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**The nature of communication structures of university
students in an international web-based computer-supported
collaborative learning (CSCL) course.**

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Abstract:

Communication, the flow of ideas and information between individuals in a social context, is the heart of educational experience. Constructivism and constructivist theories form the foundation for the collaborative learning processes of creating and sharing meaning in online educational contexts. The Learning and Collaboration in Technology-enhanced Contexts (LeCoTec) course comprised of 66 participants drawn from four European universities (Oulu, Turku, Ghent and Ramon Llull). These participants were split into 15 groups with the express aim of learning about computer-supported collaborative learning (CSCL). The Community of Inquiry model (social, cognitive and teaching presences) provided the content and tools for learning and researching the collaborative interactions in this environment. The sampled comments from the collaborative phase were collected and analyzed at chain-level and group-level, with the aim of identifying the various message types that sustained high learning outcomes. Furthermore, the Social Network Analysis helped to view the density of whole group interactions, as well as the popular and active members within the highly collaborating groups. It was observed that long chains occur in groups having high quality outcomes. These chains were also characterized by Social, Interactivity, Administrative and Content comment-types. In addition, high outcomes were realized from the high interactive cases and high-density groups. In low interactive groups, commenting patterned around the one or two central group members. In conclusion, future online environments should support high-order learning and develop greater metacognition and self-regulation. Moreover, such an environment, with a wide variety of problem solving tools, would enhance interactivity.

Keywords: Communication, Community of Inquiry, Constructivism, CSCL

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1 INTRODUCTION

For the last two decades, many studies have strived to highlight the nature of communication structures within online learning environments. Armed with the theories of learning, these studies have ventured to investigate the phenomena of knowledge acquisition, knowledge construction and knowledge transfer. Well displayed or covertly ingrained, constructivist theories and their subsequent socio-cultural theories largely illustrate the idea that cognitive processes follow an interpersonal process (interaction with social environment) of knowledge development. In addition, constructivist approaches have proved that learners' engage in learning activities and the same learners appreciate the facilitation of the teacher to kick-start the knowledge acquisition and maturation process. The learning processes are situated in cultural, historical, and political contexts. High outcomes are achieved through collaborative and self-regulative mentoring, negotiation, discussion, and decision-making activities. It is worth noting that collaborative activities are central in most, if not all, computer-supported collaborative learning (CSCL) environments. The discourse therein, is achieved through the shared understanding among the members of the learning group. In CSCL therefore, the complex nature of the mode, medium, unit and context of communication shapes the learning and acquisition of knowledge. With that in mind, this study will trace the learning process in Learning and collaboration in technology-enhanced contexts (LeCoTec), an international course on CSCL.

1.1 Definition of Learning

Alexander, Schallert, and Reynolds (2009) define learning as ‘a multidimensional process that results in a relatively enduring change in a person or persons, and consequently how that person or persons will perceive the world and reciprocally respond to its affordances physically, psychologically, and socially’. The definition adds that this process of learning has as its core the systemic, dynamic, and interactive relation between the nature of the learner (who) and the object of the learning (what) as ecologically situated in a given time (where) and place as well as over time (when).

1.2 Learning with Technology

E-learning is an inclusive term for all the forms of educational technology that support teaching and learning by the use of electronic media. These media, including information and communication technologies, work to promote the educational objectives (Tavangarian, Leypold, Nölting, & Röser, 2004).

The media employed in e-learning uses helps to deliver text, audio, images, animation, and streaming video and includes technology applications and processes such as audio or video tape, television, CD-ROM, and computer-based learning, as well as local intranet/extranet and web-based learning.

Information and communication systems, whether free-standing or based on either local networks or the Internet in networked learning, underly many e-learning processes. (Tavangarian et al., 2004).

1.3 What is collaborative Learning?

According to Dillenbourg (1999) collaborative learning is a *situation* in which *two or more* individuals set out to *learn something* together as a *group*; actually, it involves individual learning (but not reduced to it).

Collaborative learning is not restricted by the education level (from kindergarten toddlers to university students) and the number of participants.

Collaborative learning can take place either synchronously (communications are sent and received at the same times) or asynchronous (communication are sent and received at virtually the same times). Asynchronous discussions present several advantages over synchronous ones: it is assumed that students get more opportunities to interact with each other, have more time to reflect, think, and search for extra information before contributing to the discussion. (Erlin, Yusof, & Rahman, 2008).

Through collaboration as a learning process, individuals *negotiate and share meanings* relevant to the problem-solving task at hand; therefore it is a coordinated, synchronous activity that attempts to construct and maintain a shared conception of a problem (Roschelle & Teasley, 1995).

Seen this way, it is inevitable that collaborative learning will now represent a radical shift from the typical, traditional classroom setting, teacher-centred that mainly involves lecturing/listening/taking notes. In collaborative learning, especially in our internet-age, the teacher ceases to be the sole provider of knowledge. The teacher's role is radically changed, not totally eliminated, but largely diminished; transformed as a guide, a conductor leading an orchestra.

1.4 Collaborative vs Cooperative

In cooperation, partners split the work, solve sub-tasks individually and then assemble the partial results into the final output. In collaboration, partners do the work together (Dillenbourg, 1999).

In cooperation, the learning is done by individuals, who then contribute their individual results and present the collection of individual results as their group product. Learning in cooperative groups is viewed as something that takes place individually.

Roschelle & Teasley (1995) describe collaboration learning as group knowledge construction that occurs socially'. It is important to acknowledge that the individuals that are involved in this are members of the group, but the activities that they engage in are not individual-learning activities, but group interactions like negotiation and sharing.

A fact that completely distinguished collaborative learning from cooperative one is the concept of group negotiation and shared meanings, which cannot be studied by the traditional lenses of conceptualizations and methods of educational and psychological research. This is mainly because collaborative learning, especially in the Internet-age, brings out novel learning concepts which definitely require novel methods and approaches to support learning.

1.5 Computer-Supported Collaborative Learning (CSCL)

To define CSCL within its constituent terms, we have to state firstly that, it is about *learning* (to create and share knowledge). Secondly, it is *collaborative*, (to work with, purposefully. Finally, it is *computer-supported* (the computer, in conjunction with internet technology) supports the process of group learning (Strijbos, Kirschner, & Martens, 2004).

Stahl, Koschmann and Suthers (2006) also define CSCL as an emerging branch of the learning sciences that concerned with studying how people can learn together with the help of computers. In other words, CSCL is primarily concerned with meaning and the practices of meaning making in the context of joint activity, and the ways in which these practices are mediated through designed artifacts (Koschmann, 2002).

Group learning has been seen to yield better learning outcomes as compared to individual learning. We will not forget that there have been technological breakthroughs and

advancements, whose benefits and focus has not left educational sciences behind. Learning therefore is adjusting and sizing up to these changes.

By the act of bundling together collaboration, computer mediation and distance education, technically problematizes the very notion of learning and calls into question the prevailing assumptions about how to study it (Stahl, Koschmann, & Suthers, 2006).

1.6 History and evolution of CSCL

The evolution of CSCL studies can be studied from various perspectives, depending on one's interest and focus. Some of the ways in which the history of CSCL be traced using thematic paradigms. This way, it has been possible to trace the growth and evolution of the field from conferences to creation of community, through the usage of technology in education, through the perception of the units of analysis (individual learning vs group learning), mental representations vs interaction meaning making and research methodologies (Quantitative analyses to micro-case studies) (Stahl, Koschmann, Suthers, 2006).

By picking one the above paradigms, Koschmann (1996) outlines the chronology of the use of computers in education and learning, and their main focus.

- computer-assisted instruction, 60's -computer drills, memorization
- intelligent tutoring systems, 70's-cognitive
- Logo as Latin, 80's-constructivist
- CSCL, 90's – collaboration and learning communities; social constructivist and dialogical/communication theories

A more recent and relevant presentation by Dillenbourg & Fischer (2007) depicts the CSCL developmental into three eras, as follows:

1. 1990 – 1995: this is the age when CSCL is born to and is seen to exert a lot of emphasis on collaborative learning, as opposed to individual learning. Also, there

was effort to promote the design of learning environments that foster more interaction among its participants.

2. 1995 -2005: the growth of a scientific community (CSCL acquired its own conference cycle, book series, society and journal). This era corresponds to the computer-supported intentional learning environments (CSILE) projects, later known as Knowledge Forum whose objectives were to deepen the learning in schools, improve motivation, and aim to restructure classrooms into knowledge communities (Scardamalia & Bereiter, 1994).
3. 2005 till present: this age is the present and the future of CSCL. It has been characterized with a lot dramatic changes on roles of teachers, and development new learning environments.

Overall, it is correct to say that the advent of the Internet in the 1990s created an exciting potential for people to connect and learn. However, early forms of learning with technology, in essence dates back to the invention of computers themselves.

Within CSCL, the focus of learning is on learning through collaboration with other students rather than directly from the teacher.

1.7 Why CSCL?

With the advent of advent of the internet and personal computers comes along a problem for learning; it has led to an age of isolated learners (Stahl et al, 2006). With the birth of CSCL, learners and educators have an opportunity to correct this issue by the development of applications and systems that bring learners together, to collaborate, to share learning environments and ideas.

