International Society of the Learning Sciences

Dialogic intervisualizing: Developing a conceptual framework for equitable engagement in blended inquiry-based learning

Susan M. Bridges, The University of Hong Kong, sbridges@hku.hk

Abstract: Studies in computer-supported, inquiry-based learning predominantly adopt an empirical rather than conceptual focus producing evidence-based justifications through 'what works' evaluations and process-based 'how it works' studies. This paper presentation seeks to further conceptualize digitally mediated learning processes in inquiry-based learning by elaborating on an existing CSCL definition of 'dialogic intervisualizing'. In particular, the conceptual framing seeks to address the issue of equitable practices (tutor facilitated or student self-regulated) for student engagement in-the-moment and over-time.

Major issues addressed

In their introduction to a special issue in *Educational Technology Research and Development*, West et al. (2020) argued for a returned focus on theoretical scholarship indicating that "the increasing emphasis on data-driven decision-making, evidence-based research, and empiricism, the value of theoretical scholarship risks being overlooked" (p. 593). In the area of inquiry-based learning (IBL), particularly in the area of problem-based learning (PBL), our focus has, in the majority, been empirical with the goal of providing evidence-based justifications through 'what works' evaluations and process-based 'how it works' studies (Bridges & Imafuku, 2020). While much of the theoretical literature has situated PBL and other forms of inquiry in constructivist traditions, less work has been undertaken to explore the potential for new theoretical contributions. Exceptions include Savin-Baden's (2016) framework for transdisciplinary threshold concepts (liminality, scaffolding, pedagogical content knowledge, and pedagogical stance) as a conceptual model to unpack how PBL supports student transformations in understanding and Ryberg et al.'s (2021) postdigital notion of 'ecotones' as affective, conceptual and generative spaces that refute digital/analogue binaries and explore spatial and material dimensions of learning. Both have arisen from empirical research on technology-enhanced approaches to PBL and design thinking respectively and both share an interest in hybridity and liminality. Similalry, Abdu et al. (2021) have proposed 'multimodal dialogue' as a term to encompass the intersection between embodied and dialogic perspectives for group learning to signify a phenomenon in which interactions occur within and across modalities.

This short paper takes a similar focus on conceptualizing digitally mediated learning processes in inquiry-based learning, particularly problem-based and project-based learning. It expands upon the theoretical underpinnings of 'dialogic intervisualizing', a concept which arose from an *ijCSCL* 2020 ethnographic study of PBL in blended environments in medical education and was proposed as an opportunity "to characterize the interplay between information management, textual negotiations and purposeful, facilitated dialogue for deep knowledge co-construction within and across learning events in an inquiry cycle" (Bridges et al., 2020). I will further examine how this concept is situated theoretically at the intersection of the learning sciences, dialogic education with technologies, social semiotics and multimodality. The overarching goal is to build upon this early work and to develop a conceptual framework that may inform further development and practical applications of dialogic intervisualizing across a range of computer-supported collaborative learning designs, including, but not limited to, problem-based and project-based learning.

Potential significance

The role of scaffolds has been well established in the problem-based literature (see Glazewski & Hmelo-Silver, 2019). Ertmer & Glazewski (2019) differentiated between 'hard' and 'soft' scaffolds that serve the goals of reducing task complexity and helping learners to focus through problematizing with the former including instructional materials, including computer-based tools and the latter more aligned with teacher (or peer) facilitation strategies such as explicit guidance and just-in-time instruction, modelling or 'making thinking visible' through classroom dialogue (pp. 326-327). What is emerging is the growing need for closer examination of the role of educational technologies and digital texts as scaffolds in the group inquiry process. For example, in blended PBL sessions the whiteboard and, more recently, interactive touch screens, have become essential hard scaffolds and mediators in the group interaction, transforming the role of 'scribe' beyond that of a secretary recording group notes, to support soft scaffolding discursive processes such as negotiating real-time curation of shared online links and resources. Research on group dynamics and individual identity in inquiry-based learning has sought to unpack how members contribute or withdraw from the group knowledge co-construction process (Langer-Osuna, 2015; Bridges et al., 2020). However, more work is needed, particularly in the period of intense attention to online learning and student engagement brought about by the COVID-19 pandemic.

