

## Chapter 5

# *Collaborative concept mapping: An education research team leveraging their collaborative efforts*

**Mark A. Tyler & Linda De George-Walker**

*Collaborative concept mapping (CCM) has been a tool deployed by educators to enhance learning in such situations as primary science classes, supported learning environments and asynchronous computer-mediated learning. Of its outcomes, CCM has produced rich group discussion about ideas and possibilities pertinent to the topic or problem at hand. The majority of research into CCM has been explicitly pointed at enhancing learning. This chapter takes a different tack by reporting on how the authors used CCM to seek understandings of its utility in enabling collaborative research by creating synergies within a research team located in the Faculty of Education at the University of Southern Queensland. The following questions were used to focus the research:*

- What was the research team's experience of collaborative concept mapping?*
- What propositions did the team construct about teamwork and collaboration?*
- How did the interactions among team members facilitate meaning-making about teamwork and collaboration?*

*The data consisted of this team's collaborative concept map and recordings of the dialogue during the process of constructing the map. Analysis revealed the team's emerging propositions about teamwork and collaboration and also contributed understandings of the co-constructed patterns of talk that produced this dynamic map. The chapter concludes that collaborative concept mapping is a useful tool for research and other team development, and possibly for the collaborative conceptualisation of future team research projects.*

## Introduction

In the seminal work of Novak and Gowin (1984), concept mapping was deployed as a specific strategy to enable students to “get better control over [their] educational events” (p. 1). Essentially it was seen as a strategy to enable learners to learn and teachers to organise learning material. It consisted of a procedure where concepts, generated from a particular knowledge domain, were organised in a hierarchical fashion and connected through a series of links to form particular knowledge propositions. From this structure or schema, students and teachers moved to what Novak and Gowin called “*shared meanings and feelings*” (p. 1, *emphasis in original*). Hence, by exploring meanings and structure, students had better access to the knowledge that they were seeking to understand.

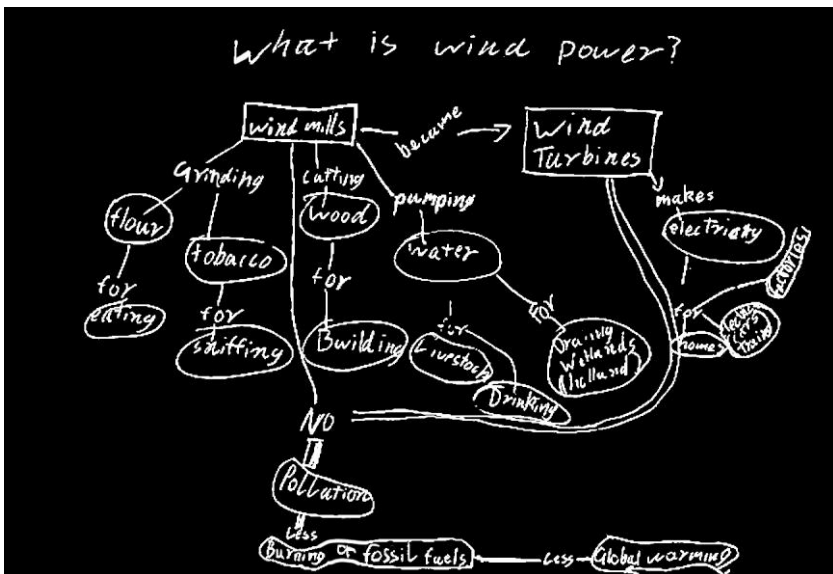


Figure 5.1. A child's attempt at exploring wind power through concept mapping

Figure 5.1 illustrates a simple concept map that one of the authors facilitated with his son. In this figure we see the primary concept of *wind power* being explored by selecting to break it down into the components that catch the wind energy and perform work. Essentially we see a child's attempt at externalising and connecting concepts in order to improve thinking about propositions around wind power. This is necessarily a constructive process.

From Novak and Gowin's (1984) work, the authors share the position that knowledge is constructed and that this begins with the observation of events or

objects. Attempts at making sense of these events and objects are made using the concepts already acquired. Further, new events or objects become concepts because they occur with a particular regularity, to which is designated a label – the concept. It is from the accumulation of these concepts and their related understandings that we obtain degrees of mastery. Novak and Cañas (2008) equate this with meaningful learning (Ausubel, 1968), where learning can be facilitated from reception, or rote, learning, towards discovery learning.