Another fact is that online learning or e-learning is quite broad; therefore CSCL endeavors to focus to a type of group learning which is enhanced with a multiplicity of modes (blogs, chats, forums) and that may also be laced with audio and/or video conferencing.

On another front, CSCL has already generated abundant volumes of research. However, one will soon discover that they have largely concentrated on not-so-many core issues, akin if writing a book on building a house by focusing almost primarily on hammers, saws and screwdrivers (Strijbos, Kirschner, & Martens, 2004). This current research will endeavor to look at what drives and sustains the interactive activities, which are the heart of collaborative learning. Understanding the discourse will shed light on the learning activities and outcomes in CSCL.

2 THEORETICAL BACKGROUND

Studies on technology and learning currently focus on CSCL, whereby learning is being facilitated by different network-based collaboration tools (Lehtinen, 2003). CSCL theories are based on the underlying assumptions that individuals are active learning agents and that they are purposefully seeking and constructing knowledge within a meaningful context (Kim & Kim, 2006). In effect, these learners deliberately strive to achieve the full array of benefits from the interactions in a collaborative way. The advantages include stimulating their cognitive abilities, exposing their minds to diverse ideology, increasing motivation to acquire more knowledge and perfecting their discourse and negotiation skills.

The constructivist theory holds that the learner is actively involved with the teacher and his/her peers in creating and constructing new knowledge and meanings. Atherton (2009) traces this theory to the cognitive and humanistic theory. Whereas cognitive constructivism focuses on how the individual learner understands things, in terms of developmental stages and learning styles, social constructivism on the other hand emphasizes on how meanings and understandings grow out of social encounters.

At the heart of social constructivism learning, John Dewey (1959) seems to lay great emphasis to two themes: 'community' and 'inquiry'; the individual will find worthwhile learning in the larger collaborative efforts of the community. In the same vein, inquiry is the core of an educative experience (Dewey, 1959, Swan, Garrison & Richardson, 2009).

Dillenbourg et al. (2009) points out that 'CSCL activities take place within broader learning environments' and therefore researchers will have to strike a balance with other events at learner level (the individual, the group), the social contexts and media or environment. Effective communication and learning process in CSCL takes into account

the nature of the learner, the role of the instructor and the nature of learning process. This is an active social process in which there is constant interaction between the learner, the instructor and the task within the learning environment. This continuous exchange/interaction is what that constitutes the communication structure as well as the actual learning process.

Evident as it is, technology is at the core of the CSCL. Technology has no doubt revolutionized communication structures within learning communities (Lehtinen, 2003). In the light of scientific theories that supported collaborative knowledge-building models of professional communities of practice, CSCL was born to harness the gains made in technological front and enhance effective knowledge acquisition and transfer (Bereiter & Scardamalia, 1996). Face-to-face, (F2F) collaborations are now substituted with numerous synchronous and asynchronous methods of communication and learning. This is evident in learners' interactions in collaborative knowledge building process as online discussion threads which include blogs and knols. The instructor's role is changing considerably, from the traditional knowledge provider and to that of a "conductor" orchestrating a broad range of activities and to ensure they fit in the larger pedagogical structures and that they yield desirable outcomes (Dillenbourg et al., 2009).

As learning gradually shifts from the traditional classroom scenario and embraces technology, Solomon (1994) suggests that 'a successful application of ICT in education will entail a radical but systematic change in the whole classroom learning environment. This change will mainly feature the development of new theoretical approaches on learning and instruction; the adaptation of epistemological principles to help analyze technology-based environments and the results thereof will provide new opportunities for knowledge construction; the creation of powerful learning environments that support

high-order learning and development meta-cognition and self-regulation; and the development of complex learning environments that provide the learners therein with a rich variety of tools for problem solving.

2.1 Constructivism

As implied in the introductory part of this study, CSCL studies are constructive in nature. Deservingly, in this section, the study will look briefly at the history of constructivism, then proceed to discern the very core foundations of constructivist thoughts as they relate to CSCL in particular and higher education in general.

This study will peruse through constructivism and introduce major figures in the constructivism thoughts, point out their contributions and shed light on the criticisms on the constructivist theory in general. Lastly, this study will look at the community of inquiry model, its core presences and how these presences connect to the central research questions of this study.

There abound many positions and theories on the definition of constructivism. Many times, in trying to understand this concept of constructivism, scholars often have fallen into the trap. Their indecisiveness maybe due to the fact that constructivism, as a learning theory, encompasses many fields that are largely outside the realm of education and learning. For instance, many of the questions raised relate to fields of psychology, sociology, epistemology and philosophy.

2.1.1 Defining Constructivism

Constructivism and/or constructivist theory has been used in diverse fields and with many varied meanings. Consequently, in trying to define it, this concept becomes an issue in itself (Pérez-Cavana, 2009). Sjoberg (2009) attributes the confusion and disagreement to

the proponents who do not keep in mind the fundamental differences between the natures of their constructivist claims. However, this study will not venture to the details of the similarities and differences that cloud and hang over the terminology.

In its lifetime, constructivism has been defined as a research program (Lakatos 1970), a way of thinking (von Glasersfeld 1984), a secular religion within educational theory (Phillips, 1995), a theory, a tool, a lens for examining educational practices (Dougiamas, 1998), a theory of learning, and it is also a theory of knowing (Walker & Lambert, 1995), a new orthodoxy, a fad and a fashion, a movement (Erickson 2001), a combination of cognitive psychology and social psychology (Huitt, 2003), a metatheory (Siebert, 2004, in Pérez-Cavana, 2009), an interdisciplinary and transdisciplinary ‘paradigma’, and a perspective in which reality depends on the observer. (Siebert, 2005, in Pérez-Cavana, 2009). This list is just a tip of the iceberg.

No doubt, scholars have ventured to explore this concept, and from the select definitions above, it is evident that their quest has stirred many questions on what comprehensively defines it. Definitely, I am persuaded to lean to the opinion that constructivism is ‘an epistemological concept’ that is not unique or restricted to a particular field of study, rather a variety of fields, including philosophy, psychology, and science. By the fact that the core issue of CSCL draws from pedagogy, psychology and technology; then it seems that this study is headed for a very controversial debate of sorts.

2.1.2 A Metaphor from Architecture

In simplistic terms, constructivism is a metaphor from architecture, which involves the building up of structures from pre-existing pieces (Pérez-Cavana, 2009). In the same breadth, it is taken that ‘understanding’ is the building of mental structures. Pérez-Cavana

(2009) notes that ‘the building blocks are not merely received, but they are products of previous acts of construction’.

2.2 Community of Inquiry

The Community of Inquiry (CoI) is a learning model or framework put forward by Garrison, Anderson and Archer (2000). The framework asserts that knowledge construction occurs in online learning environments through an optimal creation and application of the three presences, which are teaching, social and cognitive presences. This way, learners in new learning environments have a best chance to recreate the knowledge building processes that exist in traditional face-to-face classroom environments.

These three core elements, also referred to as ‘elements of an educational experience’, are multi-dimensional and interdependent. It is evident that collaborative/constructivist learning experience unites these elements into one primary recipe to achieve a successful learning experience.

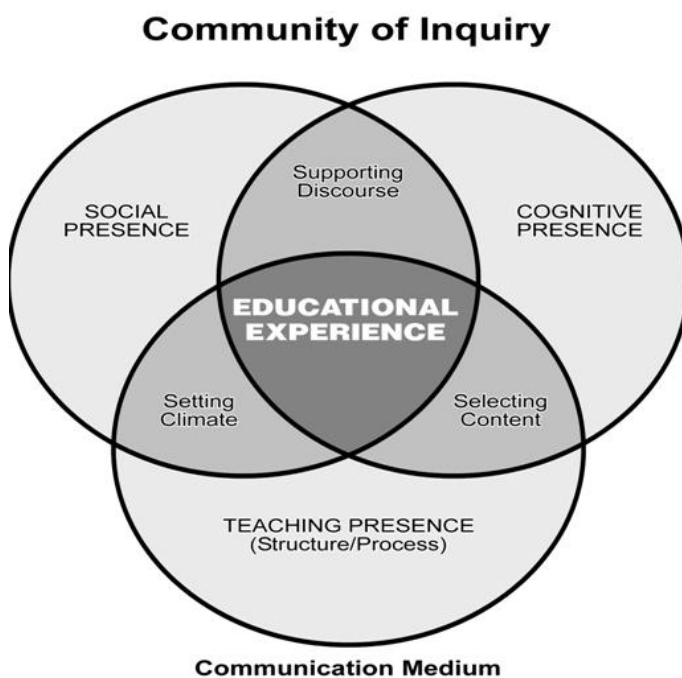


Figure 2.1. The CoI Framework (Garrison, Anderson & Archer, 2000)

It is assumed that learning occurs at the intersection of the three elements; meaningful, worthwhile learning will be realized when the three presences are explored to the limit. With this in mind, it has been the objective of stakeholders in online learning environments to investigate ways in which the three elements are created and employed optimally.

