Appropriation of a Graphical Shared Workspace: The Learner-Tool Connection

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Abstract: The influence that a CSCL tool has on a group of learners depends on how the tool is appropriated. Different ways of appropriating a tool may lead to different effects on the way learners interact and carry out their task. To study the process of tool appropriation we apply an analytical distinction between interaction with the tool and interaction via the tool.

Introduction

CSCL tools are designed on basis of expectations about how collaboration within a dyad or a group proceeds, and how this collaboration could be enhanced through use of technology. However, learners do not necessarily use a tool in accordance with the expectations of the designers. When learners are presented with a new tool they have to appropriate it. Learners appropriate a tool by 'adapting' it in a goal-directed activity. Hereto the learners have to make sense of the properties of the tool, and find 'a way of doing' to carry out their task. Group members have to explore its possibilities and monitor the consequences of their actions. In the case of collaboration, group members have to coordinate this effort. The group has to arrive at some kind of agreement on how to operate the tool. For example, they have to attain a shared understanding of the symbols that are displayed in the user-interface. And they have to find a common strategy to manipulate the user-interface to achieve an outcome. The affordances of tools are appropriated in sometimes unexpected ways (Dwyer & Suthers, 2005). Different ways of appropriating a tool may lead to different effects on the way learners interact and carry out their task (Overdijk & Van Diggelen, 2007).

Tool-mediated interaction

Scholars within the CSCL community have argued that tools reflect information about their use and effect through the way they interface with the user. The user-interface makes affordances available that provide certain opportunities for action. The notion of 'affordance' has been proposed as an instrument to analyse the 'effects' and 'constraints' of a technology (e.g. Suthers, 2006). The theory of affordances (Gibson, 1979) adopts a relational approach towards the connection between the learner and the tool. The concept of 'affordance' proclaims that learner and tool are mutually constitutive and inseparable (Gibson, 1979). This makes a conceptualization of the effects and constraints of a technological tool problematic, because the phenomenon of tool-mediated interaction can not be attributed to the learner or to the tool. To overcome the inseparability between learner and tool we propose the application of an analytical distinction between interaction of learners *with* the tool and interaction of learners with each other *via* the tool. The interaction of a learner *with* the tool can result in a number of tool-shaped actions. These tool-shaped actions can lead to tool-mediated interaction between learners *via* the tool. This analytical distinction helps to analyze (1) how interaction with the features of the tool shapes the learners' actions, and (2) how this interaction gives rise to specific patterns of interaction between the learners.

A graphical, shared workspace

To illustrate our concept we present a brief example of an analysis of tool appropriation. The example focuses on one group of learners (N=3), and is taken from a case-study about a specific type of CSCL tool: a graphical, shared workspace. This tool was deployed to support an argumentative discussion within the group (For a full report on this study, see: Overdijk & Van Diggelen, 2007). Basically, the shared workspace tool consists of a drawing space and a graphical notation system that supports specific kinds of communicative acts. The user interface of the tool "prompts" a specific set of contribution cards and makes these contributions salient to the users. Learners can choose a contribution card from the notation system, and add a textual message to it. They can use a comment window to give a more detailed account of their ideas or thoughts. Once the contribution is placed in the drawing space, it can be moved through the drawing space and related to other contributions through the use of links. Learners can contribute to the workspace simultaneously. In this way, learners can collaboratively construct argumentation in form of a diagram.

Method

The content and structure of the contribution cards in the drawing space changes continuously over the course of the interaction process. All possible manipulations – like changing the location of a card, or adding of a link – have to be taken into account. The replay function of the tool allows us to reconstruct the interaction process. It captures all 'basic actions' that take place in the tool, resulting in a frame-by-frame representation of actions. The replay is transcribed into a spreadsheet that includes the time-line, all basic actions, the students responsible for the action, and the textual content of the contribution. This enables us to provide a detailed account of the interaction process. To describe the interaction process we apply an analytical distinction between the interaction with the tool and the interaction via the tool. The analytical distinction leads us to distinguish two levels of analysis. First we address the learners' interactions with the tool, then we attend to the interactions between learners via the tool.