The application of concept mapping to learning environments has been extensive and varied. Its deployment in schools appears successful. Watt (2002) noted the enthusiasm that concept mapping generated in his classroom. The energising effect of the brainstorming phase, and its reinforcement of concepts through transcription onto post-it notes enhanced not only the introduction of new units of study but also the depth of exploration of new concepts. Success in schools is further exemplified by Chittenden (2007). As a science teacher he used concept mapping to clarify the principles of electricity. He equated the process with the KISS (keep it simple, stupid) principle and used the organising question “Don’t get zapped. What does this mean?” (p. 59). Even though it was a Friday afternoon lesson, Chittenden concluded, “it was working” (p. 59). Perhaps more circumspect is the work of Askell-Williams, Lawson and Ellis (2008). They stated that in their research there was a developing trend, as opposed to strong data, that explicit instruction using “visual representations [such as concept mapping] provided students with an additional strategy for learning” (p. 18).

The positive experiences in the use of concept mapping have not stopped at the school gate. Tertiary education too appears to have benefited. Kuhn and Davidson (2007) have used a computer software version of concept mapping as a reflective tool to enable university students to obtain a deeper understanding of qualitative research methods, suggesting that it moved learning into the tacit realm and in this case hastened students’ “methodological expertise” (p. 64). Turner (2007), seeing concept mapping as a contemporary theory of information design, deployed it as a resource to assist academics in writing online learning resources. Francis (2007) also used concept mapping to give useful and meaningful information to faculty about student assessment, claiming that “concept maps represent authentic views of undergraduate knowledge” (p. 70).

At this point it is valuable to note the similarities and differences between concept mapping and another knowledge mapping process referred to as mind mapping which was developed by Tony Buzan (1976). Both concept mapping and mind mapping are used to visualise, organise and represent knowledge. Brinkman (2003) explains that mind mapping begins with a topic placed centrally (rather than at the top in the case of a concept map) with branches radiating from this central point for each of the main ideas. Secondary branches can extend from these main branches and so on to reflect sub-topics. Colours,

symbols, drawings and so forth are encouraged when mind mapping but do not feature on concept maps. Apart from these obvious format differences between concept mapping and mind mapping, different knowledge outcomes result from the two processes. When concept mapping, the relationships between the concepts are fully described with the use of linking phrases or words which in turn indicate propositions or meaningful statements about the connected concepts. While portions of the mind map are associated, the links and connections between elements in a mind map are not as explicitly sought nor recorded; thus the relationships between the elements may not be fully explored or the propositions may be obscure (Brinkman, 2003). With an interest in exploring and representing shared meanings and propositions about *teamwork*, the authors have focused on concept mapping instead of mind mapping.

As is evident in the title of this chapter, the authors' interest also lies in the collaborative aspects of concept mapping. Collaborative concept mapping (CCM) is the use of concept mapping in pairs or small groups. Basque and Lavoie (2006) provide a detailed overview of CCM dating back to the late 1980s. These authors cited 39 studies into CCM with groups ranging from 15 to 808 participants. The results of these studies were expressed as the effects of CCM on task performance, learning, and on interactions between participants. All of the studies cited produced variance but essentially positive results – for example, “that a shared mapping mode . . . resulted in better performance” (p. 3) and “groups which generated CCMs [collaborative concept maps] performed better at problem-solving than groups which simply completed CCMs” (p. 4). With regard to the last of the result categories, interactions between participants, the following interactions were noted:

- sustained discourse
- on-task group focus
- the piggy-backing of ideas or the continuing of others' contributions
- co-constructed reasoning
- an instance of the laboured negotiation of ideas by adult participants where one member of the group led the concept mapping exercise (Chang, Sung, & Lee, 2000 in Basque & Lavoie, 2006).

It is these types of interactions, informed by the sociocultural processes of language, dialogue and socially constructed knowledge (Vygotsky, 1978), that were of interest to the authors of this chapter. As with Kuhn and Davidson (2007), the authors saw the benefits of CCM as a means through which: support could be given for individual reflections by each research member on her or his sense of *team* and how this is interdependent with other members' perspectives; team members are invited to work as a microcosm of a learning community (Laufgraben & Shapiro, 2004); the team makes public their collaborative research efforts; and a valuable artefact (a shared concept map) is constructed and utilised.

---

Thus, the authors sought to examine the use of CCM as a potential tool for enabling a team of researchers to explore, create and document the synergies in their understandings of collaborative teamwork. The following questions were used to focus the research:

What will be this research team's experience of CCM?

What propositions will the team construct about teamwork and collaboration?

How will the interactions among team members facilitate meaning-making about teamwork and collaboration?