It will be seen that the three elements work in a unison, a trinity of sorts, a tight complementary relationship in which the cognitive presence being the main goal of the educational experience. The social presence laying the necessary groundwork for high-level discourse, whereas the teaching presence working to enhance the structure, organization, and leadership associated with a successful learning environment.

One key challenge for current stakeholders in CSCL is how these presences can be manipulated to maximize the quality of learning outcomes in learning environments.

2.2.1 Cognitive Presence

Cognitive Presence is the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson & Archer, 2001).

It might appear that cognitive presence is likely to be the most challenging to study and develop in online courses, because it takes place in one's or collective mind. It would require a lot of expertise and effort to bring this presence out into play.

Lee and Lee (2006) studies pointed out that collaborative groups that apply critical thinking skills are likely to be more successful in exhibiting this presence. In such groups,

a variety of personalities may be more effective in developing metacognitive interaction than do groups comprised of only extroverted or introverted learners.

To understand how cognitive presence works, Garrison et al. (2001) developed the practical inquiry model, which highlights the intricate workings of this presence.

2.2.1.1 Practical Inquiry Model

It is comprised of two groups of intersecting dimensions:

1. deliberation and action
2. perception and conception (insight and understanding)

The model has four phases which work around the above dimensions in a clockwise fashion.

- triggering event – issue, problem, dilemma
- exploration - search
- integration - connections, explanations
- resolution – solution, applications

A point of note is that these phases are not discrete or linear, (as they may appear in the chart below), but they overlap and loop in places.

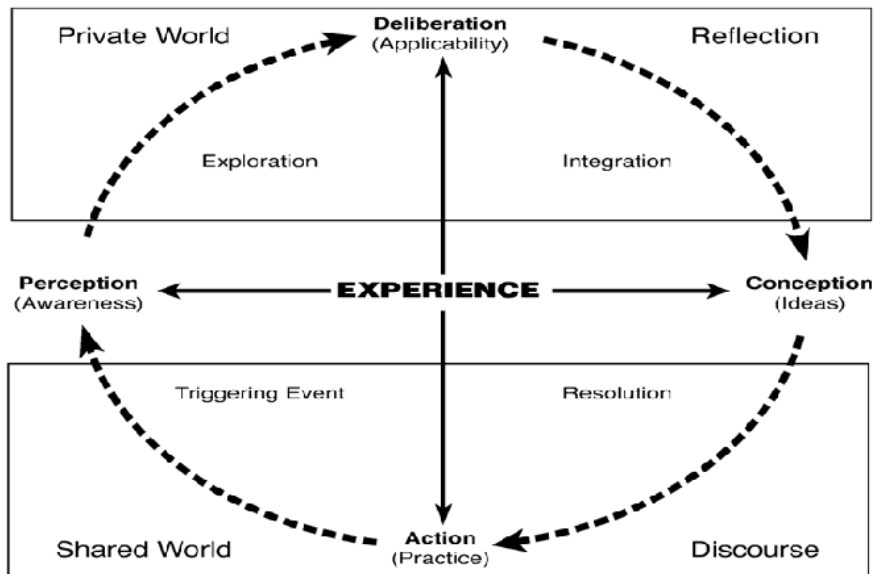


Figure 2.2. Practical Inquiry Model (Garrison, Anderson & Archer, 2001)

In online discussion forums, Lecotec not being an exception, most postings concentrated at the exploration phase where participants shared information and brainstormed ideas (Garrison & Arbaugh, 2007). And further studies showed also that a number of online discussions did not progress beyond the exploration phase, raises a lot of questions on the quality of online discussions and hence learning. Kanuka & Anderson, 1998; Meyer, 2003, 2004; Murphy, 2004). This takes the responsibility not only to participants, support team (teachers and tutors and coaches) but also to program coordinators and learning environment developers.

As usual, fingers quickly point to the faculty, as seen in Meyer (2003, 2004), that they need focus their teaching presence, be more directive in their assignments and tasks in order to elevate the quality of interactions and effectively the levels of inquiry.

Garrison & Arbaugh (2007) puts forward a few suggestions that can help reinvigorate interactions and discourse, and also by extension improve learning outcomes. They suggest that the teacher, as a subject matter expert, should interject relevant information

and diagnose misconceptions if the discourse is to be productive. Secondly, the nature of assignments and instructions should be well understood, so as to enable exploration and resolution of new knowledge. The latter suggestion is echoed by Meyer (2003) and Shea and Bidjermo (2008).

2.2.2 Social Presence

Social presence is the degree to which participants in computer-mediated communication feel affectively connected one to another their ability the ability to project themselves socially and emotionally, thereby being perceived as “real people” in mediated communication (Garrison et al., 2000).

Social presence is an important antecedent to collaboration and critical discourse because it facilitates achieving cognitive objectives by instigating, sustaining, and supporting critical thinking in a community of learners. Once possessed, learners will be able to share ideas, express views and collaborate effectively (Akyol, Garrison & Ozden, 2009).

Learning is both social and communal and it results from experience that is contextually based and socially situated. Therefore, any experience through collaborative learning cannot overlook the social aspect, more so, because it brings to the fore the affective and emotional aspects of learning interactions (Lipman, 1991).

With the foregoing, we can confidently say that the social presence has a direct impact on the development of community and learning through collaboration in online courses.

Vaughn & Garrison (2006) proposed four elements of social presence whose levels are determined by the interactive relationship among the learners, the instructors, the course content and the online environment.

- affective/ personal expression
- open communication,
- social cohesion
- collaboration

In addition, Tu and McIsaac (2000) proposed three dimensions of course design that influenced social presence: social context, online communication, and interactivity, which includes reciprocal communication patterns and timely responses.

As we know, learning is a social event, and it is through a rich social presence that communication is enhanced. Therefore, it will be of great importance that new learning environments promote social presence for them to attain excellent learning outcomes.

2.2.3 Teaching Presence

Anderson et al. (2001) define teaching presence as the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes.

There exists the need for purpose, structure and leadership in an educational process; this makes the teaching presence to be indispensable throughout the learning experience. After all is said, teaching presence is not only difficult to implement in any collaborative learning experience, but also more complicated in a multi-faceted online environment.

Unlike other two presences, teaching presence is unique because it is undertaken exclusively by a knowledgeable tutor who must guide the progression of the

collaboration, also to encourage and support the learners in their journey to critical inquiry awareness (Kanuka, Rourke, & Laflamme, 2007).

In a sense, the teaching presence unites the whole learning experience, at the same time giving it the crucial direction and support. This is clearly seen in the dimensions of teaching presence (Swan, Garrison, & Richardson, 2009). They include designing and organizing the learning, by providing with resources, facilitate the discourse, provide direct instruction and feedback.

ELEMENTS	CATEGORIES	INDICATORS (examples only)
Social Presence	Open Communication Group Cohesion Affective Expression	Risk-free expression Encourage collaboration Emoticons
Cognitive Presence	Triggering Event Exploration Integration Resolution	Sense of puzzlement Information exchange Connecting ideas Apply new ideas
Teaching Presence	Design & Organization Facilitating Discourse Direct Instruction	Setting curriculum & methods Sharing personal meaning Focusing discussion

Figure 2.3. The Summary of the CoI categories and the corresponding indicators (Garrison & Anderson, 2003)

2.3 Relevance

Technology-enhanced learning environments have opened the door to many possibilities and potential of teaching and learning. Inasmuch as these new frontiers promise and exhibit increased learning outcomes, collaboration, per se, is not a recipe for outcomes; its results depend upon the extent to which groups actually engage in productive interactions (Dillenbourg et al, 2009).

The content of the LeCoTec course was designed for university learners. The study itself, through its research questions and objectives, focussed on the learners' communication patterns, and the role of these interactions in knowledge building. By the fact that the course took place in an international setting, provides an opportunity to study how these remotely located learners learn the theory and the practice of CSCL.

2.4 Research Questions

The main research question of this study is:

What is the nature of communication sustained by university students in a computer-supported collaborative learning (CSCL) course?

- What types of interactions are supported and enhanced by the CSCL environment for the university students in the LeCoTec course?
- How do the interactions of the university students in the LeCoTec course serve as evidence of learning outcomes?

2.5 Research Objectives

This study aims to describe the way learners interact and collaborate in an online environment. It is apparent that interactions (communication) are the heart of CSCL, and

analyzing them will highlight the complex group learning process and attainment of learning outcomes. This study will look at these communication structures among the key participants, throughout the phases of the Lecotec course, in terms of their frequency and quality, and highlight how these interactions relate to the learning process and learning outcomes. The key participants include the learners, the tutors, the writing coaches and the course coordinators.

3 THE LECOTEC COURSE ENVIRONMENT

3.1 Introduction

The Learning and Collaboration in Technology-enhanced contexts (LeCoTec) was an online advanced international CSCL course, organized for graduate (Masters and PhD) students in the universities of Oulu (Finland), Turku (Finland), Ramon Llull (Spain), and Ghent (Belgium). The course was coordinated by the Learning and Educational Technology Research Unit (LET) at the University of Oulu, in conjunction with tutors and writing coaches from the other three partner universities. The course was offered in the spring semester of 2010; it ran for a nine-week period, starting February 8th through May 12th, 2010

The LeCoTec course took place on two web-based online learning environments, as follows:

LeCoTec blog site – The course content support was provided on the blog website, at <http://lecotec.wordpress.com>. Here the students found course instructions, course coordination, course learning material and short profile information regarding the participant students and their respective universities.

