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Student use of an online learning environment: Comparisons of group usage within a first year Health Communications course

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Abstract

Health Communications is a first year course that was offered online for the first time during autumn term, 2004 using the learning management system, 'Blackboard'. One-hundred-and-seventy-seven students were enrolled in the course and they were placed into small workgroups. Four of the 37 group transcripts were selected; two groups possess high levels of interaction and the other two possess low levels of interaction.

Each workgroup completed the set weekly activities. The online transcripts for week three were coded and analysed to compare and explore the following: (1) student engagement that facilitated the construction of learning and depth of learning (2) interactions with peers and teachers that facilitated learning and learning depth, and (3) aspects of the online environment that appear to have hindered or facilitated student engagement and interaction.

Observable differences in the nature and depth of student learning are explained by the group dynamics and interactions. The interactive qualities of an effective learning group are revealed and include praise for discussions about tasks. For one group, attention to humour stimulated interaction though there was little evidence to indicate that it enhanced learning. Findings suggest it is important for teachers to direct, model and reinforce interactions that should lead to engagement with content and the construction of learning.

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Introduction

The increasing integration and adoption of online learning environments has made the concept of online learning commonplace in higher educational institutions (Gunawardena & Lowe, 1997). Flexibility in (1) geographical location, and (2) time to study afforded by online learning environments both influence significantly

the ways students engage with course content and the ways they interact with their peers and lecturers. The way that students interact does not always conform to the expectations of those responsible for facilitating student learning in the online learning environment.

In order to understand and enhance the way students engage in online learning it is necessary to examine the nature, depth and educational value of their online interactions and student outcomes (Gunawardena & Lowe, 1997). Such research has the potential to aid course developers understand the optimal environment for the construction of student learning. The purpose of this study was to compare and explore the following: (1) student engagement that facilitated the construction of learning and depth in learning; (2) interactions with peers and teachers that facilitated learning and learning depth; and (3) aspects of the online environment that appear to have hindered or facilitated student engagement and interaction.

Various researchers have examined the construction of learning in online environments by examining online transcripts and coding them (Anderson, Rourke, Garrison, & Archer, 2001; Gunawardena & Lowe, 1997; Henri, 1991; Lally & De Laat, 2002; McLoughlin & Luca, 1999; Merrill, DiSilvestro, & Young, 2003; Newman, Johnson, Cochrane, & Webb, 1996; Swan, 2002; Veerman & Veldhuis-Diermanse, 2001; Veldhuis-Diermanse, 2002). Henri's seminal work is one of the early examples of such research.

Henri (1991), like many other researchers in the field, was concerned with the process of online learning rather than the product. From Henri's perspective, learning is significant when the learner actively seeks information, uses it to construct knowledge, and integrates these into existing cognitive structures or schemas. Furthermore, Henri stressed the process of meta-cognition, which deals with the knowledge and skills the learner brings to bear on the overall cognitive activity. In order to examine both the cognitive and meta-cognitive strategies employed by learners, Henri developed an analytical framework and model that comprised five dimensions including participative, social, interactive, cognitive and meta-cognitive. Each dimension comprised a number of categories that were used when coding transcripts and that dimension.

Henri's work is cited extensively by researchers who have examined learning in online environments (Anderson, Rourke, Garrison, & Archer, 2001; Gilbert, 2002; Lally & De Laat, 2002; McLoughlin & Luca, 1999); however, the actual coding scheme has been heavily criticised because the theoretical framework upon which it is based was poorly developed (Gunawardena & Lowe, 1997). For example, even though it is noted that online environments promote collaborative work, it appears that Henri's model is based upon a teacher centred instructional paradigm (Gunawardena & Lowe). Also, other researchers have experienced difficulty when attempting to employ Henri's coding scheme with their data (McLoughlin & Luca).