In the proceeding sections we provide a brief background and context of the team and describe the means through which CCM was actioned within the team. This is followed by rich description of the experience and an analysis of the outcomes in terms of the team's propositions about teamwork and how the interactions facilitated meaning-making. We conclude with comments about the opportunities that CCM presents for this team and other education research teams.

## **Our research team**

The "Capacity-building, pedagogy and social justice research team" is located in the Faculty of Education at the University of Southern Queensland. The team was formalised in March 2009 after a process of successfully applying for recognition and funding from the Faculty of Education. At the time of writing, there were seven members in the team – six continuing academic staff and one contract academic; three of the team members were also Doctor of Philosophy students. The research experience of the team members ranged from early career researchers to senior researchers; and the professional experiences and background of the team members were diverse, including early childhood, vocational education and training (VET), literacy and psychology.

Prior to becoming a team, the members had researched and published together in pairs or trios, but not as a larger group. During the first few meetings of the research team, the members engaged in individual reflection and shared dialogue about expectations, goals and the skills they each felt they could bring to the team. The CCM exercise that is described below occurred about five months after the team's formation.

## **How concept mapping was deployed in our team**

The CCM process took place during two sessions one week apart. The first session was of approximately one hour's duration and the second session of approximately 30 minutes' duration. At the first session, five team members were present in person, one attended by phone and one team member was absent owing to unexpected illness. For the second session, six team members were present in person and one team member was absent owing to other commitments. The process of constructing the team's concept map was similar to the process described by Novak and Cañas (2008). On both occasions the sessions were audio-recorded and digital still images of the map were taken at the end of the session. Participants, excluding the authors of this chapter, have been given pseudonyms so as to offer anonymity to their contributions, as required by the university ethics review committee. The concepts that emerged from the process and appear in the map are formatted in *italics* throughout the text for convenience and clarity.

We, the authors, were the facilitators of the process and as team members were also participants in the process. From this, a participant observational perspective (Silverman, 2010), our role was to engage in an ethnographic immersion (O'Leary, 2010) to highlight the elements of CCM pertinent to this team. Our interpretative enquiry uncovered the complexities and variability associated with this socially constructed phenomenon and, as we were the primary research instruments, it was from our reflexivity with each other, the process and its participants that we produced the following rich description (Denzin & Lincoln, 2000).

### ***Session one***

At the beginning of the first session we, the authors, sought formal consent from the team members and gave general guidance about the process. This included talk about the exercise as being the brainstorming of particular concepts that had meaning for the group, and seeking to connect these in order to produce propositions that answered the question "How do we team?"

After some general clarifying questions, the team went to work writing the concepts onto post-it notes. This was quiet, reflective work. In silence members reflected and penned those concepts that had a personal individual connection to the question. These were placed in the central "parking lot". Examples of the concepts that began to congregate were: *deep discussion, listen, build capacity, capability, collaboration, talk, lifelong learning, distribution of tasks and sharing of ideas.*

Light discussion began to ensue – for example, Kim pointed out that it would be easy for her to relate the concepts to the various contributors. The penning continued. Frances, who was connected by phone, added some of her concepts: *responsibility, coffee, sub-teams, reciprocity and relationship.*

As Frances was connected by phone, a last-minute decision was made to take photographs (electronic images) of the developing concept map and to send them to her via email so that she had an almost real-time visual reference to what she was contributing and also to the general overview of the developing map. Unfortunately this did not prove satisfactory. It was found that the computer camera produced only a mirror image of its subject; hence the written words appeared in the photo in their mirrored form. The member could not decipher this easily. Using a bathroom mirror proved too cumbersome! The exercise was to be conferenced through Skype (an internet person-to-person communication protocol) but unfortunately the expertise with regard to its set-up and operation was not available at the remote site. Consequently, the flow in generating the concepts tended to be slightly staccato. The result was that some members engaged in some aside conversations whilst the technical issues were worked through.

The next phase was arranging the concepts into a loose resemblance of a map. Discussion began over the type of concept(s) that represented the upper point of the hierarchy. This discussion was about whether or not the group wanted tasks, attributes, values or themes as the highest concepts. Questions were asked by various group members that prompted deeper thinking about the type of higher order or meta-concepts – for example, “Should these concepts have idealistic or realistic themes?” and “Have we considered whether or not we want to divide the concepts up into social/academic and personal/professional?” These questions and others like them did not appear to be resolved but their use as rhetorical prompts appeared successful.