Interacting with the tool

In order to submit a contribution to the drawing space, multiple interactions with the tool are required. A contribution is composed of several 'basic actions'. First, one has to select a notation card. The card can be placed in the drawing space by clicking on a location of choice. The selected card appears and can be further manipulated. A text can be written in the title space of the card by clicking on it. When the card is double-clicked, a separate comment window appears. In this window a more elaborated textual statement can be added to the card. Furthermore, the card can be resized, a link can be added between two cards, and the card can be moved through the drawing space.

We calculated the relative frequency of each basic action for our example group. The basic actions that occurred most frequently were adding a card to the workspace (15%), adding a title (15%) and link (23%), and moving the card through the workspace (42%). We used the software Sigmaplot® to generate a graphical representation of the frequency and distribution of each basic action over a time-line. Figure 1 shows that of our example group. Three basic actions are displayed: adding a title to a card, moving a card, and adding a link between two cards (Figure 1).

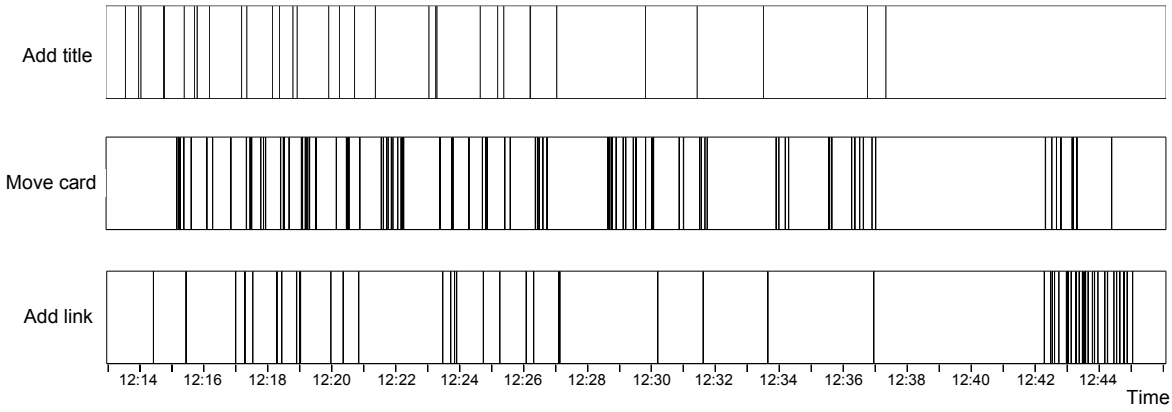

Figure 1. Basic actions in the tool.

By looking at the basic actions in the tool we can start to describe the interaction process. For example, we learn that the members of the group submitted 7 contributions before they started to move their cards through the drawing space. We can also see that the group members performed a lot of moving actions throughout their discussion, and that near the end of the discussion, they performed quite some moving and a lot of linking actions.

Interacting via the tool

In order to examine the interaction process in further detail we now turn to the level of interaction via the tool. We analyzed the contributions in the drawing area by unravelling them into separate 'discussion lines'. A discussion line is a string of contributions that are placed in adjacency by one or more learners. The learners made use of two principles to place contributions in adjacency in the drawing space: linking and spatially grouping of

contributions. By moving cards through the drawing space, students could change the position of a card and spatially group cards. The application of these two principles was used to distil separate discussion lines from the diagram in the drawing space. Some of the diagrams display a number of floating contributions that are not clearly associated to any other contribution in the diagram. These were left out of this part of the analysis.

The figure below depicts the contribution cards of our example group organized in discussion lines, and represented horizontally in temporal order (Figure 2). The straight horizontal lines represent a demarcation of two separate discussion lines. Our example group constructed four discussion lines (1.1, 1.2, 1.3 and 1.4). Each group member is represented with a shape: a circle, a triangle or a square. The connecting lines between the contribution cards of a particular group member indicate that member's 'jumps' between discussion lines, i.e. spatial behavior in the drawing space.