Another fundamental difference between the work of Henri and many other later researchers (Lally & De Laat, 2002; McLoughlin & Luca, 1999; Veerman & Veldhuis-Diermanse, 2001; Veldhuis-Diermanse, 2002) interested in understanding the process of learning in online environments, is that Henri's work has a distinctly cognitive orientation. Recently, many other researchers have adopted a constructivist approach when examining online learning environments because a move from a teacher centred view of learning to one premised upon shared construction of knowledge seems more appropriate and particular to this medium. Constructivist theories of knowledge emphasise social interaction, dialogue and reflection as being central to learning (McLoughlin & Luca).

From constructivist perspectives, learners use skills they have gained from prior experiences to facilitate the construction of learning as well as the incorporation of new ideas and concepts (Bencze, 2004; Chicago Academy of Sciences, 1998–2000). Furthermore, learners should construct their own meanings about things through experiences, negotation and discovery, rather than memorise the right answers to someone else's meaning (Bencze; Funderstanding, 1998–2000; Gunawardena & Lowe, 1997). Hence, the online social context is an important variable when shaping learning as well as the mental model the learner possesses of that learning (Instructional Technology Global Resource Network, n.d.).

From a constructivist perspective, curriculum should be designed in such a way that students meet learning goals with just enough help from 'scaffolds' (Galloway, 2001). Scaffolds may take the form of reading materials, structured activities, cooperative group arrangements and specific instruction or interactions with more knowledgeable others such as teachers and professionals who can model appropriate behaviours and strategies in meaningful contexts (Galloway). Hence, the actual design of the online environment, the curriculum, rules of engagement, and involvement of the teacher are all pivotal to the meaning making process and the construction of learning. In order to analyse online conference transcripts, attention should be given to the transactions between participants where knowledge is shared and negotiation of meaning occurs (Gunawardena & Lowe, 1997).

McLoughlin and Luca (1999) applied a coding scheme which was originally devised by Henri and transformed by Gunawardena and Lowe (1997); it was based upon a constructivist theoretical framework. The resulting five phase analytical model assumes knowledge construction moves through five levels from knowledge sharing to knowledge building, with each stage involving higher levels of cognition and reasoning. However, the authors concluded that the majority of online interactions were related to the elaboration of existing belief and knowledge and there was little evidence of construction of new knowledge.

McLoughlin's and Luca's (1999) work is limited in that questions arise about whether learning necessarily follows a sequence of steps. Many step or stage theories have been challenged for lack of such evidence. Marzano, Pickering, and Brandt (1990) argue that knowledge construction is extended and refined when students compare information, and this occurs in various ways when engaging with each other online. So, for example, when a student compares two or more concepts in details, even if he or she knows them fairly well, he/she will probably learn something new (Marzano, Pickering, & Brandt). Marzano et al.'s work leads to questions about the conclusions of McLoughlin and Luca; that students did not learn anything new. The problem may lie with the assumptions underlying the theoretical framework and the limited nature of the coding scheme itself rather than with the online environment and the learners.

Another research team, Lally and De Laat (2002), employed a modified coding scheme based on the work of Veldhuis-Diermanse and Biemans (2000) to examine the social co-construction of knowledge. This coding scheme was also based upon constructivist principles and incorporated meta-cognitive activities, cognitive activities, affective activities and a miscellaneous category. They also adapted a second category of codes which was based upon the work of Anderson, Rourke, Garrison, and Archer (2001) to probe the influence of the teacher who had been assigned to the online workgroup. Interactions and levels of learning were graphed, and revealed that within the discernable peaks of discussion activity within a group, high levels of learning and teaching were co-incident in time. Lally and

De Laat suggest that there exist strong links between teacher and student interactions and levels of learning. However, questions also need to be asked about the actual interactive qualities and behaviours within online learning groups that facilitate and influence learning. That is, what is it that groups do when interacting in an online environment that influences or inhibits learning?

Importantly, Lally and De Laat (2002) blended different coding schemes that were designed by other researchers, in order to answer questions of interest about student and teacher interaction and learning. The blended coding schemes were tested successfully and obtained meaningful results by this research team; such success appeared to be rare in this body of literature. This blended coding scheme could also be used to examine other questions of interest; in particular, the qualities of online groups and interactions within the group and between the teacher that appear to influence learning and contribute to learning depth.

