INSTRUMENTING COLLABORATIVE WRITING AND ITS COGNITIVE TOOLS

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Abstract:
The purpose of this article is to discuss findings from case studies where 2 groups of students (16 academic students) have used traditional collaborative writing tools and synchronous cscw technology (Cf. Aspects®). The article focuses on the cognitive transformations that are the result of the integration of a collaborative tool in a traditional collaborative writing task. Examining the effects of cscw technology on collaborative writing, on writing strategies and on the implication of students activities, I give some suggestions on what to preserve and what to change in the design of collaborative writing tools.

Keywords: instrumental genesis, constructing meanings, collaborative activities.

1 Introduction

The relationship between humans and tools is central to an investigation of the process of mediated collaborative writing, when computer systems are designed to support both social and cognitive aspects. Although there has been a growth of interest in collaborative writing [Ede and Lunsford, 1990], [Saunders, 1990], [Zammuner, 1995], [Higgins et al.,1992] and in mediated collaborative writing [Kraut et al., 1990], [Beck, 1994], [Plowman, 1995] the fundamental relationship between tools and subjects in this context has overlooked, even though [Sharples and Peberton, 1988] and [Rimmershaw, 1992] have argued that writing experiences are transformed by the use of writing tools. The reasons for this have implications for the design of technologies to support collaborative writing, one of the main areas of interest for computer supported work [Sharples, 1993]. There is a history of discussions of the relationship between subjects and tools [Belisle et al., 1997]. [Norman, 1991] for example, referred to the power and importance of culture and artefacts to enhance human abilities and from this perspective he proposed in his well known presentation of cognitive artefacts that those external tools mediate cognitive process. Norman highlighted how cognitive artefacts completely transform the activities that they mediate (e.g. an airline checklist). From a learning point of view, [Jonassen, 1992] distinguished between ‘delivery technologies’ and ‘cognitive tools’, emphasising that the role of delivery technologies should be to

1 Aspects is a commercial synchronous collaborative word processor, running on the Macintosh platform. Basically it allows the setting up of a common work space and a communication space. It also allows on-line writing and editing with each participant taking control alternatively over the shared document. To get more details, see http://www.grouplogic.com/aspects/#new

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display thinking tools, tools that facilitate thinking processes. Rethinking cognitive tools, [Kuutti and Kaptelinin, 1997] criticised ‘augmentation’ perspectives, arguing that the potential impact of tools on human cognition is not enhancing some native capabilities, but, introducing new forms of mediation. The perspective adopted here is similar to these theoretical understandings of the nature of tools and processes underlying integration of technologies into human activity. However, collaborative writing is a specific cognitive and social activity. Therefore, two dimensions concerning human activities and then collaborative writing are still unclear. First, an understanding on how subjects integrate technologies as cognitive tools. From manipulating features to use them fluently and meaningfully: what happens in between? Second, how do groups integrate cscw technologies into individual and collective activities?

