to highlight the role of a shared artifact in contributing to the construction of differential influence and marginalization.

Methods

As part of a broader study in which we were interested in understanding processes of marginalization in group work, we reviewed some classroom video data to find a compelling example in which a student made efforts to be involved in the group task, and was relatively unsuccessful. We selected a video from a corpus of classroom video data. The teacher in this particular classroom video (pseudonym Emma) cared deeply about equitable teaching and wanted all of her students to become independent mathematical thinkers.

The video we chose was 33 minutes long, and involved a group of three students: Kyla, Ariel and Monica. Other participants included Emma and a researcher, Indigo. The students were given a worksheet to share that depicted two maps of different neighborhoods in their city. The maps identified the locations of all grocery stores in those neighborhoods, and students were tasked with identifying ‘food deserts’ on the maps, using any mathematical concepts and tools.

The school was a girls-only independent school in a Canadian city, with tuition of approximately $14,000 per year. The students were drawn from all over the city, and although there were some bursaries and scholarships, most families paid the full tuition rate. The school was founded on a feminist philosophy and the teachers were committed to aligning their teaching with their understanding of girls’ learning needs.

Analysis

To begin analysis, we created a basic transcript that included talk, gestures and body positioning of each of the participants. The transcript included a column for analytic notes and coding, and a column for sketches of the placement of the three students and any other participants in the camera frame. As we watched the video repeatedly to understand the dynamics of group interaction (Erickson, 2007), we became increasingly interested
in the central importance of the group’s shared worksheet. Our observations of the video led us to believe that this learning artifact mediated the group’s collaboration in important ways. Rather than implementing the DI framework as a coding scheme, we searched for examples from the video to highlight how access to and influence on the group’s learning artifact had an impact on the four components of the DI framework. These examples, with commentary, are presented as the results of this paper, which expands on the DI framework.

Results

In the sections that follow, we will demonstrate the ways in which students’ access to and influence over the learning artifact was related to each of the four dimensions of the DI framework: (1) Perceived Merit, (2) Perceived Authority, (3) Access to the Conversational Floor and, (4) Access to Interactional Space, and ultimately, on influence. Ariel held onto to the group’s worksheet during most of the activity, and we use vignettes to illustrate how her access to the worksheet facilitated each of the dimensions of the DI model and, in turn, helped her to become influential in the group work activity.

Perceived Merit

In the DI framework, Perceived Merit captures the group’s assessment of the value of one another’s ideas. It is not an attempt at an ‘objective’ assessment of the merit of an idea; rather, this code captures the group’s talk and actions that indicate whether they find an idea to be meritorious. Perceived Merit can be seen when participants explicitly evaluate the validity of an argument, when they use gestures (such as eye rolling, head nodding or shaking) to convey an evaluation, or when they verbally align themselves with or against an argument. In the DI framework, the Perceived Merit of one’s idea directly impacts one’s influence on the group’s actions. That is, a person who presents an argument with Perceived Merit gains a corresponding increase in influence. Likewise, when a person’s ideas are perceived to be of low merit, there is a corresponding decrease in their overall influence.

Access to and influence on the learning artifact allowed Ariel to gain influence on the group’s final product without having to convince others of the Perceived Merit of her ideas. This can be seen from the following example. The vignette begins early on in the group’s work, just after Ariel had read aloud the instructions from the learning artifact and the group members had inspected the map.

Vignette 1.

While Kyla stood up and leaned over Ariel to be able to see, the group engaged in a lively discussion about the boundary of the food desert on the map. Ariel traced a line around a region, implicitly identifying the inside of this region as a food desert. As she drew the boundary, she explained what she was doing, and told the group “if you don’t agree with me for any of this tell me.”

