INVESTIGATING KNOWLEDGE CONSTRUCTION IN ORGANISATIONAL AND EDUCATIONAL CONTEXTS: A SOCIAL CONSTRUCTIVIST PERSPECTIVE

Dolene Rossi
Faculty of Science Engineering & Health, College of Health & Human Services
CQU, Queensland, Australia
& Faculty of Education USQ, Queensland, Australia
Email: d.rossi@cqu.edu.au

Gurparkash (Guru) Singh*
Faculty of Business & Informatics, School of Management & Information Systems- GroupSolutionS,
CQU, Queensland, Australia
Email: g.singh@cqu.edu.au

Preferred Stream: 13, 6, 9

Profile:

Dolene Rossi is a lecturer within the College of Health and Human Services, Faculty of Science Engineering and Health at Central Queensland University (CQU) and a PhD candidate within the Faculty of Education at the University Southern Queensland (USQ). Dolene has a health care background and is a registered nurse, midwife, community nurse and nurse educator. She has a Master of Science in International Health from Queen Margaret College Edinburgh and a Postgraduate Certificate in Education from Strathclyde University, Glasgow. Her research interests include maternal and child health, health promotion, adult education, learner interaction and knowledge construction within online environments.

Gurparkash Singh is lecturer and a PhD candidate in the School of Management & Information Systems at the Faculty of Business and Informatics at Central Queensland University (CQU), Rockhampton, Queensland, Australia. He has completed a graduate diploma in Information Technology (MAHE, Manipal, India) and Masters of Information Systems from CQU. He is part of Group SolutionS Research Group at CQU and his research interests include knowledge management, collaboration, collaborative knowledge building, and activity theory.

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ABSTRACT *Even for those who embrace a constructivist paradigm there has been a reluctance to examine critically the nature of what is constructed or the manner in which the constructive processes in which learners engage can be related to the processes through which knowledge building is collaboratively undertaken. This paper presents a conceptualisation of knowledge and the process of knowledge construction from a social constructivist perspective and identifies a number of issues that present a challenge when investigating knowledge construction within organisational and educational contexts. The paper extends an ongoing debate regarding the nature of the knowledge construction process and concludes by identifying important methodological implications which can serve as guidelines for researchers and practitioners. Although unplanned, the authors acknowledge that the paper exemplifies the outcome of a collaborative knowledge sharing process. As individuals with similar research interests the authors extend networks across diverse sectors within an educational organisation in order to enhance personal and theoretical understandings of collaborative knowledge construction.*

Keywords: Knowledge construction, collaboration, theory development, research methodology

Current global changes with rapid advances in technology, economy and existing social structures require employees and employers to have the skills necessary to look beyond existing policy and procedures. Within today's society there is a need to develop competencies and practices that extend existing knowledge and provide innovative, progressive solutions to problems. Limited individual cognitive ability (Lehtinen, Hakkarainen et al. 1999) and ever increasing competition have led to an increased emphasis on collaboration and group work as a means of knowledge construction (Savery and Duffy 1996). Dialogue and reflection with peers and more knowledgeable others can bring diverse perspectives and views to the problem space (Vygotsky 1978). Thus collaboration is a critical means of constructing knowledge within organizational (Simonin 1997; Owen 2001) and educational contexts (Stahl 2004).

Computer supported collaborative knowledge construction is an emerging field with an active community of researchers that has emerged in the past decade (Scardamalia and Bereiter 1994; Koschmann 1996; Lipponen 2002). There is an ongoing debate within this field regarding the theoretical foundations in terms of defining the nature of knowledge construction (individual or social cognitive process) and the process of collaborative knowledge construction (CKC). The aim of this paper is to present a conceptualisation of knowledge construction and the process of knowledge construction from a social constructivist perspective, and to identify issues that present significant investigative challenges for professional and educational researchers. The paper is an attempt on behalf of the authors to contribute to the ongoing debate by presenting a model of the CKC process to explicate the complex processes and

relationships in collaborative knowledge construction activities. The issues, acknowledged by the authors' independently and summarized within this paper are conceptual, contextual and methodological. Throughout this paper the terms "knowledge construction" and "knowledge building" are used interchangeably as both constructs are believed to encompass notions of knowledge creation, progressive knowledge building and enhanced understandings through dynamic interactions which are centred on meaning making activities (Gros, Guerra et al. 2005).