Knol sites – Provided by the now defunct Google Knol, at <http://knol.google.com>, these personalized individual and group pages provided a very fundamental stage for interactions to take place among all the participants and their respective groupings.

In addition to these two environments, the Collaboration Awareness Tool for CSCL Users (Euro CAT) (<http://www.cat-cscl.eu/moodle/>) was setup to provide planning support for the students and the tutors.

3.1.1 Participants

A total of 66 students participated in the course, represented as follows:

University of Oulu - 16 (16 female, 0 male)

University of Turku – 4 (3 female, 1 male)

University of Ramon Llull – 6 (5 female, 1 male)

University of Ghent – 40 (36 female, 4 male)

There were seven writing coaches and at least one tutor for each university represented.

3.1.2 Aim

The aim of the course was to provide theoretical and practical understanding on how learning can be supported and enhanced pedagogically in technological environments.

The following are the specific objectives of the course, as outlined in the course blog site (LeCoTec, 2010):

- to understand the theoretical aspects of collaborative learning and pedagogical models in CSCL
- to design and evaluate collaborative learning in technology-enhanced environments
- to analyze collaborative learning process and to find ways for teachers and educators to implement and enhance collaboration
- to strengthen collaborative academic writing and argumentation skills
- to strengthen reading and communication skills in English

3.1.3 Lecotec Course Content

The focus of the Lecotec course was the theoretical perspectives of collaborative learning theories. This is the core issue of many CSCL studies (Stahl et al, 2006). The course content was divided into themes, as follows:

1. Motivation and emotions in CSCL
2. Structuring and scripting in CSCL
3. The structure of communication on CSCL environments

There was a large collection of course learning material provided at the start of the course, and also as the course progressed. The learning material was in form of articles, PowerPoint slides and video presentations.

3.1.4 Course Tutoring

The local university teachers, “topic” teachers, and writing coaches (Barcelona group) during collaborative writing also provide an indispensable role of supporting the entire collaborative process; and from time to time, gave advice on writing, discussion and other reference material.

3.2 The Lecotec Course Phases

The Lecotec course was structured in four phases, as follows:

- Orientation Phase
- Individual Study Phase
- Collaboration Phase
- Elaboration phase

These phases were geared to induct the learners (participants) to the LeCoTec course initially, and the CSCL studies as a whole, by providing them with adequate collaborative knowledge, skills and best practices.

3.2.1 Orientation Phase

The duration of this phase was about one week and it comprised of face-to-face local meetings of the participating students and their respective teachers/tutors at their home/local universities. In this phase, the students were introduced to the LeCoTec course, its aims and objectives.

The students also received the course learning material, which included a video lecture and accompanying slides from the coordinator of the course. This video lecture was indispensably important because it provided a detailed overview of the CSCL research.

The students were advised on good academic writing using the APA standards

They also had a chance to understand the course learning environments, that is, the blog and the knol. The students were required to register and create their individual knol pages at knol.google.com. In addition, they were advised to add a personal profile photo and choose “open collaboration” model option. These were meant to increase visibility and enable their colleagues to review and comment each other’s knols.

The various teachers and coordinators from each participating university were required to link the students’ knols to the home blog – name students’ knols accordingly. By so doing, visitors will get an enhanced navigation between the two learning environments.

3.2.2 Individual Learning Phase

The duration of this phase was three weeks, whereby the students explored and familiarized themselves with the three thematic topics of the course, and wrote a brief manuscript on each topic.

As a learning outcome, the manuscript (diary-type personal reflection) was about 500 – 1000 words, roughly 1-2 pages. The learners were also required to make at least two comments on their colleagues' knols.

The aim of the individual learning phase was to enable the students gain a deep understanding of the main issues and perspectives in the CSCL studies (as outlined in the blog site). Secondly, these reflections would be a resource material for groups during the collaborative phase. The idea of writing and cross commenting was aimed at giving a chance for the students to have an idea of their colleagues' thinking, in addition to understanding the course content.

After the second phase, the learners were asked to submit a theme of their choice for the next group collaborative learning phase. The population was divided into 15 groups, and each group was allocated a topic, within their theme choice, on which to study and write upon.

3.2.3 Collaborative Phase

This phase took place from 30th March through 7th of May 2010. This phase was quite important because, they had an opportunity to put into practice and investigate further the CSCL theories. The students were arranged in groups of between 3 and 5; and they were given a thematic topic and core learning materials for reference. The main goal of this

phase was collaboration in practice. The learning outcome was a group academic article written in standard English and that follows the APA manual standards.

This was a very crucial and involving stage of the course because participants had an opportunity to ‘learn to collaborate and collaborate to learn’.

3.2.4 Elaborative Phase

This final phase of the course was designed to enable the students to meet their local university tutors and receive guidance and feedback. This was mainly face to face and students had a possibility to discuss, brainstorm on the course activities, share experiences and motivate each other to collaborate.

It was also a guide opportunity to receive guidance on the technical aspects of the learning environments, raise questions and have an opportunity to field questions and get clarification on several technical aspects of CSCL studies..

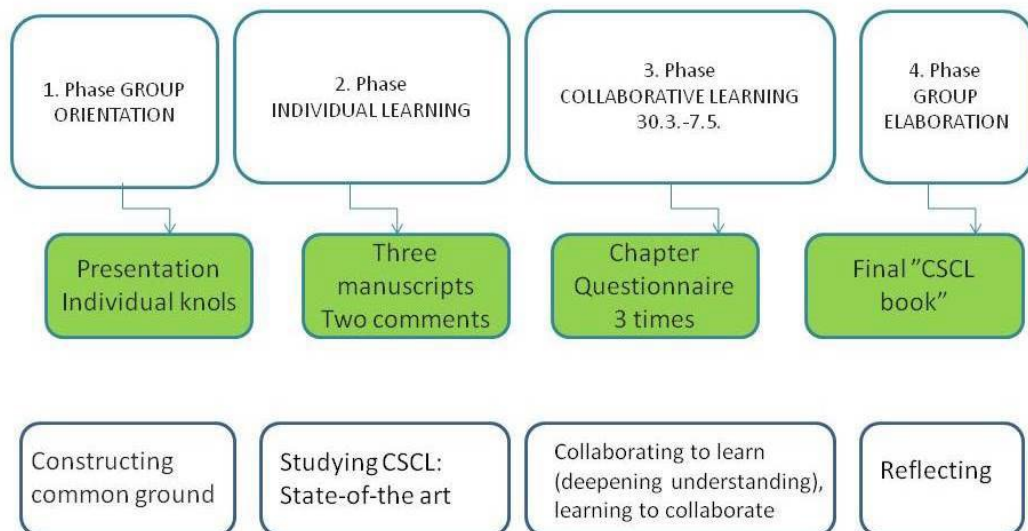


Figure 3.1. Summary of LeCoTec phases, outcomes and purposes (LeCoTec, 2010)

3.2.5 Lecotec Course Evaluation

Evaluation in the LeCoTec course was done on two levels: the group level and student level. At the group level, the course support team (coordinators, teachers and tutors) gave a detailed evaluation of the final group article, which included a personalized appraisal and comments on their work.

On the other hand, the students in the course were evaluated on a Pass/Fail scale. They also received seven ECTS points that were added to their degree program at the respective universities. The students' pass or fail was based on their participation in the course, attend local meetings, contribute to group article and filling questionnaires whenever required.

4 METHODOLOGY

This study will employ a mixed method approach to analyze the collected data. First, on a micro-level, the study will use Content Analysis (CA), whereas Social Network Analysis (SNA) will be employed at the macro-level.

The use of both micro- and macro-analyses is important and highly advisable especially when dealing with the issue of collaborative learning. As we have seen, CSCL involves a mosaic of interrelated and interoperating units and processes. Learners are constantly interacting among themselves, with the teacher, with the learning resources and with the environment itself. Therefore, the use of the CA and SNA will help to investigate and capture the intricate process of learning in this CSCL environment and present a more comprehensive perspective thereof.

4.1 Content Analysis

Content analysis is one of the popular approaches used by researchers to evaluate comments from online discussion forums. At this micro-level, the study will analyse the comments types, cognitive process, knowledge types that are evident in the LeCoTec course. Here, the unit of analysis will be the message being exchanged between the individual participants and the learning environment.

With the application of Henri (1992), the study endeavors to highlight the learning process that could be depicted by the messages of interacting collaborating learners.

4.1.1 Research Instrument

Henri (1992) analytical model is comprised of five dimensions: participation, social, interaction, cognitive and metacognitive.

The Henri (1992) model is one of the popular and most cited approaches in the CSCL research. This is by the fact that it has a strong cognitive approach and it emphasizes on

the collaborative and collective knowledge. The model also focuses on interactivity, which is one of the main indicators of learning and knowledge sharing.