Kyla and Monica both watched as she continued to draw her line. Very quickly, Monica began to voice disagreement. The specific point of disagreement was that Ariel’s outline crossed what appeared to be a ravine. “But wait, there’s no roads there so you’d have to...there’s probably like a ravine there so you can’t access there,” said Monica. There followed a discussion of the ravine, involving Kyla, Monica, the teacher, and another student. Everyone except Ariel agreed that people would not want to walk across a ravine to get their groceries, but Ariel continued to draw her boundary.

Finally, Monica reminded Ariel of her earlier words: “Yeah! You told us if we didn’t agree with you we could say it and you’d change it.” Ariel still continued to draw her boundary on the map.

In the vignette, despite the fact that her classmates explicitly disagreed with her multiple times, Ariel was able to mark her boundary on the map. In the language of the DI framework, Monica and Kyla positioned Ariel’s idea as being without merit, and yet Ariel was still able to use her influence over the learning artifact to carry it out. Even though her contribution was without merit, this example illustrates how Ariel’s influence on the learning artifact allowed her to increase her overall influence on the group work.

Perceived Authority

In the DI framework, Perceived Authority is the extent to which a participant is seen as a credible source of information. According to the model, Perceived Authority is negotiated through interactions between students and has a direct impact on one’s influence in the group. Examples of Perceived Authority include when someone’s credibility is accepted without hesitation, when they are oriented to as an expert (for example, if a group member asks them questions or for help), and their suggestions are trusted and taken up by others. When a person gains perceived authority, they have a corresponding increase in influence as well as Access to the Conversational Floor and Interactional Space.

As can be seen in vignette 1, before seeking her group members’ approval, Ariel began marking the worksheet with her ideas. The fact that her ideas were initially accepted without hesitation (since she wrote them down before having checked with her group) indicates that she was taking up a position of authority. This

© ISLS
was a common occurrence during the group work activity and will be illustrated again in vignette 2. Ariel’s access to and influence on the learning artifact helped to increase her Perceived Authority, allowing her to write ideas without the permission or approval from the group.

**Access to the Conversational Floor**

Engle and colleagues define the conversational floor as a socially negotiated space wherein people make verbal contributions to a discussion. The DI framework considers how individuals gain initial Access to the Conversational Floor, as well as whether they are able to maintain this access to present a point in its entirety. For example, an individual who is able to begin presenting an utterance by simply opening their mouth and starting to speak has greater Access to the Conversational Floor than an individual who needs to wait to be called on. Similarly, an individual who is able to share their point until they signal that they are finished has greater Access to the Conversational Floor than someone who is continuously interrupted. An individual with strong Access to the Floor can also affect who else gets access to it and greater Access to the Conversational Floor can lead to greater overall Influence in a discussion.

The learning artifact was a shared and central component of the activity and we observed that when a group member had influence over the worksheet, they were granted easier Access to the Conversational Floor. Ariel maintained her influence over the worksheet throughout most of the activity and we illustrate how this influence granted her Access to the Conversational Floor in the following vignette. This vignette occurred relatively late in the group’s work session, after several instances in which Kyla and Monica had asked Ariel if they could write on the worksheet.

**Vignette 2.**

The worksheet was in front of Monica and there was some back and forth talk between the girls about the map and what general assumptions they had to make when identifying food deserts. Ariel interrupted Kyla and said to Monica, “You should write, ‘we assume that they can’t walk over that [meaning, can’t walk more than 500 m.], so maybe they have physical problems’.” As she spoke, Ariel took the worksheet from Monica and began to write. As she wrote, she also spoke the words out loud, thus maintaining her position in the conversational floor. While this was happening, the previous back and forth conversation involving Monica and Kyla ceased. Both Monica and Kyla oriented their bodies towards Ariel and the worksheet.

After about 40 seconds, Monica indicated that she had an idea, but refrained from actually sharing this idea. Ariel continued to write and to dictate aloud, and a moment later Kyla asked, “how long is your sentence going to be, miss run-on?” but also refrained from speaking further. After another 50 seconds of dictation, Ariel finished and signified this by saying, “period!” Throughout this time, both Monica and Kyla’s bodies remained oriented towards Ariel and the worksheet.