THE NATURE OF KNOWLEDGE AND THE PROCESS OF KNOWLEDGE CONSTRUCTION

Wells (1999), maintains that "knowledge" is a linguistic construct that can be convenient for certain ways of talking but that such ways may mislead us into reifying knowledge and separate it from the activity of people knowing in particular situations. This contextual view of knowledge is supported by Buckingham Shum (1999), who suggests that:

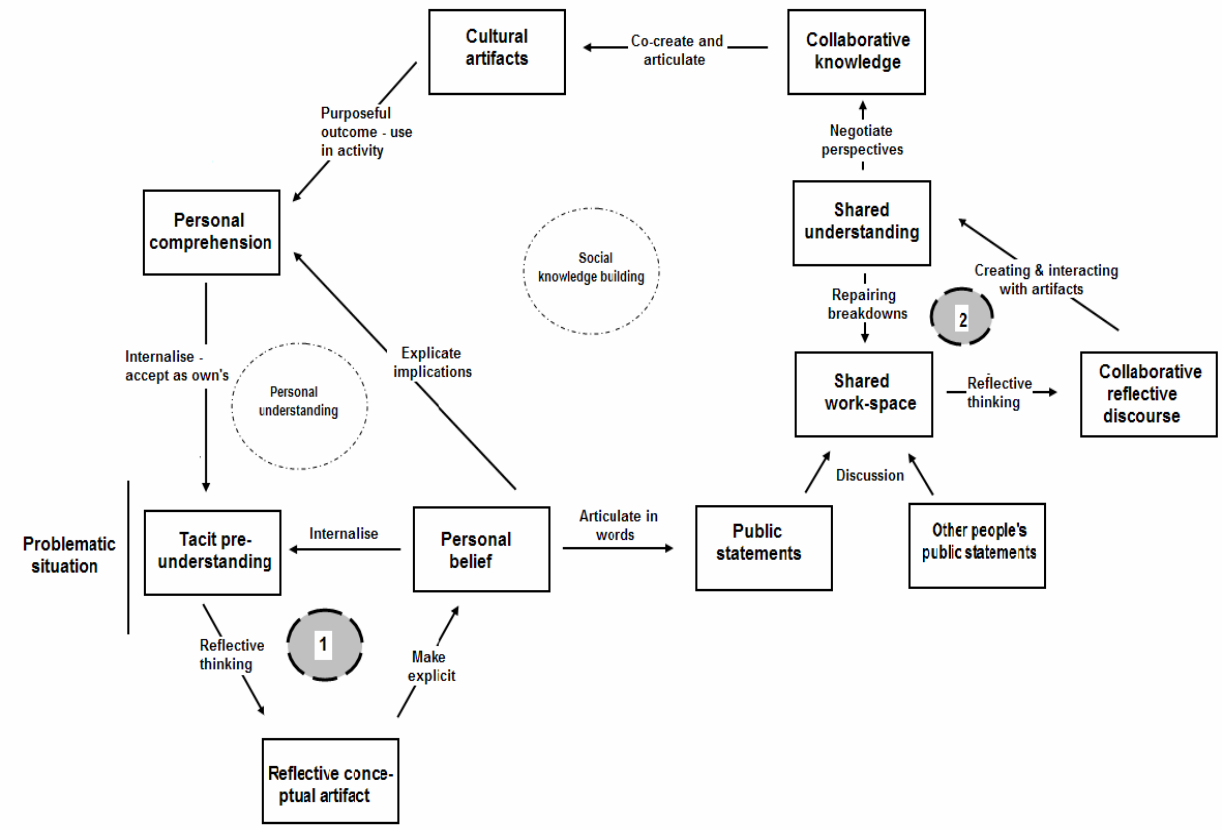
> *Knowledge goes beyond structured data (information) by adding intangible, hard-to-quantify 'value'. When we speak about knowledge we are talking about creativity, timing, judging relevance and reliability, classifying problems and applying lessons learned. Human knowledge is evolving, multifaceted and embedded in social interaction within communities. Meaning and significance are context-dependent properties, not fixed attributes (p. 5).*