The group moved on to four concepts that all agreed were important: *heteroglossia* (Bakhtin, 1981, the co-existence of different voices), *trust* (its establishment and extension), *energisers* and *celebration*. It was noted with regard to the latter that the concept of wine was an important collaborator. The concepts associated with socialising were discussed – in particular the concept of *fun* and the need to enhance the social/relationship needs of the group. Knowing group members beyond the point of just work colleagues appeared to be important.

At this point a moderate shift in focus took place. It was suggested that the top concept be *education* because of its connection to members’ *work* and the *relationships* that formed as a result. It was this link, between what members do – educate – and the relationships that they formed with one another, that offered members new sets of values to consider. It was these encounters with one another that prompted members in *meaning-making*. Rex put it succinctly: “Making meaning is how as individuals we engage with the world and also how we engage with others. To me making meaning underpins education, lifelong learning, respecting other people, relationships and so on”.

Group members were unanimous that *making meaning* was to be the top concept. Cayleen suggested, “We don’t ‘do’ unless it has meaning.” Discussion then moved to the next level of the map. Concepts such as *lifelong learning* and *learning* (about others) were mooted. Intertwined in this exchange was the perception that *learning* was considered more inclusive than *education* and that *lifelong learning* has been “overused” and underdone. Nevertheless the first two tiers of the map began to consolidate with *making meaning* at the apex and *lifelong learning*, *learning about new points of view* (or open-mindedness) and *learning from others* emerging as important propositions. Kim immediately moved into extrapolating *open-mindedness*, suggesting that “we could link this with *authenticity*. But it is really interesting because authenticity links with a number of these other ones [concepts].”

At this point an abrupt shift in direction took place with the question and answer put by Frances: “How do we ‘do’ team? One way we ‘do’ team is through our *values*.” Another lively exchange took place:

“A string that comes off values, then we list some of the values.”

“They don’t hang off, they drive.”

“Values are up there with *making meaning*.”

*Making meaning* was displaced by *values* as it was conceded that values gave the group particular meaning. For example, did the group value process or product, individual or collective? They decided that “process” and “collective” were what they were “on about . . . otherwise we sell ourselves short.” The following values were listed as concepts important to the group: *respect*, *reciprocity*, *responsibility*, *forgiveness* and *recognition*. Under these concepts additional concepts congregated – for example, under *respect* were: *support*, *listen* and *talk*; under *recognition* were: *celebrate* (together). This was further broken down into *wine* and *coffee*.

The remainder of the session was a shared process of selecting an apparently applicable concept, negotiating its placement, and then searching for other concepts that “felt right” alongside or under it. What was apparent in this exercise was the existence of a greater focus on developing a parking lot of appropriate concepts, and then placing them in related groups of concepts that exhibited some resonance. The group did not explore the reason for this resonance to any great depth. What the group produced in one hour was a partially completed concept map with 44 concepts, loosely joined by some connecting words. Most concepts clustered in homogeneous groups that had few connecting words which would make it difficult for any non-group member to make meaning out of any possible propositions around *teaming* that the map attempted to illuminate. At the conclusion of this first encounter with this exercise, it would be fair to suggest that this was clearly a “work in progress” concept map. The concept map was developing sophistication, yet a number of concepts remained unexplored in depth and disconnected.



---

## Session two

This session began with the authors outlining the CCM process that had commenced the previous week. The beginnings of the concept map and the parking lot concepts were laid out as they had been at the conclusion of the previous session. We, the authors, drew attention to the considerable number of concepts that had been generated in the previous session. We also highlighted that only a few links between the concepts had been generated, and explained that clear concepts and linking words were required to develop propositions and a concept map that works. The session objectives were stated as: (1) to allow Frances who had been connected by phone in the previous session to view and add to the map; (2) to give Zach a chance to contribute as he had been absent from the first session owing to illness; and (3) to focus more on the connections between the concepts to develop the propositions. After this the team were reminded of the focus question “How do we team?” and the team’s decision at the previous session for the most general and top-level concept of the map to be *values*. It noted that further concepts could be added to the parking lot if needed, and that an outcome of the process was to be a concept map that would be provided to all team members and become an artefact that the team might wish to revisit in the future. The overall aim was stated as being to develop a shared understanding of what the team is about.