Later in this exchange, Ariel handed the worksheet back to Monica and said, “Your turn. Write.” When Monica demonstrated some uncertainty as to what she should write, Ariel probed her with questions after which Monica suggested, “Maybe…maybe the other person doesn’t want to go to the grocery store because they’ve already got a corner store near their house?”. Ariel then replied, “Sure. Write that.”

The vignette demonstrates how Ariel’s influence on the learning artifact provided her with Access to the Conversational Floor as she not only initiated talk by interrupting Kyla, but was also able to maintain the Floor until she completed her idea. As Ariel spoke she was attended to by both Monica and Kyla based on their bodily orientations and limited talk. When Ariel held the worksheet, she had easy Access to the Conversational Floor because the worksheet was central to the activity and if Kyla and Monica wanted to know what was being written, they had to listen to Ariel’s dictation.

The vignette also demonstrates how Ariel provided Monica with Access to the Conversational Floor by giving her access to the learning artifact, probing her with questions, and giving her the opportunity to offer up an idea. Ariel maintained control over both the learning artifact and the Floor but created specific entry points for Monica. Taken together, influence over the central learning artifact mediated Ariel’s Access to the Conversational Floor, which, in turn, allowed her to become more influential in the group work activity.

**Access to Interactional Space**

According to the DI model, access to Interactional Space occurs as a result of an individual’s bodily orientations in physical space. These orientations are socially negotiated through interaction. Engle et al. define Access to Interactional Space as, “the degree to which the student is visually attended to and physically oriented to by others when speaking or listening, and is able to affect the spatial access of others” (p. 12). Access to Interactional Space can be shaped by the physical organization of an activity including how people are seated, their relative proximity to the center of activity, and whether they are blocked by other objects or people. Access to Interactional Space is said to have an indirect effect on influence in that greater Access to Interactional Space

© ISLS 288
can lead to greater Access to the Conversational Floor and thus greater influence. For example, Engle et al. demonstrate how a student who is more often physically oriented toward became influential in a debate.

In our analysis of the group work activity, we observed that proximity to the worksheet facilitated Access to Interactional Space. Specifically, Ariel maintained influence over the worksheet for the majority of the activity and the physical organization of this activity was, for the most part, centered around her and the learning artifact. The learning artifact was a focal point of the activity and when it did switch hands, there was a corresponding, noticeable shift in the physical organization of the group as individuals re-centered themselves around it. For example, referring back to vignette 2, after Ariel handed the learning artifact over to Monica, she turned her body towards Monica and the learning artifact. Kyla stood up, walked over, and also oriented herself towards Monica and the learning artifact. Figure 1 demonstrates the group’s body positions while Ariel held the worksheet, and then when Monica did.

![Figure 1. Body positioning with the worksheet in front of Ariel (left image) and Monica (right image).](image)

In the DI model, increased Access to Interactional Space also facilitates Access to the Conversational Floor and so influence over the learning artifact facilitated both of these processes. We can therefore argue that by facilitating access to both the Conversational Floor and Interactional Space, influence over the learning artifact helped Ariel to become, overall, more influential in the cooperative group work activity.

Access to the Learning Artifact Versus Influence Over the Learning Artifact

An important distinction that came to light during our analysis was that access to the learning artifact was very different from influence over the learning artifact. While Monica had some access and Kyla had minimal access to the worksheet, this access alone did not facilitate Access to the Conversational Floor or Interactional space and nor did it help them to become more influential. As was depicted in vignette 2, simply having the worksheet in front of her did not grant Monica control over the Floor and Ariel still had clout over what ideas ended up on the worksheet. Furthermore, Kyla’s attempts to write on the group’s worksheet are instructive as to the distinction between simple access to, and influence over, the worksheet.