This study modified the Henri's (1992) five dimensions, and came up with ten new categories, as follows:

Table 4.1

The Henri (1992) model with modified categories (Henri, 1992; McKenzie & Murphy, 2000)

Dimension	Category	Description
Participation	Administrative	Questions about submission of work, dates, deadlines, group organization
	Technical	Environment technical know-how, user guide, instructions, Issues dealing with access, eg log ins, passwords,
Social	Social	Unrelated exchanges, greetings, Introduction, Asking names
Interactivity	Interactivity	Direct and indirect responses, commentaries, between participants and other statements relating to the assignment; communicating intentions to the rest of group
Cognitive	Content	Tackling the assignment, referring to questions asked
	Critical Thinking	Clarification, Inferences, judgments and strategy that offers solution to task/assignment
	Information Processing	Brief/detailed texts, suggesting solution (whole/part), presenting a wider view
	Referencing	direct list of references, quotations
Metacognitive	Knowledge	presenting own self information/perspective; compared, and contrasted with others' information
	Skills	Steps of evaluating problem, plan/strategy, and self-regulation/assessment/review of strategy

4.1.2 Research Subjects and Sample

All the webpages for the individual and group knol pages were saved into the local personal computer in html format (hypertext markup language) and later converted into PDF file type. The saved pages maintain the same content, look and features as the

online copy. Individual knols downloaded at the end of the 2nd phase (28/04/2010) whereas the group knols downloaded at the end of 3rd phase (09/05/2010).

It will be assumed that tightly close groups, highly interactive and long chain levels would be evidence of knowledge sharing and building in learning environments. Subsequently, CSCL environments would be no exception.

This study analyzed the group transcripts and interaction as follows:

1. Individual level (Active and Popular)
2. Chain level (Content Analysis)
3. Group level (SNA)

4.1.3 Individual level

The study will look at how the individual participated and contributed to the writing of the group task. Here, the study will analyze the interaction and highlight the activity of the individual throughout the group learning process.

This way, one is able to see how ‘active’ and/or ‘popular’ the individual was in the learning task. By looking at the number of comments per individual, and the type of comments, or themes and ideas thereof, the study will show the level and type of participation for select individuals.

Because of the large amount of groups, students, and comments; it will not be possible to analyse each and every individual, group or chains.

CSCL’s main concern is group interaction in online environments. For CSCL to highlight the evidence of learning in these environments, it focuses on most active/interacting group/individual, versus least active. This way, studies hope to unearth communication

structures that support and sustain learning in such new learning environments. In our case, the environments were blog and knol.

4.1.4 Chain Level

Comment chains are direct evidence of individuals interacting. It comprises of a startup comment and a number of follow up or response comments. In a highly active learning environment, the chains represent the individuals debating, negotiating and sharing ideas about the task at hand. Therefore, longer chains have a higher possibility of pointing to a deep learning process in the online environment.

To help achieve this, the study selected chains based on the following criteria:

1. Three long Chains
2. Two short chains

4.1.4.1 Sampling

On the chain level, this research will look at the length of the chain, in terms of the number of comments. Longest chains will be analysed, compared and contrasted with short ones. And again, similar to the above two analyses of individual and group, the research will try also to pinpoint evident factors that helped create and/or sustain such high/low interaction in the chains.

- Quality of chains
- Visualize the chains, and if possible show process and pattern

The study chose the top five most active groups (groups with the highest number of postings, start up and responses). In this case, these groups were identified had a cumulative number of messages of over 80. These were Groups 2, 3, 4, 8, 12, and 15.

Group 15 was excluded from this set because of posting irregularities, whereby, all participants posted on one single thread.

This study went further, and picked the longest thread from each of these groups. In addition, the study will be random, and will avoid the instance of picking two long threads from a single group.

By taking account that a number individual comments in this study are rather long texts, not just couple of sentences, it becomes necessary to break these into various themes and ideas.

It is also good to note that the group participants had the tendency to share their task findings, the text, along with the references and citations, before they incorporate these into the actual task (the group article). Actually, this is idea of sharing knowledge could have led to the other participants being inspired and motivated to read that text, and also provide follow-up texts, commentary and other findings to aid to the task.

4.1.5 Group Description

In addition, the study will highlight how the group interacted, and show how tight or loose the individual members of the group were; how distant or close they interacted.

The study will look at how the group interactions were distributed within the various groups. These would pit the top interactive groups against each other so as to describe and identify how the interaction within these groups accounted for high quality group outcome. In addition, this kind of analysis will help highlight the possibility of tutor support and its effect in the long run.

The study will also try to identify active ‘teams’ (universities) and groups.

To analyze how the group performance, the study will review and rate the group product, that is the group essay. The group to be analyzed will be the ones which had the highest number of chains and also, the ones with longest chains.

This way, the study will try to correlate between group interactivity and learning outcome. It is generally assumed that highly interactive groups will produce high quality learning outcomes.

4.1.6 Popular Themes

From the above analysis, the two most popular themes are ‘Participation’ and ‘Social’ themes which were used 15 times in each case. This could mean that the students were keen to participate, and deliberately worked to create a social presence that would serve as a foundation for further interaction and knowledge building.

Task Content and Direct References Inclusion

The comment chain had a total of 4 units that were related to the content and 5 units related to Direct reference. It was noted that students extensively used the task content in the comment chains. This was later categorized as ‘Information processing’. This is because, that text may not necessarily be the final that appeared in the final group product (article).

It appears that most of the comments are about each individual’s contribution/participation , and interactivity is not actually emphasized. Also, almost absent from this chain is ‘Metacognitive’ elements of learning.

This means that the participants placed a lot of emphasis on social awareness, as seen in their greetings, and getting to know each other statements.

4.2 Social Network Analysis

Social Network Analysis (SNA) is a perfectly designed tool to analyze relations, and visualize networks by representing them in easy to use graphical representations (Nurmela, Lehtinen, & Palonen, 1999).

At the macro level, the study will measure discourse sequences and conversation features. The unit of analysis will be a ‘comment’ made by individual participants.

These comments were analysed both at the individual level and group (university) level.

The key constructs will be analyzing the interactions and establish their density, frequencies, sequences, features, patterns, etc.

- Overall density of interactions
- Centralizations

This study used UCINET 6 program (Borgatti, Everett and Freeman 2002) to analyze the network data. Commenting each other text was thus examined by using social network analysis. For the analysis, the comments were written to square matrix where all participants were written both at rows and columns. Density measures indicate how much there is commenting inside each group. Then standard deviation values can be treated as centralization measures that indicate how much commenting is focussing around the most central members of each group. Density characterises the general cohesion of the groups, whereas centralization indicates tie distribution among participants. The values were analysed both for dichotomic values (where each member was calculated only once) and valued matrix (where each comment was calculated).

5 RESULTS

The LeCoTec course was all about collaborative interactions. The table below (Table 5) shows the summary of all the groups' startup and response comments.

Table 5.1
Summary of group interactions. Sum, mean and standard deviation

Group	N	Total Startup	Total Response	Mean Startup	Mean response	SD Startup	SD Response
1	6	14	53	2.33	8.83	3.386	3.710
2	6	49	87	8.17	14.50	5.601	10.33
3	6	30	53	5.00	8.83	3.406	6.524
4	5	15	98	3.00	19.60	2.236	6.542
5	6	9	48	1.50	8.00	2.51	2.828
6	5	14	64	2.80	12.80	2.588	5.762
7	5	12	46	2.40	9.20	2.408	2.683
8	5	15	108	3.00	21.60	2.55	10.431
9	6	14	35	2.33	5.83	1.366	3.43
10	4	14	21	3.50	5.25	2.082	3.775
11	6	11	67	1.83	11.17	1.835	7.91
12	5	23	89	4.60	17.80	2.966	12.317
13	5	21	42	4.20	8.40	2.28	6.025
14	5	10	81	2.00	16.20	3.082	16.529
15	5	9	129	1.80	25.80	3.493	17.936
mean	5.33	17.33	68.07	3.23	12.92	2.79	7.78

There were a total of 260 startup comments and 1,021 response comments.

The *Figure 5* below shows all the groups' total comments, both startup and responses, with the average indicated by the blue and brown lines respectively.