Rex set in motion the process of continuing to build the map by referring to the Bakhtinian concepts in the parking lot – *heteroglossia*, *unfinalisability*, *dialogue* – as relevant to teaming. As the talk turned to finding a place in the map where these terms might fit, Frances sought the meaning of the term *heteroglossia*. Following an explanation, the terms were initially placed near the concept of *talk*. The group then proceeded to consider the hierarchy of these concepts, beginning initially with the order of *values*, then *talk*, then *heteroglossia*. As the team grappled with the hierarchy, further questions and discussion helped to clarify: Frances queried whether *heteroglossia* was a *value*, another team member suggested it could be valued, another queried whether it was a descriptor and another contextualised the term with an example. *Going deeper* was proposed by Rex as a solution to the placement of the concepts on the map and he suggested the following order after *values*: *talk*, *dialogue*, *heteroglossia*, *unfinalisability* (the last word is never spoken). A link between *unfinalisability* and *flexibility* was noted.

It was at this point that we, the authors, prompted the group to consider how the concepts connected in terms of propositions. Some further clarification about propositions and linking words was sought by the team and the following examples were generated with reference to the concept map:

“Values are understandings which produce our authenticity.”

“Values are valued because talk and dialogue produce heteroglossia . . . which has as its central element unfinalisability.”

“You could do it exactly the opposite starting at the bottom . . . valuing unfinalisability . . . then leads to an acceptance of heteroglossia which opens up dialogue and we talk.”

The group pace slowed at this point as a few linking words were jotted on post-it notes and added to the map. This also seemed to provide the group members with a chance to reflect on the propositions, after which there were several attempts at trying to establish more precision in the linking words and propositions. The group experienced some difficulty in reconciling the connection between *talk* and *values*, and shifted focus briefly to consider the origins of the word *talk*.

At this point the propositions were left unfinished and another shift in focus occurred with a prompt to consider if any other terms remaining in the parking lot should be shifted to the map. *Learn about others* was raised in relation to whether a concept could appear twice on the map, or whether to reflect this using linking words and arrows. There was support from most team members for concepts to appear twice.

The direction then quickly shifted as a section of map lacking any connections was highlighted: the section with concepts of *lifelong learning*, *flexibility* and *mentoring*. *Fun* was then raised as having sparked considerable conversation in session one and whether the team should return to this concept and “do something with it.” As in the previous session, this concept opened up substantial conversation. It was suggested that *fun* links to *relationships*, and that *fun* is one way of sustaining energies, possibly a *common goal*, possibly a *value*. It was then that a key question was posed: “Is that [fun] almost our central concept?” There was some hilarity at this suggestion after which yet another question was posed: “Is it wrong to have fun?” In response, the team discussed outsider views of work needing to be serious, not fun, and “fun is [considered] frivolous.” Some connections were made with a recent educational authority presentation where fun might have been considered a dirty word. After a brief period of off-task discussion focused around the educational authority presentation, the group was brought back to task by one of the team who returned to the question posed about *fun* as a central concept. The group response was “only if we can make it serious enough” – that is, linking it to sustaining *energy*, building *relationships* and people’s aspirations, and as a way of opening up *dialogue – heteroglossia*. In this sense *fun* was proposed as a tool, but there was some dissent from this utilitarian view. Zach suggested: “There’s a synergy that we sense that fun is an underlying value we share rather than a tool we choose to use.” Linda responded: “It [fun] might not be all it means to us but there is some concern in giving it value to those outside the team and maybe that’s where being utilitarian – that might have value to others maybe.” This was identified as a very important point – that is, parallel, dual and triple meanings can operate simultaneously.

Rex then redirected attention to the parking lot and the remaining terms, in particular *transformation*. The deliberation around this concept was initially in relation to learning: “*Transformation* is one kind of learning we can engage in, and *lifelong learning*, to be called lifelong learning, needs to be transformational.” *Transformation* was then connected to *values*: “It [transformation] can become one of our *values* because it drives us and motivates us to think in particular ways.” And finally a significant tension was recognised between the concepts of *transformation* and *common goals*. Zach described the tension as: “This is me and what I’m bringing and I have this goal, yet at the same time I’m open to hearing other voices and engage with others, which is a transformative experience.” Mark followed on: “I think this is a great example of social interdependence. I’m very much dependent on everyone in this room in order for me to be able to deal with the tension between transformation and the common goal and my personal goals.” A similar type of tension was also raised between *fun* and *seriousness*.

It was at this point that the suggestion was made by Mark for the team to return the concepts to the parking lot and attempt another concept map to see what happened. The concept of *unfinalisability* was referred to as a good reason for repeating the map and that we “could end up with something, but that something could have been something different. It could be of value to explore what other way it could be.” As time had run out there was support expressed by the team members for revisiting the map at another time. It was noted by one of the group that many concepts on the current map were not yet linked, and another commented that what we had was a great place to start.