Method

An online Health Communications course was offered to first year undergraduates of Central Queensland University for the first time in autumn term, 2004. Ethical clearance was given by the University's Human Research Ethics Committee in July, 2004. Only 40 from a total of 159 (25%) enrolled students provided their consent via email to participate in the research.

The primary researchers were awarded a 'Teaching and Learning Grant' by the University for the purpose of conducting this research. With the funds, a research assistant was employed to assist with the research.

Online transcripts from week three only were selected for analysis for reasons of limited time and funds. The transcript data were then coded for the first stage of the research using a blended coding scheme based upon the work of Veldhuis-Diermanse (2002) and Anderson, Rourke, Garrison, and Archer (2001). These coding schemes had been used successfully to code online data (Lally & De Laat, 2002). A combined message and meaning unit was the selected unit of coding, that is, more than one code could be assigned to a posting. Attachments were not coded though were consulted on occasion to check the validity of codes and to facilitate student meanings expressed in the posted message.

This blended coding scheme was iteratively tested and revised for internal consistency with members of the research team to ensure that it was suited to this set of data. Following adaptation of the coding scheme, the data was recoded and again checked with co-researchers until a high level of agreement was reached. Some codes were redefined, removed, merged or expanded. The revised blended coding scheme is given in Appendix A.

Following the first coding stage, learning depth and quality of students' constructed learning were assessed using the coding scheme from Veldhuis-Diermanse's (2002) doctoral thesis which was based upon the work of Biggs and Collis (1982). The taxonomy was constructed with four levels of increasing learning complexity. The lowest level is level D and the highest, most complex level of learning is reflected in level A. The coding scheme is found in Appendix B. Data selected had been coded in the first stage with one of the following codes: cdpf, cdaf, ccei, csei, cil, mge.

Once data were coded, student group data and teacher input were compared and reasons underlying differences and similarities were explored.

Subjects

All student subjects were enrolled in the online Health Communications course, and lived in Queensland. The course design encouraged students to actively engage with course content through, weekly, pre-reading material, PowerPoint presentations and a range of individual and group activities. The activities were directly related to the content for the week and varied in number, over the duration of the course these activities offered students the opportunity to discuss and analyse both written and observed interpersonal interactions, for example, content in week three related to theoretical concepts related to relationship development. Weekly activities included an individual submission which required students to discuss and analyse a documented scenario between two individuals from diverse cultural backgrounds. Two subsequent group activities required students to observe two separate interactions presented on CD and discuss and analyse aspects of self-disclosure within relationships and issues related to relationship development and maintenance. The final activity, which was the only recurring activity throughout the course, required students to relate and demonstrate the application of communication theory to a self-selected topical issue. Two university lecturers monitored student postings and provided feedback to groups and the data were also coded using the teacher presence coding dimension.

Four student workgroups and associated online data were selected for further analysis (see Table 1). These groups were finally selected because they were sufficiently different in their online behaviour to be able to make comparisons about online learning and because they were accessible following the difficulties posed by Blackboard migrations.

Table 1: Qualities of selected online study groups

Group	Total Males	Total Females	Non-participants	Total participating students
A	0	4	0	4
B	2	3	0	5
C	3	1	1	3
D	0	3	0	3

Results

Tables 2 and 3 list the frequency of each code assigned to online group data for week three. For example, Table 2 shows that for the social presence dimension, there were 39 occasions of ‘cohesive’ behaviour evident in the online transcript for group **A**, 28 for group **B**, 17 for group **C** and 18 for group **D**.