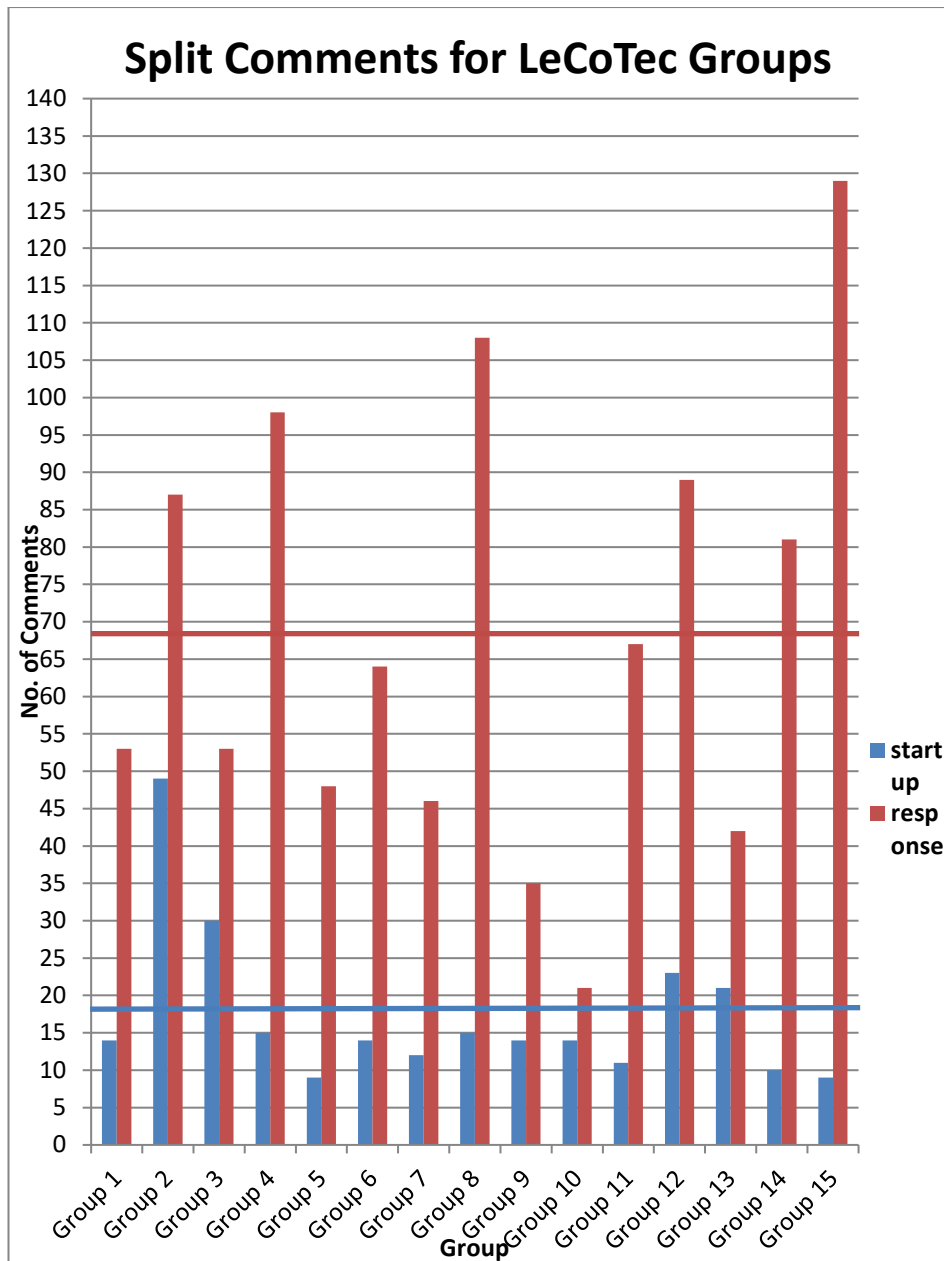


Figure 5.1. Split group comments showing startups and responses table

As seen from the figure above, four groups (groups 2, 3, 12 and 13) had at least 20 startup comments, which was above the average number of 17. The rest of the groups had less than fifteen startup comments. Startup comments are an important indicator that many groups comprised of individuals who were enthusiastic to participate in the collaborative exercise. Therefore, high number of startup comments could mean that a lot of effort was made to initiate interactivity within the groups.

On the other hand, six groups (groups 2, 4, 8, 12, 14 and 15) had at least 70 response comments (the average was 68.07 comments). This is a good overview to show that a number of groups had many active discussions and sharing of ideas and information within these groups.

5.1 Interactivity

Interactivity in the groups was indicated by the number of startup comments, response comments and the response rate. The numbers from here will help highlight the active groups, passive groups and also the level of interactivity within these groups.

The groups with very low response rates is an indicator of having many startup comments not responded to.

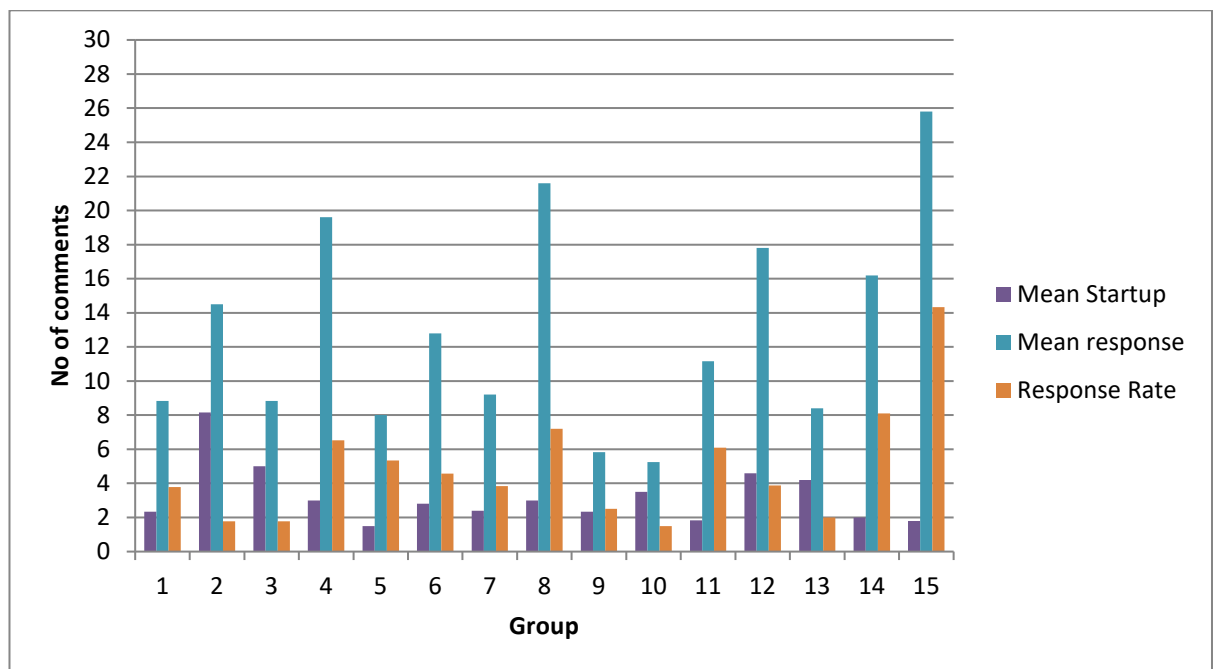


Figure 5.2. Lecotec groups’ combined startup, response and response rate comments

5.1.1 Startup Comments

Startup comments will indicate the how active the learners were in initiating discussions in the group work. A large number is a sign of many startup comments. In the figure

below, Fig. 6, it shows that at least half of the groups (groups 2, 3, 4, 8, 10, 12 and 13) had the group participants initiating at least three comments each.

This is a good indicator because we are able to predict the groups that had many active students who were outgoing and ready to initiate discussions.

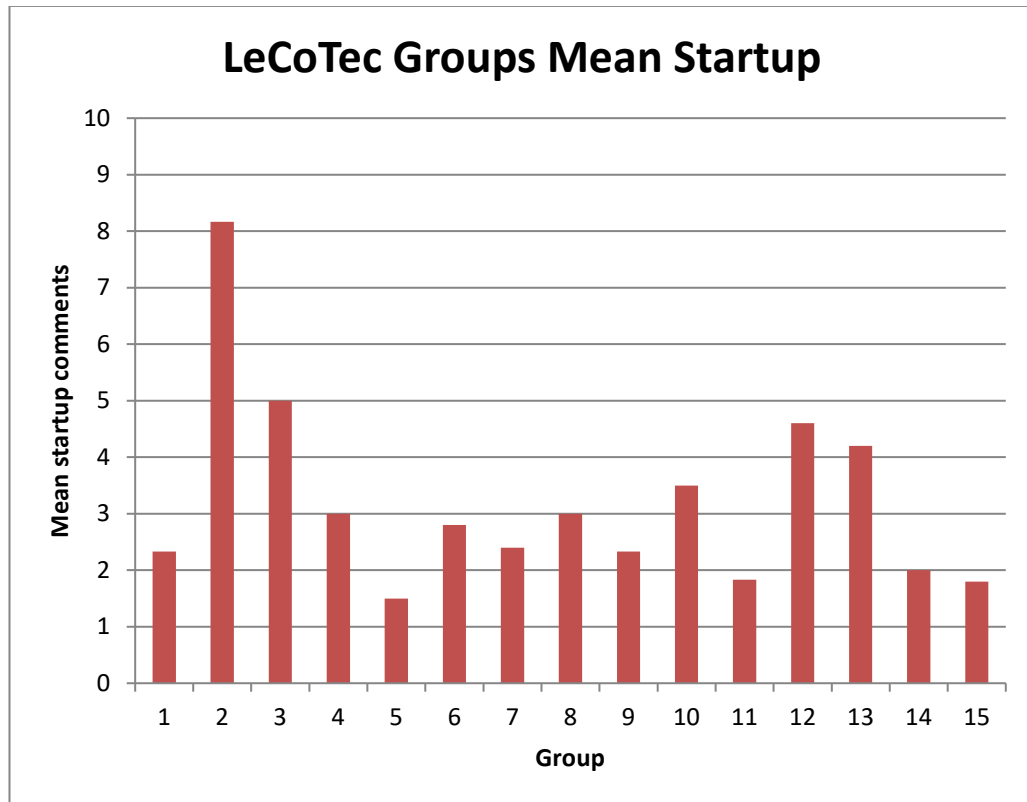


Figure 5.3. LeCoTec groups' mean startup comments

5.1.2 Response Comments

Just as startup comments are important, so are the response. These two aspects, startup and response, are important parts of the interaction and communication process.