As photographs of the map were taken which signaled the end of the formal part of the task, informal discussion turned towards the final product and aspects of the process. A comment was made about the round table influencing the umbrella-like shape of the map and the possibility that this could be a metaphor. In response we, the authors, noted the use of the table in preference to the white board to ensure the hands-on participation of all team members. Frances referred to the parking lot as “a hugely useful device” which she had recently suggested to a student who was concerned about discussions in the adult learning environment getting out of control. She had discussed with the student the notion of the parking lot as a place to park ideas and show that they were valued but not necessarily going to be able to be dealt with at that time. A final point was raised that, if we were to treat ourselves as we treat our students, we would make links between the concepts generated and theorists, and with a cross-section of disciplines like psychology, literacy and VET within the team there was a query about how that influenced the connections.

By the end of session two, the concept map was more developed. A number of concepts remained unexplored in depth, some lay disconnected and others, a work in progress, are illustrated in Figure 5.2 as grey nodes with no labels.

## What our collaborative concept map illuminated

The preceding section focused on rich description to illuminate this research team's experience of CCM. In this section we respond to two questions. The first relates to the propositions produced by the collaborative exercise and the second to how the interactions facilitated shared meaning-making.

### ***1. What are the propositions the team constructed about teamwork and collaboration?***

If a literal perspective on the aim of concept mapping is taken, one aim is to construct particular propositions about how various important concepts are brought together to make claim, in this case, to a shared perspective on how our team collaborates. Figure 5.2 represents the work in progress case for this team. The construction of propositions around the question "How do we team?" were:

- *Values are forgiveness, recognition, responsibility, reciprocity, trust and respect;*
- *Authenticity enables meaning-making;*
- *Authenticity is a requirement to establish and extend trust;*
- *Authenticity is defined as talk, support, listen, share, shared responsibility and shared celebrations, collaborations; and*
- *Flexibility is lifelong learning is learning about new viewpoints and values is learning from others.*

There was an attempt to link *values*, the top concept, with *authenticity*, a second-tier concept, by using the words *understanding* and *awareness*. But these were not verbs, adverbs or prepositions and hence lost their potential for forming a clear proposition. One assumption is that, as a value, *authenticity* requires degrees of understanding and awareness. This relates particularly to an interpersonal position that privileges the construction of identities that value certain ways of interacting. This position, engaging authentically, is a preference for the team.

As is visually evident in the map, the team was busy with discursive work in relation to the concept of *authenticity*. It was connected to a position on trust – that is, to establish it and extend it – and also to notions of trust being flexible. *Authenticity* was also connected to *talk, dialogue, heteroglossia* and *unfinalisability* through space apportioned for using connecting words after *talk*, but with no actual propositions finalised. In this string of concepts, the recording of the meeting gave clues as to how these concepts were linked and the degree of importance they had for the team. Enabling a process for valuing the many voices expressed by team members was of high importance.



Several other unfinished attempts to make propositions were evident. *Establishing* and *extending trust* were connected by a two-way arrow with *values*. The unfinished connection was between *learning from others* and a concept within its sub-tier, *mentoring*; and a *commitment* and *relationship* proposition lay unfinished towards the bottom half of the map. Whereas these unfinished strings did not offer any clear, concise propositions, they did imply a specific hue to the shared lenses of the team. What was emphasised was valuing trusting relationships among team members in which they felt free to act authentically and this required particular talk/dialogue within a context or environment where all voices were heard. So too holding individual perspectives that were open-minded to the point that the team as a whole agreed about the unfinalisability of opinions, frames of reference and the evidence that informs judgements.

Even though they were not connected directly, there were concepts that highlighted the importance of the personal and the social to the team. Building to the left from *talk* were *support*, *listen*, *share*, *shared responsibility* and *shared celebrations* and *collaborations*. These appeared as the doing of authenticity, the “stuff” members had to engage in as a part of their engaging authenticity. This reverberates like a sonar ping off the lone unfinished proposition connecting *commitment* with *relationship*. This theme of the interpersonal is again evident in the lower right quadrant of the map.

In a line extending from *friendship*, located to the extreme right, were concepts that added strength to notions of remembering to celebrate the success of individuals and the group. These included: *having fun together* (one of a few propositions written as a single concept), *wine* and *coffee*. The concept *build capital and capacity* stands alone, just to the left of this group of concepts and at the bottom of the map. It appears as a full stop, suggesting that this alone is what the team is endeavouring to achieve. But this full stop did not have an essence that halted perspectives, nor was it a clear marker of the end. It was more a bold statement, a strong announcement of intention that implied energy, action and progress.