Table 2: Results of coding to analyse students' learning activities by group

General coding categories	A	B	C	D
Social presence				
Cohesive (U)	39	28	17	18
Emotions (conventional) (AE)	9	4	3	2
Emotions (unconventional) (AUE)	8	3	0	0
Chatting/social talks (AC)	5	12	5	1
Self disclosure (ASD)	1	0	1	0
Asking for feedback (AA)	5	5	2	3
Compliments/appreciation (AIC)	10	14	14	3
Teacher presence				
Direct instruction (TDI)	3	2	2	1
Facilitating discourse (TFD)	4	3	4	1
Instructional design & organisation (TIDO)	0	2	0	0
Cognitive learning activities				
Problem/solution with support (CDPF)	26	26	3	0
Problem/solution no support (CDPNF)	3	6	0	0
Agree/disagree with example (CDAF)	18	9	0	0
Agree/disagree no example (CDANF)	1	4	1	0
Asking content directed question (CDAQ)	8	5	1	1
Contributing/referring to info from other information sources (CCEI/CSEI)	20	22	3	0
Summarising/evaluating external info (CSEI)	5	1	0	0
Referring to earlier experiences (CREE)	7	0	1	0
Linking facts, ideas in discourse (CIL)	10	2	0	0
Repeating info without interpretation (CIR)	2	5	0	0
Meta-cognitive learning activities				
Presenting approach to carry out task (MPA)	12	5	12	3
Asking for approach to carry out task (MAA)	1	1	0	1
Explaining approach already adopted (MEA)	3	5	2	1
Explaining info in notes/answering question (MGE)	0	1	0	0
Monitoring original planning (MKW)	1	1	0	0
Reflecting on own actions or contributions (MRP)	5	9	3	1
Units unable to be decoded using categories above	4	2	0	6

Table 3: Frequencies of codes to assess students' constructed knowledge

Depth of learning	A	B	C	D
Level D				
Identify	1	7	0	0
Define	6	3	0	0
Level C				
List	0	2	0	0
Describe/organise	18	27	2	0
Level B				
Explain	9	1	1	0
Relate/combine	3	1	0	0
Compare/contrast	2	0	0	0
Level A				
Reflect/conclude	3	0	0	0

Qualities of group A

This group of 4 females displayed high levels of interaction, reflected by the 60 total postings and the high word content averaging 138 words per posting. These students interacted extensively online about the content, as can be seen by the 100 occasions of cognitive activity (i.e., sum of all codes within 'cognitive learning activity').

When discussing content, group A tended to add new points or discuss something in more depth by agreeing or disagreeing as indicated by the CDPF and CDAF codes. Discussions about tasks were often considerate of external sources such as references or personal experiences. Furthermore, members often drew upon ideas already mentioned in the discourse when reframing or adding 'new' ideas to a topic, as indicated by the frequency of the 'CIL' code. The use of praise (coded AIC) was a strategy employed by members to reinforce engagement with the task, and the open exchange of ideas.

Frequencies of the recoded 'depth of learning' data (see Table 3) shows that group A tended to discuss content in relative depth at level C and B (see Appendix B) and their work was at a high standard as a consequence. While group members did refer to similar points already made, they also tended to add something else, which had the effect of extending content, learning and coverage of the topic.

Qualities of group B and how it compared with group A

Group B exhibited high levels of interaction, as indicated by the 23 pages comprising 54 postings and approximately 92 words per posting on average. Group members behaved very differently toward one another when compared to group A and these differences may have been an important factor leading to differences in the depth or integrity of learning and the variability in the quality of their work.

There were 80 occasions where cognitive activity was apparent, though one eighth of these (or 10) were not supported by an illustration or verification (coded CDPNF

and CDANF) and five of these were copy and paste actions without additional comments (coded CIR). Members utilised external sources such as references when discussing the content and activities, though they did not share any relevant personal experiences. An important component of constructing learning lies with using past experiences to facilitate meaning making and to extend knowledge.

Members tended not to elaborate on another's contribution. However, they did tend to elaborate on instances of humour (coded 'AC') and reinforce these kinds of contributions with praise (coded AIC). As week 3 progressed, an increasing proportion of the discussion was devoted to humour over content.