2 A cognitive approach of computer instrumented collaborative writing activity

Vygotsky’s contribution demonstrates that the complex psychological processes cannot be explained without taking into account the important mediation role of psychological tools. According to [Vygotsky, 1934/1997] the are two kinds of tools: technical and psychological tools. Technical tools, such as for example a hammer, are oriented to transform an object, (e.g. to join pieces of wood together to build a chair) while psychological tools are oriented to transform the subject himself or to influence other people, (e.g. a calendar to remind about dates). Adopting this distinction, different types of transformations can be obtained when using these material or symbolic tools. According to Vygotski’s psychology and influenced by the Piagetian approach, [Rabardel,1995] extends these theoretical frameworks in an anthropocentered model he applies in the domain of ergonomics. For Rabardel, the distinction made by Vygotski is not pertinent to the effects of computer tools on cognitive and social activities. As [Kaptelinin,1995] has demonstrated, there are, at least, two features of computer tools which differentiate them from other tools. First, computer representations are active, and can be modified by computers according to their algorithms. Second, computer tools have the potential of implementing representation to reality. These two features of computer tools, indicate the possible function of computers as an extension of the internal plane of action as for [Kaptelinin,1992]. These two features are considered by Rabardel as characteristics of instruments. Instruments are these tools which are technical and psychological at the same time; a sort of intermediate universe between subject and object and it transforms both. What is really important to understand is that instruments are mediated constructs that do not exist in themselves. They are constituted by an artefact -material or symbolic-enriched with action schemes -specific cognitive and biological skills-. Instruments exist only inasmuch as the artefact used, has been associated with schemes² of use. The distinction between artefact and instrument is crucial to understand this approach suggesting that a machine or a technical system does not immediately constitute a tool for the subject. Adopting this approach, the study of mediated collaborative writing is the study of the instrumental genesis in collaborative writing with cscw technologies. That is a process which concerns the evolution of the use of the artefact and the elaboration of schemes by the user. In other words, it is the

² A scheme is a cognitive invariant, it can be defined as the structure common to all those acts which - from the subject’s point of view - are equivalent
study of cognitive appropriation of artefacts which concerns a development of schemes associated 1- to specific features of the artefact, that is functions and technical properties, 2- to particular subject’s goals of tasks, and 3- to interrelated social activities, that is interaction with other subjects.

2.1 Focus on collaborative writing

Literature suggests that the introduction of computer tools to support collaborative writing will have a significant impact on the communication and on the negotiation of texts and collective activity which take place during the process of writing. Computer systems confront groups with a set of constraints which they have to identify, understand and manage in order to find the artefact usable. From this perspective I have conducted case studies with the objective to get a better understanding of the process of traditional collaborative writing and of transformations taking place during instrumental genesis.

3 Comparing traditional collaborative writing activities with computer supported collaborative writing

I have selected academic students from a management school who were familiar with word processors and e-mail and with practice in writing reports in groups. 16 students distributed in two groups were video-taped, observed and interviewed. Both groups had four students using traditional collaborative tools and four students using Aspects® distributed into two computers.

3.1 The task: elaborating an argumentative report

The task consisted in producing a 20 pages long academic report about decision making processes. Students had to evaluate a decision process by an expert system and by a team of managers. Therefore the problem to solve was to argue about benefits and weakness of the integration of expert system in industrial decision making.

3.2 Methodology

I have collected pre and post-questionnaires, interviews, drafts and final versions and I have videotaped 28 hours of student’s collaborative writing activities. I have analysed verbal exchanges and messages exchanged through a chat-box of Aspects® and related it to the texts written. Two units of analysis has been used: paragraphs and exchanges. Paragraphs are the unit of analysis for the text. One paragraph is constituted by one or more sentences and it is delimited by one point obligating the change of current line. Exchanges are the unit of analysis for the dialogues: one exchange is equivalent to a turn-taking. A turn-taking is composed by at least two utterances: initiative and reaction. An evaluative utterance can appear as a third component of the turn-taking. Utterances have been coded by their semantic objects: ‘action’-how do we do to write collaboratively?; ‘content’-what do we write for the common text?; and ‘artefacts’- how do we do with these technical features?, and in other ways. Comparisons between groups in the face-to-face situation and in the mediated situation have been done taking into account the first 30 minutes of collaborative writing activity.
4 Analysis and Findings