## ***2. How did the interactions among team members facilitate meaning-making about teamwork and collaboration?***

In addition to developing an understanding of the team’s propositions in relation to teamwork and collaboration, an aim of this research was to explore the nature of the team’s interactions and dialogue during the process of CCM with a view to understanding the co-constructive processes at work. Consistent with the findings of several research studies that have investigated interactions among participants engaged in CCM, the following features of co-constructive

discourse were evident as our team engaged in CCM: sustained and on-task dialogue, articulation of thoughts, elaboration of meaning and resolving differences (Basque & Lavoie, 2006; Sizmur & Osborne, 1997; Van Boxtel, Van der Linden, Roelofs, & Erkens, 2002).

Sustained and on-task dialogue is apparent in the session descriptions which show most concepts raised were subjected to considered discussion. There were only a few instances of concepts raised and then left unexplored. For example, in session two the concept *learn about others* was considered only in relation to a procedural aspect of concept mapping, then followed by an immediate shift in focus to another concept. Only twice were team members distracted and off-task, engaging in neither relevant ideational exchanges (referring to the content or potential content of the concept map) nor relevant procedural exchanges (referring to the actions to be followed in compiling the map) (Sizmur & Osborne, 1997). For example, during session one, team members engaged in off-task aside conversation as technical issues were being resolved, and during session two the group discussion shifted to irrelevant details about the policy directions of a local educational authority.

Articulation of thoughts was obvious throughout each session in terms both of recognising knowledge gaps and explaining individuals' own conceptions. For example, in session two as the team dialogued about the concept of *heteroglossia* several team members initially queried the meaning of the term, thus raising awareness of a knowledge gap. Team members then explained their own ideas about the meaning of this concept. One of the team members who queried the meaning of the term drew on prior knowledge of word roots to attempt to discern the meaning of the term, then others familiar with the term built on this to clarify and exemplify the term. As the team grappled with the relation of the concept *heteroglossia* to other concepts, team members further explained their conceptions of the term – one suggested *heteroglossia* was a *value*, another stated it could be “valued,” another queried if it were a descriptor and another offered the perspective of exemplifying the term. The dialogue continued with team members integrating and elaborating the input of others until a shared understanding was achieved sufficient to place *heteroglossia* in relation to other terms.

Chang et al. (2003, as cited in Basque & Lavoie, 2006) in their study of the interactions of those engaged in CCM found adults tended not to negotiate ideas. Yet negotiation among team members was evident in our sessions. For example, in session one in response to the question “How do we ‘do’ team?” there was negotiation and resolution of different conceptions:

“One way we ‘do’ team is through our *values*.”

“A string that comes off values, then we list some of the values.”

“They don’t hang off; they drive.”

“Values are up there with *making meaning*.”

This negotiation resulted in *meaning-making* being displaced by *values* as the top concept as it was conceded that values gave the group particular meaning. A possible procedural difference explaining the considerable presence of negotiation in our study was that all team members were involved in elaborating the map whereas there was only one member of the group elaborating the map in the Chang et al. (2003, as cited in Basque & Lavoie, 2006) study.

Consistent with a sociocultural perspective, and the empirical findings of other researchers, CCM engages language for collective thinking and allows the co-construction of conceptual understanding (Van Boxtel et al., 2002). Working as a common referent, CCM provides a shared context which opens up communication and allows co-construction of knowledge (Gao, Shen, Losh, & Turner, 2007; Sizmur & Osborne, 1997), in this case about the goals, values and practices of teamwork and collaboration.

## **Conclusion**

There is little doubt that the process of CCM was effective in producing meaning for this research team. Much of the meaning was around the central action of teaming and qualified the quality of this interaction with the articulation of concepts that related to the shared values of the team, some of the doing of the team and the centralised position of *authenticity*. What the concept map portrayed was central to an articulated shared understanding of how members preferred to interact with one another. How this translates into authenticity within team performance remains to be seen. Considering the quick progress made in achieving the milestones required in editing this book together, the future looks bright. Some measure will come by the team's reflecting upon its doing. For us, Mark and Linda, a suitable means of gathering data around these very acts will be future toil. But we are heartened by the team's use of the concept of *unfinalisability*, for we believe that the team's concept map is but a moment in time and remains an unfinalised project – a project that offers a rich history of, and yet promotes possibilities for, shared meaning-making for a particular group of academics attempting to leverage their individual effectiveness through this form of social connection. Hence, CCM is recommended as a useful process for other education research teams to explore and develop shared understandings of their team values and operations and as a way of documenting that development over time. CCM is not limited to this application and future research could explore extensions such as research teams using CCM for collaborative conceptualisation of team research projects or publications.