The development of a synthesized framework will contribute to theory-building in problem-based and project-based learning and will identify implications for practice. It addresses the current need to elucidate the interactional processes involved when inquiry-based learning designs are blended with technologies and facilitators are engaged in the challenging process of mediating group dialogic processes where open access and multimodal resources are accessed, either as: scaffolds within the learning design; or through asynchronous self-directed searching and curating; or through synchronous group mediated digital resources sharing and co-constructing. As such dialogic intervisualizing was defined as:

> a collaborative process of facilitated inquiry involving discursively negotiated navigation of in-the-moment and over-time accessed, curated and devised information and visual representations which evolve through in webs of socially and cognitively intertextually tied webs of meaning-making (Bridges et al., 2020).

Key features of the process of dialogic intervisualizing include:

- situating the inquiry cycle and its associated textual processes as a meta-discursive set of orienting signals and processes;
- recognizing the dynamism and centrality of new text types as contextualization cues to meaning and sociocultural processes;
- building discourse ties between visual, often digital, multimodal 'texts' and the actions of learners as group members;
- recognizing student agency and autonomy in navigating digital information flows in a more open and fluid form of small, group problem-based inquiry; and
- situating facilitator expertise in guiding the process of textual development for inquiry (visual textual selection, curation, critique and final appropriation.

While the definition is extant, there is theoretical room to develop this into a robust conceptual framework. At present, the concept meets at the intersection of the learning sciences (see Goldman & Brand-Gruwel, 2018), particularly sociocultural perspectives (Mercer & Howe, 2012); dialogic learning with technologies (Wegerif, 2007) and, from the wider field of literacy research, social semiotics (Lemke, 1998) and multimodality (Kress, 2010).

In further considering the issue of equitable practices, student presence and activity have long drawn research attention in problem-and project based group interactions. For example, Jin's (2014) ethnographic study of silence in PBL tutorials illustrated the often productive power of silence; however; student assessments focused on rating performativity may discriminate against the reflective student. In a digitally-enhanced environment, issues of equitable access, dominance and shifts in dynamics such as 'racing to be first' with a google search answer and managing mobile devices have been added to the group co-operative learning dynamic and add to the complexity of the facilitator role (Hendry et al., 2016). Gourlay et al. (2021) also argue for the need to theorize these areas of interest and concern in higher education:

> the subtle, complex, relational and affective dimensions of student online engagement, we suggest, have been under-theorised, in parallel bodies of research which have placed an over-emphasis on the inculcation of 'activity', while paying insufficient attention to what underlies student ability to be 'active', their willingness to participate and their sense of belonging, all necessary for engagement to take place. (p.11)

However, while recognizing the role of student agency and autonomy, the current definition of dialogic intervisualizing does not meet the challenge of how one cultivates equitable practices (either tutor facilitated or student self-regulated) in-the-moment or over-time. This is an area to be explored with the CSCL community in this paper presentation.

Theoretical contribution

The developing conceptual framework draws on multiple fields to identify and elaborate the theoretical intersections underpinning dialogic intervisualizing. The learning sciences' perspective is foundational given its systems-oriented focus on the situated complexities of classroom life (Yoon & Hmelo-Silver, 2017). It draws on both cognitive and sociocultural perspectives of learning as both a process that occurs in the head of learners but

one that is socially mediated by the design of learning environments and the historical and cultural contexts which contribute to shaping those environments and the teachers and learners involved. Furthermore, the learning sciences recognizes the cumulative nature of learning over time and seeks to explore how knowledge, skills and dispositions develop in formal and informal learning contexts. From a learning sciences perspective, learners employ a range of "representational practices as embodying strategies for constructing, manipulating and interpreting inscriptions" (Medina & Suthers, 2013, p. 34). Dialogic intervisualizing, as a concept, has sought to capture the meaning-making process as it is "supported through the building of discourse ties between graphic representations as visual, often digital, multimodal 'texts' and the actions proposed or made transparent by members in the PBL cycle (e.g., facilitator, students)" (Bridges et al., 2020).