The figure below, Fig. 7, shows the groups' mean response. High values are an indicator of high response. On average, groups 2, 4, 8, 12, 14 and 15 had a high response rate, of at least ten responses per individual participant. That shows that students in these groups were more involved to participate in the collaborative process.

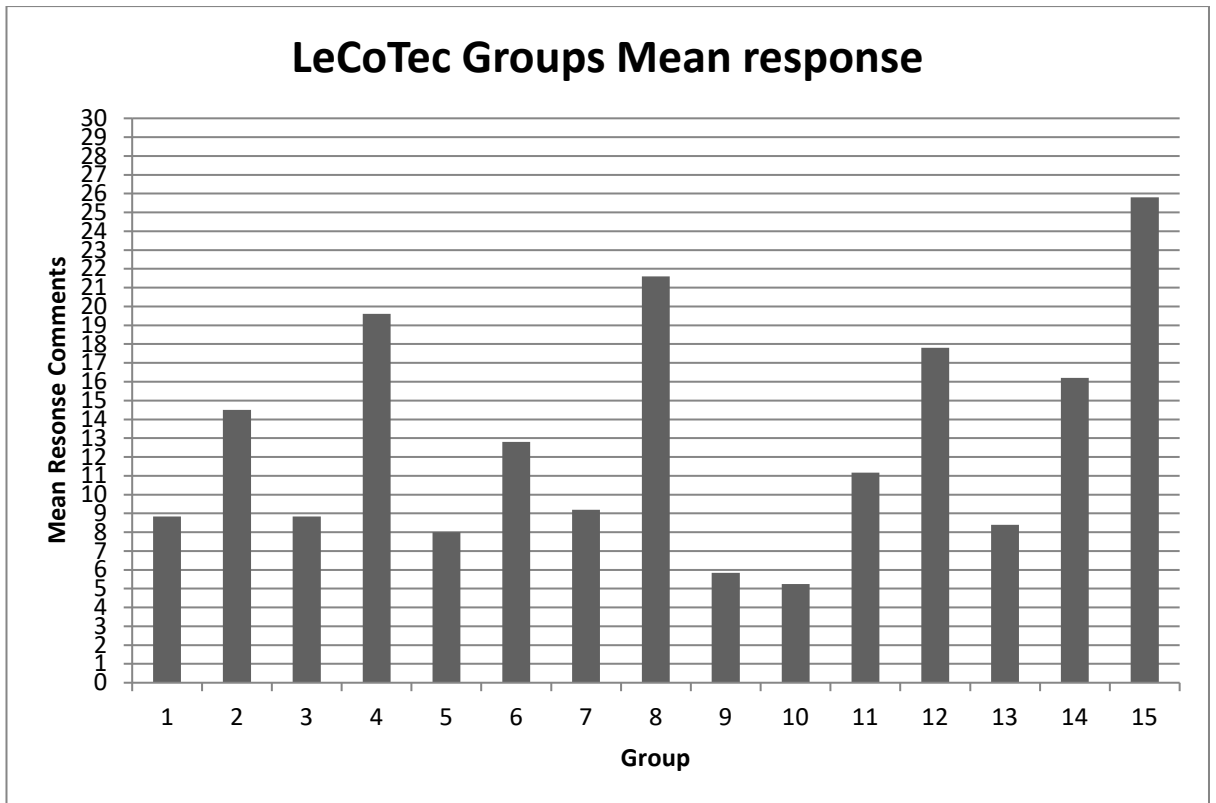


Figure 5.4. LeCoTec groups' mean Response comments

5.1.3 Comments Response rate

Comments response rate is basically the number of response comments divided by the startup comments. The reason for this will help to determine how many startup comments were actually responded to. In other words, it shows how many responses per startup comment. This is a good indicator because, it will give an idea how participants were responding to the startup comments sent.

As seen from the figure below, Fig. 8, six groups (4, 5, 8, 11, 14 and 15) had more than average responses, of at least five response comments per each startup comment.

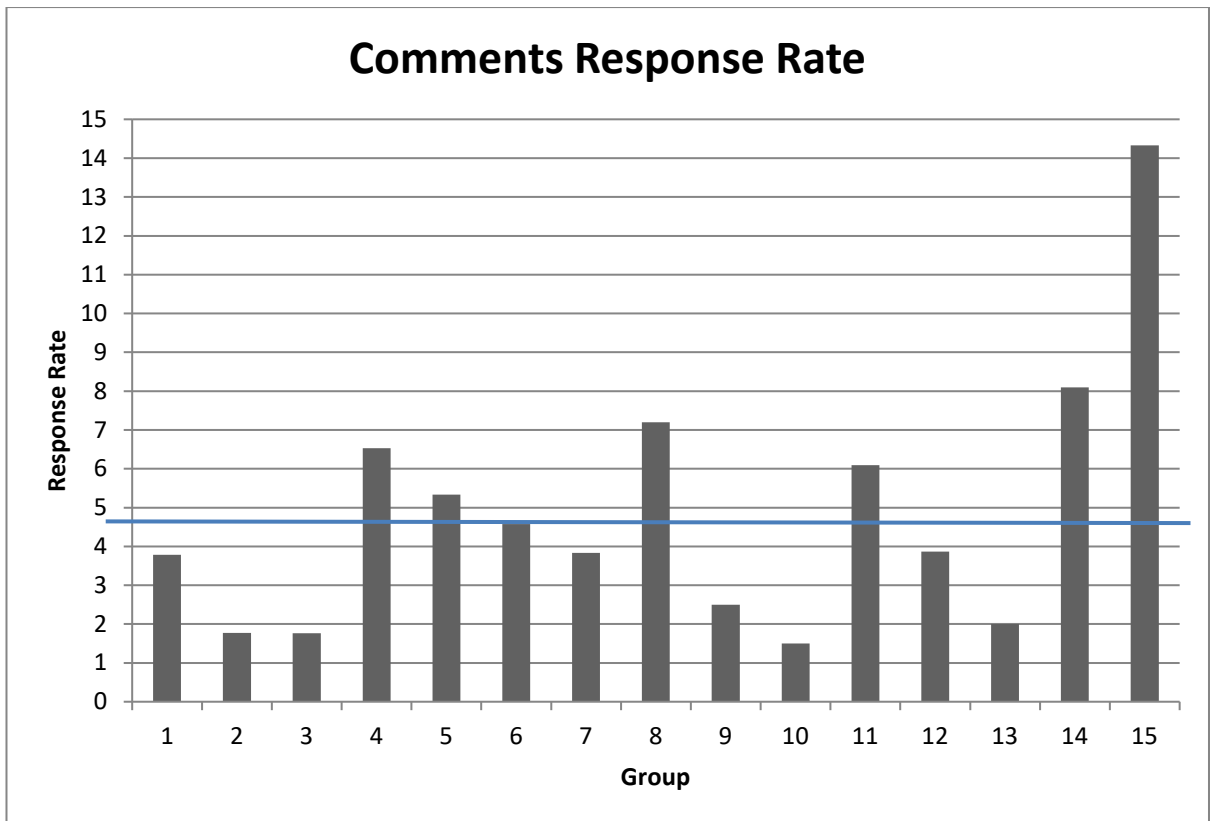


Figure 5.5. LeCoTec groups' Response rate

5.2 The type of comments

The result from the three top interactive groups was analyzed using the modified Henri (1992) instrument (table 1) as follows:

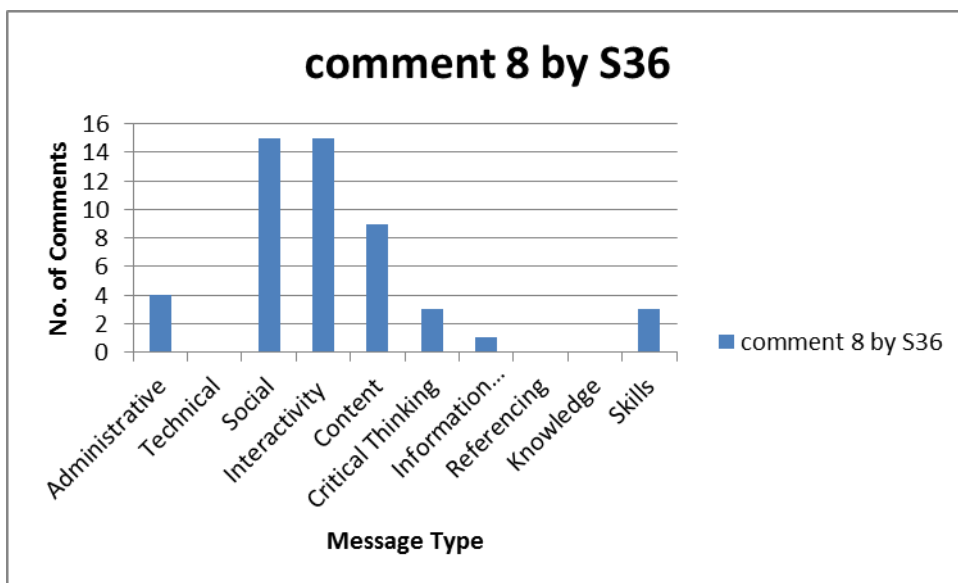


Figure 5.6. Chain Analysis of Comment 8 by S36. The frequency of the message types.