---

## References

- Askell-Williams, H., Lawson, M., & Ellis, T. (2008). *Classroom-based interventions to improve students' learning capital*. Paper presented at the annual conference of the Australian Association for Research in Education, Brisbane, Australia. Retrieved from [www.aare.edu.au](http://www.aare.edu.au)
- Ausubel, D. (1968). *Educational psychology: A cognitive view*. New York, NY: Grune & Stratton.
- Bakhtin, M. M. (1981). *The dialogic imagination: Four essays* (C. Emerson & M. Holquist, Trans.). Austin, TX: University of Texas Press.
- Basque, J., & Lavoie, M. (2006). Collaborative concept mapping in education: Major research trends. In A. J. Cañas & J. D. Novak (Eds.), *Proceedings of the second International Conference on Concept Mapping*. Retrieved from [cmc.ihmc.us/cmc2006Papers](http://cmc.ihmc.us/cmc2006Papers)
- Brinkman, A. (2003). Graphical knowledge display: Mind mapping and concept mapping as efficient tools in mathematics education. *Mathematics Education Review*, 16, 35-48.
- Buzan, T. (1976). *Use both sides of your brain*. New York, NY: Dutton.
- Chittenden, E. (2007). Building conceptual bridges. *Teacher*, 178, 58-60.
- Denzin, N., & Lincoln, Y. (2000). Introduction: The discipline and practice of qualitative research. In N. Denzin & Y. Lincoln (Eds.), *The landscape of qualitative research: Theories and issues* (pp. 1-28). Thousand Oaks, CA: Sage.
- Francis, R. (2007). Demonstrating scholarship and effectiveness of teaching through the application of data collected from concept maps. *Journal of University Teaching and Learning Practice*, 4(2), 64-71.
- Gao, H., Shen, E., Losh, S., & Turner, J. (2007). A review of studies on collaborative concept mapping: What have we learned about the technique and what is next? *Journal of Interactive Learning Research*, 18(4), 479-492.
- Kuhn, S., & Davidson, J. (2007). Thinking with things, teaching with things. *Qualitative Research Journal*, 7(2), 63-75.
- Laufgraben, J., & Shapiro, N. (2004). *Sustaining and improving learning communities*. San Francisco, CA: Jossey-Bass.
- Novak, J. D., & Cañas A. J. (2008). *The theory underlying concept maps and how to construct and use them*. Retrieved from <http://cmap.ihmc.us>
- Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. Cambridge, UK: Cambridge University Press.
- O'Leary, Z. (2010). *The essential guide to doing your research project*. London, UK: Sage.
- Silverman, D. (2010). *Doing qualitative research*. London, UK: Sage.
- Sizmur, S., & Osborne, J. (1997). Learning processes and collaborative concept mapping. *International Journal of Science Education*, 19(10), 1117-1135.
- Turner, M. (2007). Contemporary approach to writing non-linear online learning resources. *Journal of Design and Learning*, 2(2), 56-69.
- Van Bostel, C. A. M., Van der Linden, J. L., Roelofs, E., & Erkens, G. (2002). Collaborative concept mapping: Provoking and supporting meaningful discourse. *Theory into Practice*, 41(1), 40-46.
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological process*. Cambridge, UK: Harvard University Press.

Watt, J. (2002). Organising information: Concept maps and data charts. *Classroom*, 22(6), 26-27.

### **Strategies for sustaining synergies**

- Brainstorm the processes that characterise collaboration in your team.
- Engage in a collaborative concept mapping process with your team in response to the focus question: “How do we team?”
- Compare and contrast your collaborative concept map with the chapter map to identify the synergies and dissonances.
- Employ a collaborative concept mapping process to conceptualise a team research project or publication.
- Discuss the applications and implications of the following Bakhtinian concepts for your team: heteroglossia, unfinalisability, dialogism.

### **Further reading**

Kershner, R. B. (2006). Mikhail Bakhtin. In J. Wolfreys (Ed.), *Modern European criticism and theory: A critical guide* (pp. 166-171). Edinburgh, UK: Edinburgh University Press.

Lupion Torres, P. & de C’assia Veiga Marriott, R. (Eds.). (2010). *Handbook of research on collaborative learning using concept mapping*. Hershey, PA: IGI Global.

Novak, J. D. (2009). *Learning, creating and using knowledge: Concept maps as facilitative tools in schools and corporations* (2nd ed.). London, UK: Routledge.