Second, dialogism in education has a long history from the oral traditions of early Socratic questioning to more recent mapping of facilitation strategies in problem-based-learning (Hmelo-Silver & Barrows, 2006). Wegerif's (2007) view is that education should be seen "as induction into dialogue" asking us to consider our new relationship with technologies a "tool for opening up and resourcing the kind of dialogic spaces that enable people to think, learn, and play together" (p. 7). Evident from ethnographically-informed studies of classroom discourse is how teacher and learner talk can support or limit opportunities for learning (see, for example, Markee, 2015; Bloome et al., 2004).

Finally, if we are to consider the essential role of digital texts in these forms of inquiry-based learning, it is essential to draw on literacy research, particularly new directions influenced by the work on multiliteracies (New London Group, 1996). As such, the field of social semiotics supports our understanding of how meaning is shaped by and mediated through digital texts as they are accessed, shared, curated and co-constructed. Indeed, Lemke (1998) has argued for the complexity of the interplay between texts and contexts seeing meaning as 'multiplicative' rather than 'additive'. As the definition of 'text' has expanded to embrace screen-based, digital texts, the concept of multimodality arose to embrace not only print and digital text types but also non-verbal texts such as embodied actions which are similarly 'read' by interactants. Collectively, blended approaches recognize the dynamic nature of digital text types and their central role as contextualization cues to meaning-making and sociocultural processes, it is clear that educational technologies contribute to an 'intervisual' web of intersubjective meaning-making within and across the PBL learning cycle design (Suthers, 2006). For example, Suárez et al.'s (2018) review of dynamic approaches to content accessing with mobile devices focused on learners' intrinsic control "to browse, filter, retrieve, evaluate, and interpret" identifying a need to develop students' digital literacy skills in filtering and analysis when consuming mobile-accessed content (p. 44). The developing conceptual framework will aim to synthesize the key domains above and situate how these impact on learners' literate practices and facilitation strategies.

Implications

Problem-based and project-based learning are constantly evolving with the affordances of educational technologies. Scaffolds such as interactive white boards and mobile devices, video cases and access to online materials have supported this evolutionary transition into a digital era pre-pandemic. In the past two years, as most in-person learning has shifted online, issues related to 'remote engagement' and how facilitators/teachers can motivate and engage learners to be 'present' despite their physical separation are also surfacing how the affective and relational aspects of online learning remain under-theorized (Gourlay et al. 2021). While the issue of equity has been highlighted by researchers examining the 'digital divide', particularly in terms of access to infrastructure, by expanding the concept of dialogic intervisualizing, this developing conceptual framework will also seek to propose how inquiry-based facilitators can support equitable engagement in blended and online learning environments. A challenge will be to develop a framework that will be applicable to a broad range of inquiry-based designs, learning contexts and learners.

References

Abdu, R., et al. (2021). Multimodal dialogue in small-group mathematics learning. *Learning, Culture and Social Interaction, 29*, 100491.

Bloome, D., Carter, S. P., Christian, B. M., Otto, S., & Shuart-Faris, N. (2004). *Discourse Analysis and the Study of Classroom Language and Literacy Events A Microethnographic Perspective.* Routledge.

Bridges, S.M., Chan, L.K., Chen, J., Tsang, J. & Ganotice, F. (2020). Learning environments for interprofessional education: A micro-ethnography of sociomaterial assemblages in team-based learning. *Nurse Education Today. 94*.

Bridges, S.M., Hmelo-Silver, C.E., Chan, L.K., Green, J.L & Saleh A. (2020). Dialogic intervisualizing in multimodal inquiry. *International Journal of Computer-Supported Collaborative Learning. 15*, 283-318.