Group B engaged in meta-cognitive activities in quite different ways to group A, that is, there was little evidence of planning how to do a task (coded MPA) with input from the group. Instead, group members informed others of what had been done when completing or executing a task (MGE) or they reflected briefly on a posting from another participant and then commented (MRP). Hence, group members tended to complete activities independently of each other and then shared their answers; there was rarely much change to that work afterward. In contrast, group A tended to discuss their answers or activities together as a group as well as the division and organisation of tasks; hence tasks were largely a collaborative effort.

There was evidence of limited depth to constructed responses by group B. Most discussions about content and constructed knowledge were at levels C and D (see Appendix B). When compared with group A, these results indicate that groups who tend to engage with each other about content are more likely to construct deeper understandings of a phenomenon than groups who tend to share their own work which has been done in isolation.

Group C compared with group B and group A

Group C interacted moderately to mildly with each other online, as indicated by the 22 postings averaging 94 words per message. There was very little evidence of cognitive activity online, even though it appears this group were highly motivated to achieve; this could be associated with members meeting face-to-face or over the phone rather than online.

Social presence was comparatively high for group C. This occurred because one member was very concerned that others discuss work online, believing that such behaviour was viewed favourably by teachers and would lead to improved grades. To stimulate and reinforce student interaction online, this member praised readily student contributions, as indicated by the high number of 'aic' codes. Furthermore, he directed students as to how to engage or interact online, and hence, the high proportion of meta-cognitive assigned codes (i.e., MPA codes). Despite the goals of this student, interaction about activities remained comparatively low. It was probably for this reason that surface level processing of content was evident with little further analysis or depth. At face value, it appears that one or two students in this group were driving or carrying the group, and they did not have the skills (and power), it appears, to know how to stimulate student online interaction.

It was difficult to ascertain the level of engagement with learning tasks for this group because members did not tend to engage much with each other online. For example, a member submitted an attachment to the discussion forum; however, there was no evidence that the group had critiqued or commented on that work.

Group D compared with all other groups

Group D students interacted very little online as indicated by the 17 postings for the week. Whether students discussed work face-to-face or over the phone is also unclear. Members tended to post their completed responses to assigned weekly activities as attachments and then requested that others comment on the work. It appears that students chose the perceived 'best' work and this was later submitted for assessment without any change. Such an approach can lead to students being exposed to different views and ways of thinking about the activity/task when they read through the other members' work. However, it was more likely that, without further discussion, there were relatively few opportunities to be challenged and deepen understanding of the concepts or content being covered. Of particular concern is that the approach taken by the group enabled those struggling and less conscientious members to pass assessments without necessarily deserving to do so. Therefore, mechanisms may be more important in online than internal courses to reduce the incidence of plagiarism.

Effects of teacher presence upon group behaviour and learning

This section discusses and compares the effects of teacher interaction or 'teacher presence' for the student groups. In particular, how teacher presence contributed to the learning environment and behaviours within the group.

Teacher presence for group A was relatively small; however, some key teacher comments led to focussed discussions and to more in depth learning of the content. Furthermore, teacher comments reinforced the ways in which students engaged with each other online when discussing content. This encouragement was valued and helped to reinforce the desired learning environment for these four students.

Redirecting and reinforcing appropriate student interactions and learning can be achieved through the direction of the teacher. In the case of group B, the teacher encouraged students to explore aspects of the content in greater depth; student humour was also reinforced. However, all students responded to the teacher's posting that reinforced student humour, and there was no engagement with the content related question. Teacher input to model and shape increased and appropriate engagement with the content appeared particularly necessary with group B. Hence, online teachers should play an important role in shaping student online interactions, and additional research about this is also needed.

Also, group B did not share any relevant personal experiences when discussing tasks. An important component of constructing learning lies with using past experiences to facilitate meaning making and to extend knowledge. For group B, content related prompts from teachers that encouraged members to explore their own experiences would be a recommended strategy to facilitate the construction of learning.