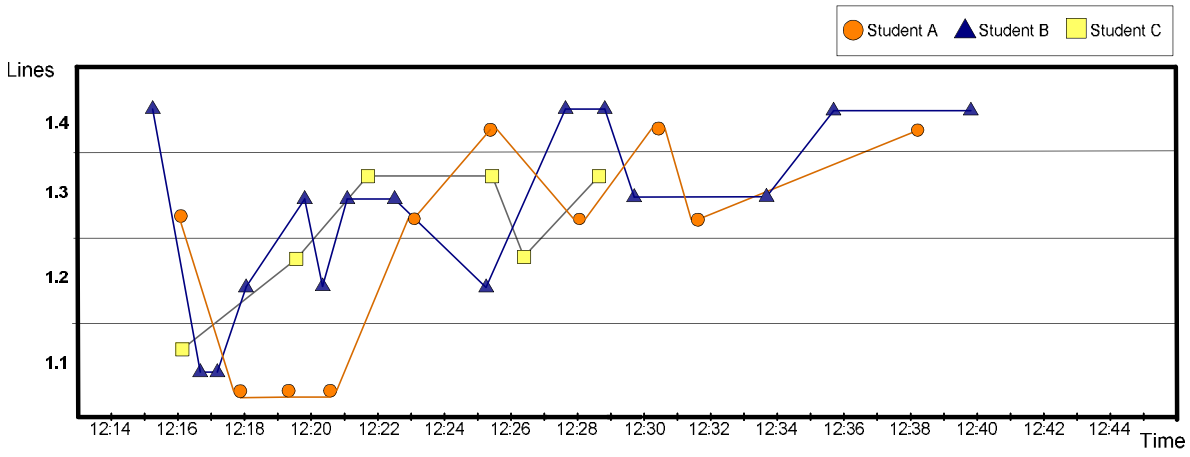

Figure 2. Discussion lines and spatial behaviour in the drawing space.

One can see that all members of this group submitted an opening statement at the beginning of the discussion, and that eventually each of these statements evolved into a discussion line. Figure 2 also indicates that the members in this group participated in multiple discussion lines. For example, student C places a contribution in line 1.1, then moves to line 1.2 and subsequently to 1.3. Finally, this part of the analysis reveals that the learners interacted with each other at a high-pace, resulting in a complex pattern of spatial behavior in the drawing space.

Discussion

The distinction between interaction with the tool and interaction via the tool provides valuable information about the process of tool-appropriation. Micro-level analysis of basic actions in the tool reveals phenomena that would otherwise remain unnoticed. These phenomena contribute to an explanation of the tool-mediated interactions between learners. For example, in their interaction with the tool learners make certain choices that influence the interaction via the tool (Overdijk & Van Diggelen, 2007). The mechanism of tool appropriation can be described as a result of interdependent tool-shaped actions and tool-mediated interaction. To unravel this mechanism, one has to study both levels.

References

Dwyer, N. & D.D. Suthers (2005). A Study of the Foundations of Artifact-Mediated Collaboration. In: T. Koschmann, D. Suthers, & T.W. Chan (Eds.), *Computer Supported Collaborative Learning 2005: The Next Ten Years!* Mahwah, NJ: Lawrence Erlbaum Associates.

Gibson, J.J. (1979). *The Ecological Approach to Visual Perception*. New Jersey: Lawrence Erlbaum.

Overdijk, M. & Diggelen, W. van. (2007). Appropriation of a graphical shared workspace: The student-tool connection. (Manuscript submitted for publication).

Suthers, D. D. (2006) Technology affordances for intersubjective meaning making: A research agenda for CSCL. *International Journal of Computer-Supported Collaborative Learning (ijCSCL) 1 (3)*, 315-337.