Wells (1999) maintains that we do not posses knowledge in a literal sense but that we strategically reconstruct a version of it by using what we can remember to "re-know" in a manner appropriate to a current situation. Knowing can be understood as the intentional activity of individuals, who as members of a community make use of and produce collaborative representations of knowledge in an attempt to better understand and transform their shared world. Thus knowing and knowledge construction can be viewed as a social and situated process that is both intrapersonal and interpersonal in nature. When knowledge is believed to be related to prior experience, learning in a social context can be particularly beneficial because diversity in the learners' knowledge can be utilised to provide a large base of resources or tools for knowledge construction within the group (Kumpulainen and Mutanen 2000), community or organisation.

The process of CKC involves an exploration of issues, an elaboration of individual perspectives, discussion and argumentation, and examination and questioning of ideas through social interactions

(Sorensen and Takle 2002). Stahl (2004, p75) describes knowledge construction as a 'cyclical process with no beginning or end'. The author presents a model which distinguishes a number of knowledge construction processes and incorporates multiple phases which include cycles of personal understanding (individual's role) and social knowledge building (group's role) (Stahl 2000) (Figure 1).

Figure 1: Adapted model of CKC process (Singh, Hawkins et al. 2007)



Arrows – transformative processes, Rectangles – products of the processes

The CKC model (Figure 1) involves processes by which participants work on a shared object or a problem, participant's articulate knowledge and present their perspective to the group, the group engages in discussion on the different perspectives presented, develop a shared understanding (could be developing common terminology, shared perspective, combining perspectives, or moving towards best possible solution), bring about an effective conceptual change in their understanding and collaboratively co-create knowledge preserved in the form of artefacts (physical or conceptual). An important feature of such artefacts is that they may subsequently be used as tools to mediate the achievement of further knowing, either by the original creators of the artefacts or by others who are able to use them to mediate or facilitate their own attempts (Wells 1999). The proposed model is an extension of Stahl's (2000) original model and

includes two additional cycles of reflective thinking activities(cycle 1 & 2, Figure 1). Reflective thinking has been shown to play a significant role in evaluating one's own learning process, (Kim 2005), articulating tacit knowledge (Tillema and Van der Westhuizen 2006) (cycle 1), bringing about an effective conceptual change, and helping achieve shared understanding (cycle 2) (Yukawa 2006). The inclusion of these additional cycles is consistent with the theoretical principles of social constructivism upon which basis the process of knowledge construction is discussed.

From this perspective knowledge construction can be viewed as the appropriation of socially derived forms of knowledge that are internalised over time and transformed in idiosyncratic ways during the appropriation process (John-Steiner and Mahn 1996). The entire process involves social interaction using language, social symbol systems, and artefacts as tools (Stahl 2000, 2006; Lipponen 2002).

Despite the current focus of research studies (Gilbert and Driscoll 2002; Chan and Aalst 2004; Collazos 2004; Aalst, Kamimura et al. 2005) aimed at developing a better understanding of the process of CKC, disagreement still exists regarding the nature and process of CKC (Tillema and Van der Westhuizen 2006) with no clear description of how participants articulate their knowledge, how conceptual change is brought about as part of the process, how groups co-create knowledge artefacts, and how participants develop shared understanding, the role of context and identifying an appropriate unit of analysis (Stahl 2006). The need for developing new tools for analysing and modelling the CKC process presents a considerable methodological challenge for researchers as well as practitioners (Valcke and Martens 2006). The next section discusses these challenges emphasising the value of modelling the process of CKC.