There are arguments that students construct learning by engaging with others about the content, including other experts, such as teachers. The problem with groups C and D interaction styles lay with the fact that teachers are unable to detect student thinking processes and to facilitate the construction of learning or extend learning.

Conclusion

This research examined student engagement that facilitated the construction of learning and depth of learning, interactions with peers and teachers, and aspects of the online environment that facilitated student engagement and interaction. This

was done by comparing the activities and interactions of four online student groups as well as their interactions with teachers.

Particular student behaviours were associated with the construction of and depth of learning. The construction of learning by student groups was reinforced and supported through the use of praise. Learning depth was promoted by adding new points or discussing something in more depth by agreeing or disagreeing, and by using external sources such as references or personal experiences. Furthermore, quality of work produced within the online environment appears to have been directly influenced by online interactions and engagement with the content. Additional research comparing student grades and engagement with the tasks and interaction wit the group need to occur to verify this view.

Teacher presence for this course was low because of the low teacher student ratio; however, this research revealed a number of important findings with respect to this. Students were reinforced and encouraged by teacher input and praise, and their understandings were extended when key questions were raised; however, various interactions were not geared toward learning and the tasks at hand. That is, even though certain groups of students may interact extensively, it may not be geared toward the construction of learning; instead the behaviour may be likened with chatroom behaviour, and teachers will need to be prepared to interrupt such dynamics.

Lally and De Laat (2002) found an association between online teacher feedback and student learning activity, suggesting that teacher presence is an important variable in learning. Hence, teachers of online courses must consider the place of interaction; whether they feel student face-to-face engagement is equally as desirable and acceptable as interaction online. Furthermore, teachers of online courses need to ask themselves, what are the optimal conditions and behaviours for learning online and what needs to occur to reinforce or set up such an environment? These are important considerations for online course planners, and are worthy of further research.

Three of the four groups tended to post their completed responses to assigned weekly activities as attachments and then requested that others comment on the work. Students then chose the perceived ‘best’ work and this was later submitted for assessment. Questions need to be asked about whether the structure or organisation of this online course favoured such a style, that is, students worked on between three and five activities each week, and read the assigned materials. Would students have behaved more like group A if they had fewer tasks to complete in the same space of time? Could the content have been covered in other ways with similar outcomes by, for example, expecting students to link key concepts and issues from a range of weekly readings to only a couple of activities?

It was mentioned earlier that McLoughlin and Luca (1999) reported computer mediated learning environments tend not to foster in depth processing of learning. However, this finding does not hold when group A is used as an example and with this coding scheme. The problem may have been with the coding scheme employed by these researchers and others who have reached similar conclusions. Hence, this coding scheme seems to be a useful tool when examining online learning and computer mediated learning environments.

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Appendix A: Blended coding scheme

Social presence
(Adapted from Rourke, Anderson, Garrison, & Archer, 2001)
Affective: Each indicator coded separately

AE	Conventional expressions of emotion to notes of fellow students, without directly reacting to the content of that note. This reaction can be positive, negative or neutral
AUE	Unconventional expressions of emotion including repetitious use of punctuation, capitalisation, emoticons
AC	Chatting or social talks that are not relevant to solve the task/case
ASD	Self disclosure; communication with element of risk or posing level of vulnerability to the communicator
AA	Asking for (general) feedback, responses or opinions by fellow students
AIC	Complimenting others or contents of others' messages or expressing appreciation

Cohesive (unified)
All of these are indicators and are coded 'u'—not more than one code per message.

U	Vocatives. Addressing or referring to participants by name Addresses or refers to the group using inclusive pronouns including 'we, us, our group' Phatics, salutations. Communications that serves a purely social function; greetings, closures.

Teaching presence
(Adapted from Rourke, Anderson, Garrison, & Archer, 2001)
Coding scheme for this study is not as elaborate as Rourke et al. because teacher input is relatively low.

