THE NATURE OF METACOGNITIVE LANGUAGE AND NETWORKING: DEVELOPMENT OF THE THEORY OF METACOGNITIVE LOCALE

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Abstract

Theoretical developments in education research have established, almost parallel, two strands of theories: theories of networks (e.g., gestalt theory, social network analysis and micro-triad analysis) which explain social interaction among students and theories about meta-cognitive function (e.g. metamemory, metacognition and metarepresentational) which explain the inner workings of the mind. This split between theories (one form focusing on networks and the other on meta-cognition) leaves little room for advancing our understanding of metacognition as a social construct since no theory exists for explaining the relationship between networks and metacognition. In this paper, the author explore four propositions derived from metacognition research to propose a local theory. The four propositions are: (1) metacognitive knowledge, (2) regulation, (3) metacognitive language and (4) networking as constructs of this theory. In particular, the theory of metacognitive locale explains the nature of metacognitive language and metacognitive networks as contextualized in a mathematics education methodology course. Video recordings of lesson study experiences of two groups of final year students were analyzed through social network analysis to visualize their social interaction, and coded inductively to identify specific phrases through which they express their thinking. The results show constructs of metacognition, metacognitive language and metacognitive networking emerge on a social, interpersonal and social-metacognitive stratum which brings the two strands of theories together, thereby narrowing theoretical divide.

Keywords: Metacognitive locale, metacognitive networks, metacognitive language, local theory, social-metacognition.

1. Theoretical orientation

A great deal of research has been done on metacognition (Lai, 2011), making a review of its literature subjective, however far less has been done on metacognitive language and even fewer (to my knowledge only Pasquali, Timmermans & Cleeremans, 2010) on metacognitive networks. For this reason, major sources of metacognition research were drawn on and conceptualised here in terms of four propositions about (1) metacognitive knowledge, (2) metacognitive regulation, (3) metacognitive language and (4) metacognitive networks. The purpose of the propositions is not only to reduce the amount of research on metacognition in thematic clusters but also to show propositions 3 and 4 are necessary to understand the social-network nature of metacognition.

2. Conceptualising metacognitive locale

Clarity is needed as to how social network analysis serves as a form of network theory that emphasises the social interactions and communication between group members (represented by nodes) and their relationships (represented as links) with one another, to express their metacognition. Network theory often describes the patterns of these relationships through a network diagram which consists of nodes and links. Such a network view can also represent patterns of metacognitive thinking where the nodes are visualised as the metacognitive domain (e.g. metacognitive knowledge and regulation) and the metacognitive relationships formed between them, either interpersonal or social in nature.

3. Empirical investigation

A qualitative design allowed insight into the nature of metacognitive language and networking, two novel concepts for understanding the social-network construct of metacognition. To do so, two lesson studies were conducted to explore these concepts and develop a local theory about students teachers' metacognitive locale, a conceptualised theoretical social-network dimension of metacognition. Data were

collected by means of audio-video recordings of a series of lesson study design sessions (for clarification regarding the lesson study sessions please refer to Jagals (2015).

3.1. Sampling of the two lesson study groups

All fourth-year university students who registered for the intermediate and senior-phase mathematics methodology module were invited to take part in the research. Their curriculum content included lesson study as a developmental pedagogical tool through which teachers can collaborate and design lessons together (Rock & Wilson, 2005). The study began by purposively inviting two volunteering groups of students who were instructed to plan, design, present and refine a Mathematics lesson suitable for a Grade 6 class at a nearby primary school. Participants' involvement in the module made them particularly useful as key role players in this research because of their familiarity with lesson study's conduct, which has an underlying social and metacognitive nature. The ethnically diverse group of participants represented both male and female students who spoke Afrikaans, English and/or Setswana as home language.

3.2. Data collection and analysis

Participants were encouraged to think aloud and share ideas during a series of four design sessions, mimicking the lesson study phases of Rock and Wilson (2005). Both groups were expected to collaboratively (1) design, (2) present (3) refine and (4) re-present a lesson for Grade 6 Mathematics on the topic of Place Value. The idea of the design sessions was borrowed from the work of Cobb, Jackson, Smith, Sorum and Henrick (2013) and added validity and trustworthiness to the data as these sessions resembled multiple perspectives. The sessions' transcriptions were analysed by following a three-step set of data analysis procedures offered by Jagals and Van der Walt (2016b), and Jagals (2015). In doing so we coded the transcribed conversations of each design session in Atlas.ti, followed by the exporting of the coded data and preparation of the nodes and vertices' columns in Excel. The three set steps of qualitative data analysis procedures by Jagals and Van der Walt (2016b) were used. First, qualitative social network analysis were conducted to determine the nature of the social relationships between participants in the two groups. Second, the transcriptions were coded through in analysis based on a-priori coding for metacognitive networks by Jagals and Van der Walt (2016b). Third, through NodeXL's (a social network analysis add-on for Microsoft Excel) data were filtered to identify interpersonal and social metacognitive language statements (e.g. I think … or: we feel …).

4. Findings

Since the social-networking character of metacognition, and the metacognitive language used to express this character drives the argument to develop the theory of metacognitive locale, the propositions discussed above provide the structure in terms of which the findings are presented.

4.1. Proposition 1 – Metacognition is individually and socially mediated knowledge

Not being able to express their reasoning clearly, and lacking the vocabulary of their thinking about their thinking, participants explained that even though they worked together, they often became frustrated when their ideas were not understood or   ecognized:

> *But we do not understand what each other means. I don't know what they don't know and what someone else is thinking about my idea…we had too many good activities and we do not know how to say that we do not want to use this or that idea…*

Discussing what their lesson plan's outcomes should be seemed to have presented them with a problem, not only for interpreting the curriculum documents, but also to put down in words a clear and explicit lesson plan and to communicate about what they expected from their learners at the end of the lesson:

> *We have an outcome, we want them to be able to identify and apply…The outcomes must be smart. It must be specific, measurable, attainable, relevant and traceable…so we have to look at it again…*

The social construct of their metacognition also developed along with metacognitive language.