CHALLENGES IN INVESTIGATIONS OF KNOWLEDGE CONSTRUCTION

The predominant issues in investigation of knowledge construction relate to the need to identify how learning and knowledge building is constituted in the interactions and learning activities (context), what is the nature of the interactions (interdependence between individual participants and group) and how participants go about creating knowledge (the process of knowledge construction). As a consequence of the aforementioned issues there has been a gradual shift to more process oriented studies aimed at understanding how the process of knowledge construction unfolds (Dillenbourg, Baker et al. 1996; Stahl, Koschmann et al. 2006a).

Conceptual Controversy

Knowledge is acknowledged as an abstract term, used in many ways to denote different types of information ranging from disassociated facts to explanatory theories as well as diverse skills and strategies (Wells 1999). As a result the process of knowledge construction can be conceived as a complex and multidisciplinary process, which makes it particularly problematic to study. There is ongoing debate about the nature and process of collaborative CKC (Stahl 2006) and it has been suggested that even for those who embrace a social constructivist paradigm there is a reluctance to examine critically the nature of what is constructed or the manner in which the constructive processes in which participants engage can be related to the processes through which the knowledge building is collaboratively undertaken (Tillema and Van der Westhuizen 2006). It is important to acknowledge that there are many versions of constructivism and vigorous discussion, among proponents of different theoretical perspectives, about the way concepts are learnt and the processes through which knowledge is acquired, appropriated or internalised (Bereiter & Scardamalia, 1996 as cited in Wells 1999). Consequently there is no clear description of how participants articulate their knowledge, how conceptual change is brought about as part of the CKC process, how groups co-create knowledge artefacts and how participants develop shared understanding (Salomon 1993).

It is evident from the literature that conceptual controversy is widespread as theoretical confusion and disorder are also acknowledged within the context of organisational learning and organisational knowledge (Easterby-Smith and Araujo 1999). Similarly, within this context, the confusion has been attributed to the many approaches, classifications and typologies associated with organisational knowledge (Chiva and Alegre 2005).

Contextual Diversity

Organisational & educational contexts

Knowledge construction can be conceptualised as an important knowledge management activity within organisations and also as a skill to be developed and nurtured within educational and organisational contexts. Knowledge construction occurs through processes of interaction, negotiation and collaboration (Palinesar 1998) and these activities are fundamental in a range of diverse and multidisciplinary contexts. Stahl (2004) argues that the construction of knowledge is always situated in an activity (could be problem solving, problem identifying, developing new products etc.) and it is the situation that grants meaning to the activity. The environment within which the activity unfolds; that is the language being used, social interaction between participants, artefacts and the tools being used; defines and transforms the context.

Contexts within studies of knowledge construction have received relatively little attention among researchers (Cockrell, Caplow et al. 2000) and traditionally there has been a split in investigations separating organisational and educational environments. Dobson and Gros (2001) have challenged this division arguing that the issues within the two contexts are the same, essentially the issues and processes of knowledge construction transcend contextual boundaries. As greater emphasis is being given to group and collaborative work, there is a need for an integrated approach that will contribute to understandings of CKC in diverse contexts.

Online environments

Technological advances in conjunction with the need for collaboration to extend knowledge have led to renewed interest in computer supported collaborative learning (CSCL) (Koschmann 1996; Roberts 2005) in both professional and educational contexts. Online environments are increasingly utilised in business and education for communication and educative purposes as the medium offers unrivalled access to resources and professionals with diverse knowledge and expertise.