Vignette 3

Throughout the group activity, Kyla made several comments on the group’s strategy for locating food deserts. She was vocal during the debate about the ravine and disapproved of Ariel’s placement of food desert boundaries. She was enthusiastic about an early strategy for locating food deserts by measuring the distance between grocery stores.

When she was not given access to the worksheet to carry out this strategy, she took out her own sheet of paper and started to measure and write down these distances. The group never oriented towards her, looked at what she was writing, or talked with her about it. At several other points, she asked to be able to write a contribution on the worksheet but was dismissed.

Finally, Ariel allowed Monica to write down two answers on the worksheet. The group continued to discuss the problem of food deserts, while the worksheet lay on the desk in front of where Kyla stood. Ariel read aloud the group’s last question (about a method for locating food deserts), suggested “use google maps,” and then turned to Kyla to ask her to “write that.” Kyla leaned forward and wrote this sentence on the worksheet: “use google maps to identify.” When the teacher came over, Kyla told her that “They’re making me write the shortest answers and I want to write.”

This vignette illustrates how Kyla continued to try to access and influence the learning artifact, without success. She even created her own learning artifact, but the group did not attend to her work and they positioned her written notes as peripheral to the task. At the end of the activity, when the worksheet was sitting on the desk in front of Kyla, she did not write until instructed to do so by Ariel, even though she had complained earlier that
she wanted to write more. Thus, Kyla had access to the worksheet through physical proximity, but she seemed to require approval from her peers before writing.

Implications
This paper has expanded on the DI framework presented by Engle et al (in press). We found that the artifact that was the central focus of the group’s work mediated their participation in important ways. The student who had the most access to and influence on the group’s worksheet was also able to gain easier Access to Interactional Space and the Conversational Floor, was able to assert her Authority without waiting for approval from peers, and was able to influence the group’s final product despite repeated challenges to the Perceived Merit of her ideas.

It is important to note that our analysis was not causal. Ariel’s Access to the learning artifact may have positively influenced the other dimensions of the DI framework, or vice versa. Most probably, there was a reciprocal relationship so that increases to Ariel’s overall influence in the group increased her access to the learning artifact, and increased access to the learning artifact also increased her overall influence. How this underlying influence over the learning artifact came to be is another important question that is beyond the scope of this paper, but requires, to begin with, further examination of previous classroom activities and student interactions.

Our aim with this paper was to build on previous research on influence in group work, in light of the cultural historical frameworks that guide our understanding of learning. In keeping with CHAT, we found that the artifact that was central to the group activity played an important role in the circulation of influence within the group. CHAT also underlines the importance of using the activity system – in this case, the teaching and learning practices of that particular classroom – as our unit of analysis (Engeström, 1987). We would expect different activity systems to support the construction of influence in different ways. Specifically, other kinds of learning artifacts would certainly mediate the group’s interaction in different ways. If all three students had separate worksheets, then the arrangement of body positioning and eye gaze would have shifted, thus changing the nature of the interactional space. Many other arrangements of learning artifacts within activity systems could be imagined, each with unique impacts on the four components of the DI framework.

These findings call on educators to consider all aspects of the context and physical arrangement of group work, as they work towards more equitable teaching practices. The physical arrangement of desks, students’ bodies in relation to one another, their physical connection or visual access to the worksheet, were all critical in determining how the group worked together, and who ultimately influenced their final product. While an analysis of student talk would certainly reveal some aspects of Ariel’s influence and Kyla’s marginalization, our analysis of the group’s embodied interaction highlights the very physical ways in which influence and marginalization were constructed. This is a direct challenge to more cognitively based analyses in which students’ physical embodiment is ignored in favor of a focus only on talk.

References

Acknowledgments
The research reported here was supported by a research fellowship from the Knowles Science Teaching Foundation (KSTF). Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of KSTF. We would like to thank the school, teacher, and students, for generously participating in the study.