Open Peer Commentaries

on Jérôme Proulx and Jean-François Maheux’s “From Problem Solving to Problem Posing, and from Strategies to Laying Down a Path in Solving”

Diachrony in Human Cognition and Problem Solving

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> Upshot • Problem solving should not be reduced to situated or localized activity since cognizers also draw on non-local resources that are not actually experienced but nevertheless impact on their situated cognition. A Varelian-inspired epistemology neglects this non-locality, which is a vital trait of human life.

Introduction

« 1 » Jérôme Proulx and Jean-François Maheux bring Francisco Varela’s (1992) account on problem-solving into the realm of mathematical educational research. Varela considers problem-solving as an activity that is reducible to situated and synchronous interactions. On his construal, problems do not exist objectively in the world; rather they are partly constituted by the subject (cf. §§4f). Proulx and Maheux advance his dialectical epistemology by promoting the idea that individuals bring forth problems in their attempt to solve them ($22$). Thus, their account is a good fit with enactivists who draw heavily on Varela’s thinking (e.g., Thompson 2004; De Jaegher & Di Paolo 2007; Froese & Di Paolo 2011). Proponents of Varelian-style enactivism share the view that human sense-making is anti-representational, situated and entails that agents bring forth their “own worlds” (Hutto & Myin 2013).

« 2 » It makes good sense to assume that problems are not pre-given and that competencies arise from situated agent-environment relations. It is doubtful, however, that a Varelian-inspired epistemology is the most suitable choice when it comes to explaining human problem-solving. For this reason, Proulx and Maheux could have benefited from considering some of the recent critiques raised against Varelian-style enactivism (e.g., Cowley & Gahrn-Andersen 2015; Harvey, Gahrn-Andersen & Steffensen 2016a, 2016b; De Jesus 2016; Gahrn-Andersen & Cowley 2017). In the following, I present aspects of these critiques while clarifying their relevance to Varelian problem-solving.

Beyond the localized

« 3 » As Proulx and Maheux rightly note, problem-solving unfolds in situations. The obvious reason for this is that agents must encounter a problem in order to be able to solve it. This goes for any kind of problem, whether it is a mathematical equation, a leaking roof or a flat tire. On a Varelian construal, however, situatedness implies that cognition can be reduced to what the agent experiences in the “now” (Gahrn-Andersen & Cowley 2017) and what interactivity-based views call the localized (Harvey, Gahrn-Andersen & Steffensen 2016a). Proulx and Maheux push the idea that problem-solving activities predominantly involve instantaneous and synchronous experience (cf. the “laying down a path in walking” metaphor). For instance, they argue that each step in solving a problem “is the posingsolving of a new problem, leading to a new posingsolving contingent to this step, and so forth” ($20$).

« 4 » However, there is more to human cognition and problem-solving than what experientially presents itself to the cognizer. It therefore makes little sense to follow Varelian-inspired approaches by reducing cognition to synchronous moment-to-moment experiences. The reason for this is that human cognitive activity also has a non-localized dimension that, in most cases, conditions the agent’s situated experiences. Thus, human phenomenology is diachronic (Cowley & Gahrn-Andersen 2015; Gahrn-Andersen & Cowley 2017). Due to its diachronic nature, cognition involves non-localized resources of different kinds including embodied habits, skills, social normativity (rules, structures and expectations) and second-order cultural constructs (e.g., grammar). These phenomena are all diachronic in the sense that they arise from a lived history of interactions. For instance, children gradually acquire mathematical knowledge by attending school, getting feedback on their home assignments and talking to their parents. And they draw on their emergent skills as they engage with new mathematical problems.

« 5 » The fact that certain cognitive resources are non-local implies that, although being actualized in ongoing interactions, they are nevertheless not directly experienced by the agent. Non-local resources, including skills and habits, impinge on us in the sense that they structure our perceptual horizon and what Maurice Merleau-Ponty (2010) calls the “body schema” (Gahrn-Andersen & Cowley 2017). These resources play a crucial role in that they enable us to make sense of our surroundings in ways that are swift, efficient and in accordance with
the socio-material practices we partake in. As John Sutton shows, a cricket batter draws on her non-local resources to eliminate reflective thinking, thus enabling her to optimize her play. In fact, default assumptions among cricketers thus stress the independence of acting and thinking; they see the successful doing involved in the execution of the long-practised, habitual, semi-improvisational embodied skills required for batting as independent of more explicit conscious or verbalizable forms of knowing such as those involved in autobiographical remembering.” (Sutton 2007: 767)

The batter’s non-localized skills and habits enable her to avoid reflective thinking while, at the same time, allowing her to exploit localized resources (i.e., the bat and ball) in ways that are skillful.

As mentioned earlier, non-local resources are not only found in competitive sports; they also condition most of our situated activities. Even teachers are relying on “habits (e.g., hand-raising) and practices (e.g., note-taking) that allow students to participate in classroom events without disrupting the dynamics of the many-to-one focus on the front of the room” (Harvey et al. 2016a: 141). In fact, had it not been for our embodied habits, we would not even be able to do basic everyday activities such as tying our shoelaces, ordering a pizza or speaking (Noë 2009). It is due to a history of interactions that individuals can be properly situated in their everyday encounters. Non-localized resources allow human experience to be “smooth” in the sense that they enable agents to enact a flow of skillful activity. Thus, non-locality gives rise to a diachronic experience that differs from the synchronous experience that, on a Varelian construal, amounts to instantaneous co-regulating activities (see also Cuffari, Di Paolo & De Jaeger 2015).

The diachrony of problem-solving strategies

This brings us back to problem-solving. I agree with Varela (and Proulx and Maheux) that problem-solving is a kind of exploration that entails a high degree of experiential immediacy and synchronicity, since solvers are sensitive to problems that are localized in their immediate surroundings. However, by reducing the process of posing|solving to what the solver immediately experiences, one loses sight of the non-local resources that solvers inevitably bring into situations and which affect situational outcomes. Take, for instance, Amy, who engages with a simple mathematical problem. She solves 741–75 in a way that “is not ‘obvious’ for everyone and is dependent on the unique characteristics of the solver, including his or her understandings and ways of doing mathematics” ($21). Thus, Amy brings certain non-local resources into the interaction. In fact, she enacts a kind of preliminary strategy that exists prior to her final strategy.

By focusing on the synchronic dimension of interactions, a Varelian-based epistemology seems unable to account for the fact that problem-solving involves past experiences that tacitly influence and guide the solver’s lived experience. For this reason, it overlooks the diachronic nature of human cognition and, furthermore, our capacity for engaging skillfully with the world as we bring into play non-localized resources such as our understanding, strategies and habits. The same holds for Proulx and Maheux’s contribution, which explicitly pushes the idea that problem-solving strategies are “local ways of engaging, co-emergent at the moment of posing|solving” ($35). However, the case of Amy tells a different story: strategies do not just emerge from situations; they also impact on situations. By embracing a synchronous view of cognition, however, Proulx and Maheux leave aside these diachronic aspects of human cognition.

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