The significance of the context of online environments has been acknowledged within previous studies, not least because they create a unique social climate that impact upon interactions and group dynamics (Gunawardena, Nolla et al. 2001). Computer mediated interaction is acknowledged as unusually complex because of the need to mediate group activity in a text based environment (1985). Within online environments, text assumes the fundamental form of an exchange, representing the dialogue and interaction between speakers; thus text is language that is functional within this particular context. Halliday and Hasan (1985) maintain that description and interpretation of the context will enable the researcher to make predictions about meanings of a kind that will help to explain how people interact and that, if the text and the context are treated as semiotic phenomena, researchers can get from one to the other in a revealing way. That said previous studies have as yet been unable to explain how interaction is used to create knowledge and understanding (McLoughlin and Luca 1999).

Methodological Concerns

Salomon (1993) points out that a scholarly community often settles on an agreed-upon way to view a phenomenon identifies an appropriate unit of analysis and then studies the phenomenon in ways that are congruent with consensually held conceptions. However, Cole (1995) asserts that in psychology, social and cultural approaches remain in a minority and there are no generally accepted theoretical foundations, methodology or delineated set of prescriptions available to relate theory to practice. The fact that researchers are still developing research methods consistent with the assumptions of a social constructivist

perspective (Wertsch, Del Rio et al. 1995; Palinesar 1998) lends support for Cole's (1995) view. Thus there is not only debate in relation to methods with which to investigate knowledge construction but there is also a lack of consensus and ongoing conversations about what constitutes an appropriate unit of analysis.

In describing his approach Vygotsky emphasises the need to concentrate not on the product but on the process of development (Vygotsky 1934 as cited by Zinchenko 1985, p97) and offers an interesting distinction between the outward and internal relationship of a unit.

> *By unit we mean a product of analysis which, in distinction from elements, possesses all the basic properties of a whole. Further, these properties must be a living portion of the unified whole which cannot be broken down further…A psychology that wishes to study complex units must understand this. Psychology must replace methods of analysis that decompose the whole into elements with a method that is based on units. It must discover the indissoluble units that preserve the properties inherent in the unified whole. It must find the units in which contradictory properties appear. It must use this kind of analysis to settle the questions that face us (1999).*

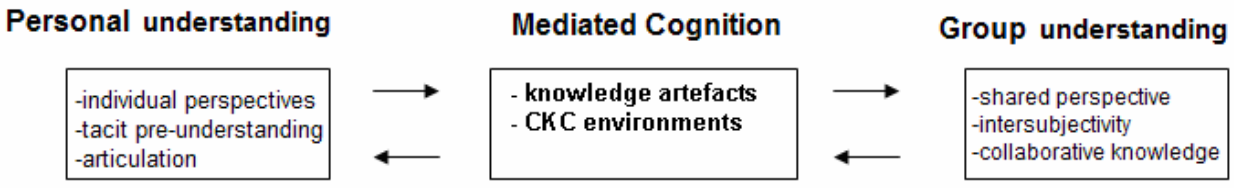
Wells (Leont'ev 1981 as cited in Wertsch, Del Rio et al. 1995) concurs, suggesting that when seeking to understand the nature of knowledge and representation, we should focus our attention on the activity of knowing rather than on the artefact that is made or used. Consequently over time there has been a gradual shift to more process oriented studies aimed at understanding how the process of knowledge construction unfolds (Dillenbourg, Baker et al. 1996; Stahl, Koschmann et al. 2006a).

There would also appear to be agreement about the need for a holistic approach and multiple levels of analysis to account for how action is situated in activity or an activity setting (1995). Rogoff (1995) reiterates the need for multilevel analysis, pointing out that it is incomplete to focus only on the relation of individual development and social interaction without concern for the cultural activity in which personal and interpersonal actions take place and that it is incomplete to assume that development occurs in one plane and not in others without an understanding of such mutually constituting processes. Rogoff (1993) is of the view that orientating enquiries to focus on how people participate and change their participation demystifies the processes of learning and development.