Bridges, S.M. & Imafuku, R. (Eds). (2020). *Interactional Research into Problem-based Learning.* Purdue University Press.
Ertmer, P.A. and Glazewski, K.D. (2019). Scaffolding in PBL Environments. In M. Moallem, W. Hung and N. Dabbagh (Eds), *The Wiley Handbook of Problem-Based Learning*. (pp. 321-342). Wiley.
Glazewski, K. D., & Hmelo-Silver, C. E. (2019). Scaffolding and supporting use of information for ambitious learning practices. *Information and Learning Sciences, 120*(1/2), 39-58.
Goldman, S. R., & Brand-Gruwel, S. (2018). Learning from multiple sources in a digital society. In F. Fischer, C. E. Hmelo-Silver, S. R. Goldman & P. Reimann (Eds), *International Handbook of the Learning Sciences* (pp. 86-95). Routledge.
Gourlay, L., Campbell, K., Clark, L., Crisan, C., Katsapi, E., Riding, K. and Warwick, I. (2021). 'Engagement' discourses and the student voice: Connectedness, questioning and inclusion in post-Covid digital practices. *Journal of Interactive Media in Education*, *1*.
Hendry, G., Wiggins, S., & Anderson, T. (2016). Are you still with us? Managing mobile phone use and group interaction in PBL. *Interdisciplinary Journal of Problem-Based Learning, 10*(2).
Hmelo-Silver, C. E., & Barrows, H. S. (2006). Goals and strategies of a problem-based learning facilitator. *Interdisciplinary Journal of Problem-Based Learning, 1*(1).
Jin, J. (2014). Understanding silence in problem-based learning: A case study at an English medium university in Asia, *Clinical Linguistics and Phonetics, 28*(1-2), 72-82.
Kress, G. (2010). *Multimodality: A Social Semiotic Approach to Contemporary Communication.* Routledge.
Langer-Osuna, J. M. (2015). From getting "fired" to becoming a collaborator: A case of the coconstruction of identity and engagement in a project-based mathematics classroom. *Journal of the Learning Sciences, 24*(1), 53–92.
Lemke, J. L. (1998). Metamedia literacy: Transforming meanings and media. In D. Reinking, L. Labbo, M. McKenna & R. Kiefer (Eds.), *Handbook of Literacy and Technology: Transformations in a Post-Typographic World.* (pp. 283-301). Erlbaum.
Markee, N. (Ed). (2015). *The Handbook of Classroom Discourse and Interaction*. John Wiley & Sons.
Medina, R., & Suthers, D. (2013). Inscriptions becoming representations in representational practices. *Journal of the Learning Sciences*, *22*(1), 33–69.
Mercer, N., & Howe, C. (2012). Explaining the dialogic processes of teaching and learning: The value and potential of sociocultural theory. *Learning, Culture and Social Interaction 1*(1), 12-21.
New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66* (1), 60-93.
Ryberg, T., Davidsen, J., Bernhard, J. et al. (2021). Ecotones: A conceptual contribution to postdigital thinking. *Postdigital Science and Education, 3,* 407–424.
Savin-Baden, M. (2016). The impact of transdisciplinary threshold concepts on student engagement in problem-based learning: A conceptual synthesis. *Interdisciplinary Journal of Problem-Based Learning, 10*(2), 1-22.
Suárez, Á., Specht, M., Prinsen, F., Kalz, M., & Ternier, S. (2018). A review of the types of mobile activities in mobile inquiry-based learning. *Computers & Education*, *118*, 38–55.
Suthers, D. D. (2006). Technology affordances for intersubjective meaning making: A research agenda for CSCL. *International Journal of Computer-supported Collaborative Learning, 1*(3), 315-337.
Wegerif, R. (2007). *Dialogic education and technology*. Springer.
West, R. E., Ertmer, P. & McKenney, S. (2020). The crucial role of theoretical scholarship for learning design and technology. *Educational Technology Research and Development*, *68*(2), 593–600.
Yoon, S. A., & Hmelo-Silver, C. E. (2017). What do learning scientists do? A survey of the ISLS membership. *Journal of the Learning Sciences, 26*(2), 167-183.