Observing how groups were elaborating different versions of the report, we found common characteristics in all groups: 1- students give priority to saving time in each meeting. To use time optimally is a criteria to continue to write with the same group in the future, 2- Students divide the task and writing evolves through individual contributions, 3- Students plan both the organisation of the groups and the organisation of the common text, 4- Students negotiate roles and semantic content at the same time. Looking at the differences, 1- the two cscw groups needed in average 8.5 hours to complete the report, while traditional groups needed 4.5 hours. Cscw groups had problems to identify paragraphs to be changed in the common file (e.g. group B needed 25 minutes to make sense of comments about a part of the common text). However, traditional groups using less time, obtained a better performance and a better understanding of the report. 2- groups using cscw had problems to integrate the individual parts of the common text. Contradictions and repetitions of paragraphs showed that reports done with cscw tools lack semantic coherence, 3- groups using cscw tools had to use their collaborative activities to organise and to coordinate each others actions while traditional groups focused their collaborative activity on the semantic content of the text, 4- groups using cscw had problems in negotiating roles and ideas compared to traditional groups. For example, to write one paragraph students developed at best 2 exchanges while traditional groups developed at best 12 exchanges -more exchanges can, of course, lead to more complicated ideas being expressed. In addition, groups using cscw respected a prescribed plan of the report given by their professor and they tended to avoid structural changes during the activity. Decisions made were maintained in order to assure a common understanding of ‘who is writing what and where’. Traditional groups showed a great flexibility and made changes as needed of pre-made agreements.

Looking at the distribution of exchanges:

Cscw groups have oriented their exchanges towards actions, that is they have been more concerned with individual actions like coordination, checking and getting information about what is going on. Therefore, the content of the common text was neglected. The manipulation of the cscw tool did not represent a problem in itself. Traditional groups were more focused on the content of the common text first, on their individual actions second, and on the use of traditional writing artefacts, third. These differences have important consequences for the common text. While traditional groups negotiate ideas and actions in order to construct text, groups using cscw needed to check constantly that the collaborative activity, in itself works. These groups spent more
exchanges in getting information about effects of individual actions on the current collaborative activity than traditional groups. For traditional groups, getting information about current actions were implicit. The principal objective of the collaboration -to elaborate the text- has been transformed into a question of how to collaborate. From an instrumental approach, that is interpreted as a failure of collaborative schemes to write a text together. An instrumental genesis takes place when groups use cscw and students have to manage in order to achieve a new organisation. Acquired cognitive and social schemes to write together have been transformed. The differences observed between traditional and cscw collaborative writing activities, are understood as a sign of development of new organisations.

Forms of verbal exchanges showed that traditional groups were much more concerned with the task than the coordination of individual -collaborative- actions. The complete form of exchanges can be interpreted as an indicator of developed reflection on what it was been said by their co-authors. Groups using cscw wrote a descriptive text and not an argumentative one. Putting much more attention on the transformation of strategies to collaborate through the cscw tool, groups using cscw tools have composed and reviewed their common text individually.

5 Discussion

From an instrumental perspective, differences observed indicate that cscw groups were at the beginnings of their appropriation of the cscw tool. They were trying to integrate the artefact into their old organisations which are associated with traditional schemes to write and to maintain relationships. Both social and cognitive routines are being transformed. In this active process, called instrumental genesis, students elaborate new ways to write together through a cscw tool. Obviously enough, these results are still tentative, mainly because in the present study groups were observed only during 15 days. Future longitudinal studies are needed to analyse instrumental genesis over time in order to inform designers about how to support collaborative and cognitive schemes associated with 'co-elaboration' of argumentative texts. However our study helps designers to understand that collaborative writing is a complex cognitive and social activity entailing imagination, creation, discussion, negotiation, coordination, integration, communication and planning, composition and revision. Collaborative writing in educational environments, is a constant co-construction of meanings. This co-construction includes the effort to accept and give opinions, comments, suggestions and to integrate them in a way that has been accepted by the group. It is not only an exchange between questions and answers. It is not a production of a number of lines to fill pages. Collaborative writing is a socio-historical practise. There is a culture to write
together that depend on people, on tasks and on tools. Finally, collaborative writing is a cognitive and socially organised human activity. Artefacts do not become instantly instruments. Humans need time to develop and to re elaborate the new schemes that will be associated to artefacts in order to become useful means of actions.

References


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