Salomon (1993) also makes an interesting point, relative to the discussion about units of analysis, suggesting that, when phenomena are examined in a new context, they require new units of analysis which in turn may lead to the formation of new perceptions and definitions of the phenomena. Thus changing the unit of analysis or changing the context in which a phenomenon is studied may reveal a qualitatively different phenomenon. It is apparent that the key unit of analysis is not the particular individuals engaged in the activity or the representations contained in their minds but the multifaceted networks of practice that constitute the activity.

To understand the process of CKC it is necessary to examine occurrences in authentic and practical situations, focusing on interactions and tools being used at the group level. According to Stahl Koshmanann et al 'The shared construction of knowledge is most visible and available for research at the group level where it appears as group cognition' (Stahl, Koschmann et al. 2006a, p12). Stahl provides a conceptualisation of this process (Figure 2) whereby the knowledge building that takes place at the group level becomes internalised by individual participants and externalised within their communities as certifiable knowledge. Using an appropriate unit of analysis will help to explain the nature of the CKC process, that is, the relation between individual participants and the group.

Figure 2: Three levels of analysis for knowledge construction process (adapted from Stahl 2000a)



Significant progress in the understanding of the CKC process requires further empirical research that is based on strong theoretical foundations and carried out in authentic and diverse contexts. The studies need to be conducted within educational communities and organisations to understand the emergent nature of the knowledge building phenomena as well as elucidate the role of collaboration. The next section provides an overview of the important implications resultant of the issues discussed in this section that can be used to inform the investigation of CKC.

IMPLICATIONS FOR INVESTIGATIONS OF KNOWLEDGE CONSTRUCTION

The predominant methodological issues in investigations of knowledge construction relate to the need to conceptualise and contextualise the process and to select a unit of analysis that facilitates an integrated analysis of individuals and groups as they engage in the process of knowledge construction (Table 1). The significance of context in relation to learning has been recognised for some time; however previous researchers have had a tendency to examine these contexts in isolation. Modelling CKC, concurrently, in diverse contexts has the potential to contribute to understandings of the underlying processes. However, modelling of this kind is not aimed at generalising the findings to different contexts; rather it should be viewed as a starting point to identify what goes on during CKC with the future possibility of designing scaffolds for the process. Similarly, to assume that the CKC process (Figure 1) follows the same path would be to reify a complex process. But the model does provide a starting point in the development of a cohesive theory and methodology for CKC.

Currently there are few conceptual tools available for practitioners (facilitators, teachers, designers, industry workers, managers) for evaluating the group-work processes (Owen 2001). With increased emphasis on collaboration (organisational and educational contexts) there is an urgent need to model the processes by which groups collaboratively co-create knowledge. Therefore from a practitioner's viewpoint, the CKC model could serve as a self reflective assessment tool to evaluate, support, implement, and improve the collaborative work practices.

Table 1: Basic features for investigating CKC

Focus	Knowledge building
Theoretical foundation	Social constructivism
Methodology	Analysing authentic activities Describing the role of context Group as a unit of analysis Highlighting the interrelationship between individual and group

Modelling the process of CKC is not aimed at generalising the findings to different contexts, but it should be viewed as a starting point to identify what goes on during CKC with the possibility of designing scaffolds for the process. From a methodological standpoint, the CKC model provides researchers with a conceptual framework to analyse the CKC process in different contexts. The model stresses the need to focus on multiple perspectives, the selection of group/s as the unit/s of analysis and analysis of authentic group activities, tracing the development of artefacts (conceptual and physical) and identifying interactive moments of collaboration in order to understand meaning making in the CKC process (Lipponen, Hakkarainen et al. 2004). Therefore the model serves a starting point in the development of a cohesive theory and methodology for CKC.

The authors acknowledge that although intended, this paper exemplifies the outcome and potential benefit of a collaborative knowledge sharing process between two individuals with similar research interests who extend networks across diverse sectors within an educational organisation context in order to enhance personal and theoretical understandings of knowledge construction.

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