

Learning by Collaborating Revisited: Individualistic vs. Convergent Understanding

Hajime Shirouzu & Naomi Miyake (shirouzu, nmiyake@scs.chukyo-u.ac.jp)

School of Computer and Cognitive Sciences, Chukyo University

101 Tokodachi, Kaizu-cho, Toyota, 470-0393 Japan

Introduction

Roschelle (1992) characterized the process of “learning by collaborating” as a search of convergence among members. This paper makes a contrasting claim that each member is individualistic in how s/he interprets the learning task, how s/he solves it, and what kind of understanding s/he gains from collaboration. The others serve as a “monitor” (Miyake, 1986) to observe what the member is doing from a slightly broader perspective and to check its validity, which triggers the member’s re-interpretation. This leads a learning pair to an iterative chain of re-interpretations, not to a search of the common ground among the two, which are often exchanged by verbal expressions in collaborative situations. In this paper we re-analyzed protocol data of collaborative learning processes in Roschelle (1992) and Shirouzu, Miyake & Masukawa (2002) to show that members’ verbalizations reflecting their interpretations or re-interpretations are individualistic through the processes.

Re-analyses

Roschelle (1992)

Two students, Carol and Dana, elaborated their conceptions of velocity and acceleration using a computer simulation of a Newtonian micro-world. As Roschelle pointed out, they gradually revised and refined their verbal “metaphors” to mean these notions. A closer look at their protocol reveals, however, that the two did not seem to converge on the usage of particular metaphors to mean particular things. Dana started with a geometric “lengthen (addition)” metaphor to indicate the velocity vectors, the acceleration ones or their relations. Carol heavily used a “pull” metaphor to represent the dynamic relations between these factors. Carol finally verbalized an expression of “travel along” in the last episode, Episode 5, to explain the composition of velocity and acceleration, which Roschelle interpreted as an integration of the two metaphors, “lengthen” and “pull” one. Dana, however, did not use the verb “pull” other than in Episode 1, while Carol superimposed her metaphor to paraphrase Dana’s insight into additive nature of vectors in Episode 3 (she said “right that’s what I’m saying” to Dana without any specification of “what”). Besides, Dana did not share the expression “travel along” during training sessions and used “move along” in their post-training interview. They thus independently revised their verbal expressions. There might be two independent shifting processes of understanding.

Shirouzu, Miyake & Masukawa (2002)

When paired subjects were asked to indicate 2/3 of 3/4 of the area of a square sheet of paper, they shifted their strategies from the non-mathematical one in the first trials to

the mathematical one in the second trials than solo subjects. Seven out of nine shifting pairs gradually generated the variations of solutions, from the most externally oriented two-step solution (making 2/3 out of the 3/4) to the external-internal mixed one (reinterpreting the externalized answer as one-half) to the most abstract one (2/3x3/4=1/2). Shirouzu et al. found that, though the members shared the algorithmic view of the task at the end of the first trial, the member who verbalized such a view during the first trial tended to propose the abstract solution in the second trial. Shirouzu (2001) also used a similar task in a small-case learning experiment with six 6th grades only to find individual differences in the quality of their reports of six months later depending on their verbalization during the experiment.

Discussion

Under seemingly “one voice” in the collaborative situations, there were different courses or levels of understandings of the members, which were reflected by their particular language use (methodologically, the transfer task or the post interview--especially individually conducted one--reveals differences well). Roschelle thinks much of convergence because it warrants not only shared understanding between members but also their integration of scientific concepts. However, we can assume another, more real course of knowledge integration, in which each member gradually revises their interpretation of the task or the solution processes using the other’s monitoring as stepping stones. Shirouzu et al. showed that the shift between solution variations coincided with members’ role shifts between task doing and monitoring. Carol and Dana often proposed “what if” cases to each other to monitor their understanding. This series of re-interpretations enables the interactive and gradual integration of the solution variations of different abstraction levels. Careful analyses on the language use in collaboration makes us possible to feed a better folk-model of collaborative learning back to everyday learners (also see Miyake & Shirouzu, 2002 in this conference).

References

Miyake, N. (1986). Constructive interaction and the iterative process of understanding. *Cognitive Science*, 10, 151-177.

Roschelle, J. (1992). Learning by collaborating: convergent conceptual change. *The Journal of the Learning Sciences*, 2, 235-276.

Shirouzu, H. (2001). Children’s algorithmic sense-making through verbalization. *Paper presented at the 23rd Annual Conference of the Cognitive Science Society*, Edinburgh, The UK.

Shirouzu, H., Miyake, N., & Masukawa, H. (2002). Cognitively active externalization for situated reflection. *Cognitive Science*