TDI	Present content/questions Focus the discussion on specific issues Summarise the discussion Confirm understanding through assessment and explanatory feedback. Diagnose misconceptions Inject knowledge from diverse sources, e.g., textbook, articles, www, personal experiences Responding to technical concerns
TFD	Identifying areas of agreement/disagreement Seeking to reach consensus/understanding Encouraging, acknowledging or reinforcing student contributions Setting climate for learning Drawing in participants, prompting discussion Assessing the efficacy of the process
TIDO	Setting curriculum Designing methods Establishing time parameters Utilising medium effectively Establishing Netiquette

Cognitive learning activities
(Adapted from Veldhuis-Diermanse, 2002, p. 58)

Domain = *Debating*

CDPF	A problem, solution or idea is presented. This contribution is followed by an illustration or argumentation
CDNPF	A problem, solution or idea is presented. This contribution is NOT followed by an illustration or argumentation
CDAF	A student does or does not agree with the opinion or idea contributed by another student or author. This viewpoint is followed by a backing, refutation or restriction
CDANF	A student does or does not agree with the opinion or idea contributed by another student or author. This viewpoint is NOT followed by a backing, refutation or restriction
CDAQ	Asking a content-directed question

Domain = *Using external information and experiences*

CCEI/CREI	Contributing new information or referring to information founding other sources (mentioned or not) in the discourse
CSEI	Summarising or evaluating the information found in other information sources (mentioned or not) in the discourse
CREE	Referring to earlier experiences (scholastic or daily)/referring to outcomes of running a model.

Domain = *Linking or repeating internal information*

CIL	Linking facts, ideas or remarks presented in the discourse/referring explicitly to a contribution in the discourse
CIR	Repeating information without drawing a conclusion or interpreting that information

Metacognitive learning activities
(Adapted from Veldhuis-Diermanse, 2002, p. 58)

Domain = *PLANNING*

MPA	Presenting an approach or procedure to carry out the task
MAA	Asking for an approach or procedure to carry out the task
MEA	Explaining or summarising the approach already adopted

Domain = KEEPING CLARITY

MSD	Structuring the contributions in the database
MAC	Asking for explanation, clarification or illustration as a reaction to a certain note
MGE	Explaining unclear information in notes; answering a question asked by another participant

Domain = *MONITORING*

MKW	Monitoring the original planning aim, etc.
MRP	Reflecting on one's own actions or on certain contributions to the database

Rest activities

RNE	Units that cannot be decoded by using the categories above

Appendix B: Coding scheme for learning depth

Biggs. (1999). Solo Taxonomy was taken from Veldhuis-Diermanse (2002, p. 64)

Level D (low learning depth)

Identify	Recognising or distinguishing something from others. One point or item that is not related to other points in the discourse. Furthermore, the new point is not elaborated.
Define	Describing clearly what something is. The description is taken over from a text or someone else; it is not a self-made definition.

Level C

List/enumerate number	Writing things one after another, usually in a particular order, but it can be a disorganised collection of items, too. Marking something with a number, usually starting at one.
Describe/organise	Giving a self-made definition of something (like for example, a theory) which explains distinguishing marks of that thing. Organising ideas or theory, but descriptive in nature. No deeper explanatory relations are given; it concerns a rough structure of information.
Classify	Dividing things into groups or types so that things with similar characteristics are in the same group.

Level B

Explain	Giving reasons for a choice made. Elaborate on an idea, theory or line of thought.
Relate/combine	Linking 2 or more things or facts, which are related to each other.
Apply	Using acquired knowledge in a(nother) situation.
Compare/ contrast	Dividing things and discovering differences or similarities between those things.

Level A (high learning depth)

Reflect/ conclude	Criticising arguments on relevance and truth. Deciding something is true or not, after considering relevant facts. A judgement is given after considering an argumentation or theory. (The conclusion has to be a point, it must rise above the earlier statements, not just a summary.)
Generalise/theorise/ hypothesise	Surpassing the concrete ideas and formulate one's one view or theory. Predicting that something will be true because of various facts; this prediction has to be checked/examined.