4.2. Proposition 2 - Metacognition is individually and socially regulated

4.2.1. Metacognitive networks. Group members later decided to work with each other's ideas, and not necessarily to come up with new ones all the time:

> *We are all here, we know what to do. We have to take everyone's ideas into consideration…We started with an idea and talked about it and made a*

combination of all the ideas. It helped us to understand the concept better… Lesson study is difficult if one student feels separated from another… When we get together we can say, this stuff works great and then we take other ideas and we build on that.

Group members had realised what their strengths and weaknesses were, and that the nature of their networking was likely to be key to overcome the barriers group members had during the sessions.

4.3. Proposition 3 - Metacognitive processes can be expressed verbally by means of a metacognitive language

In Group A, one student urged the group in the beginning of the session to expand on their idea for a lesson. He did this by using a mental verb:

I think we can perhaps begin by expanding what we know.

This was followed by another student who talked about "we" and used this social language to highlight what they knew and do not knew:

We said in the introduction that we will test their prior knowledge. But how are we going to test their prior knowledge when we are there?

Her question was almost immediately answered by another student who expressed her metacognitive knowledge through pedagogical language, hinting on her theory of mind:

We have to look at what level they are on.

4.4. Proposition 4 - The epistemic context-specific metacognition is a local construct that can be represented as a metacognitive network

The findings of the four propositions outlined above can be positioned on three cohesive theoretical networks, identified in this study as strata 1, 2 and 3 as an attempt to outline and construct a topology of metacognitive locale.

5. Discussion

Some studies have shown that teachers' metacognition is not adequate to model metacognitive thinking (Jagals & Van der Walt, 2016a), yet the way in which metacognition is expressed, observed and documented may be an underlying cause for this crisis.

First, metacognition can be regarded as individually and socially mediated knowledge, with the assumption that metacognition consists, in part, of a knowledge domain. Second, metacognition is individually and socially regulated, posing a second domain to its character as a regulation of the knowledge. Third, and this is a somewhat novel understanding, is the assumption that metacognitive processes can be expressed verbally by means of a metacognitive language. The fourth proposition assumes that metacognition is a local construct, meaning it contains context-specific epistemic metacognitive knowledge and regulatory components that can be expressed as a metacognitive network.

Barabasi (2011) explains further that networks exist because of the growth in knowledge, ideas and influence. It seems as if the result of such social interaction in a learning context can produce awareness of the metacognitive knowledge and regulatory domains, as the findings of proposition 1 and 2 show. This individual and socially mediated nature of knowledge and regulation can, however, be expressed through a metacognitive language as posed in proposition 3 and, as a result, shape the metacognitive networks formed in that context as implied in proposition 4. Together, the four propositions with their underlying assumptions suggest there is a typology involved in the architecture of metacognition's social-network character. For the sake of reference, let's call the collection of these networks *strata*. Based on the natural flow of information that is exhibited in social interactions, the first strata can represent, theoretically, an abstract view of the social network. Through social interaction participants in this study reflected on their own and each other's comments during the lesson study design sessions and, in doing so, they expressed through a metacognitive language an individual (e.g. I am…) or social (we are…) metacognition as the findings of proposition 3 show.

Stratum 1 would involve the metacognitive domains of knowledge and regulation that are socially mediated through social interaction. It refers to the social sphere of metacognition and encapsulates propositions 1 and 2. Stratum 2 represents the interpersonal metacognitive networks, expressed through participants' metacognitive knowledge as claimed in proposition 3. Stratum 3 shows how social interaction as well as impersonal metacognitive networks come together to form a social-network metacognitive dimension of the metacognitive locale.

The findings obtained from exploring these propositions reflect the social-network character of metacognition and are conceptualised in this paper as a theoretical dimension of metacognition. This theory of metacognitive locale explains the interrelated nature of the relationship between the constructs

of metacognitive language and metacognitive networks as represented in the topology of the metacognitive locale. To apply the theory of metacognitive locale across contexts, one should keep in mind that this dimension of metacognition is developed in and is thus suitable for use in the conditions where: theory is to be developed about metacognition, methodological contributions are desired to study metacognition's social-network construct and its development in social contexts.

The theory of the metacognitive locale is therefore contextual and limited by the didactical environment or the theoretical variables (e.g., instructional philosophies) in that environment.

6. The way forward and conclusion

To advance the applicability of the theory of metacognitive locale, the following recommendations are proposed for future research. Concept analysis of metacognitive language and metacognitive networks can inform the development and refinement of the theory, particularly in different contexts. The findings of this study can also be interpreted from a structuralist or post-structuralist perspective, focusing mainly on the taxonomy of different possible metacognitive network structures and the metacognitive language used to express them. This will enable teachers to implement a meta-curriculum that promotes the expression of metacognitive thinking as an individual, social and social-network construct. Educationists can also focus on the preparation and delivery of a curriculum that promotes social metacognition to instil a network view on learning. This study was an attempt to show how a social-network understanding of metacognition could develop a new theory that could lead to, at least, two results important for collaborative learning in group settings in general, and the preparation of teachers in particular. The use of metacognitive language in social settings can promote growth in metacognitive awareness of self and others and transcend to a higher level of socially shared metacognition. In doing so, and with some metacognitive reflexivity in mind, this higher-order thinking in social settings can be mapped as, perhaps, a new façade of learning in a cosmopolitan future.

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