This chain had 23 nodes, and when analyzed using the modified Henri (1992), it came up with 50 message types. As seen from Figure 7 above, Social and Interactivity type of message account for more than half of the total comments in this chain.

The chain is also characterized by an absence of Technical, Referencing and Knowledge comments as well as very low Administrative, Critical Thinking, Information and Skills message types.

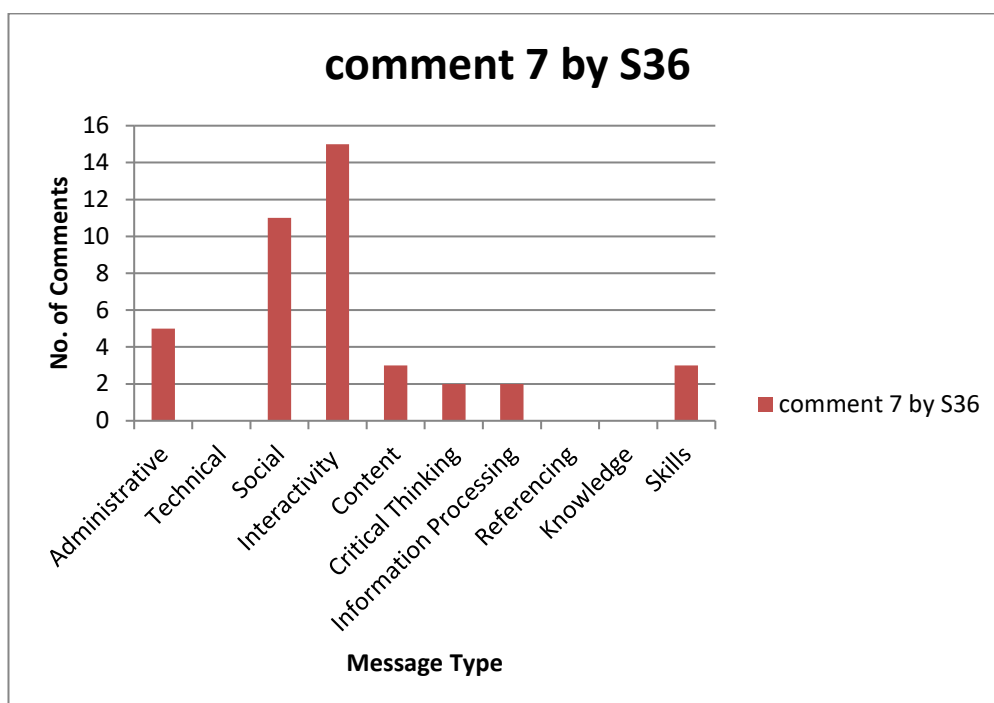


Figure 5.7. Chain Analysis of Comment 7 by S36. The frequency of the message types.

The chain had 22 nodes, and it yielded 41 comments when analyzed by modified Henri (1992) instrument.

This chain was characterized by high Social and Interactivity type of comments, followed by Administrative comments. It can be seen that the group lacked Technical, Referencing and Knowledge type of comments. The lack of Technical type of

comments, for instance, could be a sign that members had a good understanding of the environment. Therefore they did not field any such comments.

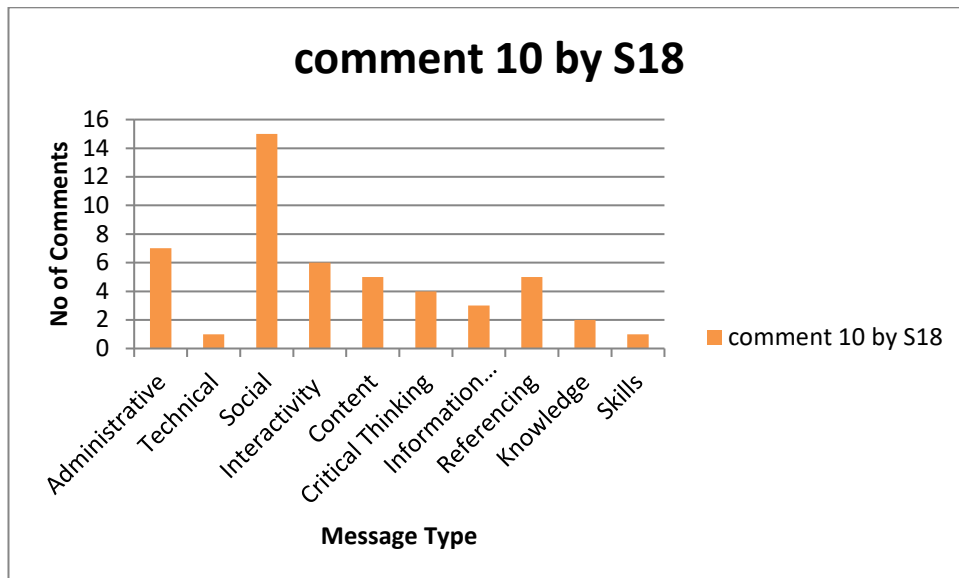


Figure 5.8. Chain Analysis of Comment 10 by S18. The frequency of the message types.

This chain included lot of Social type of comments, followed by Administrative type of comments.

5.3 Inside Group commenting

The results of social network analysis indicate that there is much variation in commenting inside the groups. The dichotomic values can vary from 0 to 100%. These indicate how big share of the group members participate in commenting. As seen in Table 5.2 below, participating was lowest at group 14 and highest at Group 2, Group 4, Group 8 and Group 12. The valued measures that can exceed 100% are densest at Group 8 and Group 12.

Standard deviations indicate how strongly the group commenting is patterned around one person. The centralization of dichotomic values do not differ very much but as regarding valued measures we can see that in Group 5 and Group 14 commenting has patterned more around the most central group members. Especially in Group 5 and Group 14

commenting is sparse and highly centralized whereas in Group 4, Group 8 and Group 12 it is rather dense and not very centralized.

Table 5.2

Commenting inside groups. Densities and standard deviations.

Groups	Density inside (valued)	St. Dev	Density inside (dichotomic)	St. Dev.
1	165%	201	45%	50
2	285%	326	75%	43
3	160%	177	60%	49
4	450%	320	75%	43
5	25%	536	20%	40
6	325%	392	58%	49
7	258%	345	50%	50
8	575%	635	75%	43
9	105%	150	45%	50
10	150%	126	67%	47
11	235%	378	55%	50
12	408%	343	75%	43
13	225%	306	67%	47
14	317%	817	16%	37
15	0%	0	0%	0

5.4 The Quality of the Learning Outcome

The quality of learning outcome was evaluated and graded using the Assessment criteria that was adapted from EDU s7 Essay Writing course (LLEES, 2010) see Appendix 1. The grading scale was between 1 and 5; 5 being Excellent and 1 being Weak.

The evaluation of the essay was concentrated on these issues:

1. Topic handling
2. Concept and terms descriptions
3. Critical argumentation of the issues
4. Logical and flow of ideas

Table 5.3

Evaluation of the Selected Active and Passive groups' learning outcome

Group	Active/Passive	Grade	Remarks
Group 4	Active	3	Good
Group 8	Active	4	Very Good
Group 12	Active	3	Good
Group 5	Passive	2	Satisfactory
Group 14	Passive	4	Very Good

Active groups

Group 4 - Good

The quality of the work was quite good, and the ideas were presented. The terms and concepts are well defined. The text still needs some refining, and get rid of unnecessary ideas and content that otherwise 'crowd' the article.

It is recommended that they use proper APA referencing, especially in regard to article organization and referencing.

Group 8 - Very Good

The text is well structured, and coherent. It follows the APA standards well, and it tackles the issues with seriousness and presents its arguments in a logical way.

Group 12 - Good

The handling of the issues is well tackled, and the ideas are presented in a coherent manner. The arguments could be expanded further and APA standards could be adhered to.

Passive groups

Group 5 – satisfactory

The text in Group 5 was rather thin, and not well developed

Group 14 – Very Good

The quality of the work for Group 14 was good, in terms of handling of the issues and concepts. It is written in a logical way and there is a good dialogue with the literature.

5.5 Levels of Interaction

Levels of interaction within the Lecotec learning groups, as displayed in the Figure 10 below, show that the most active and popular participant were the Support Team (ST). This is obvious, by the fact that the support team was cutting across all the groups and their contribution was critical for the success of the learning process.

Nevertheless, a number of participants such as S36, S46, S27, S9, S57, S52, among others stand out as being very active and popular.

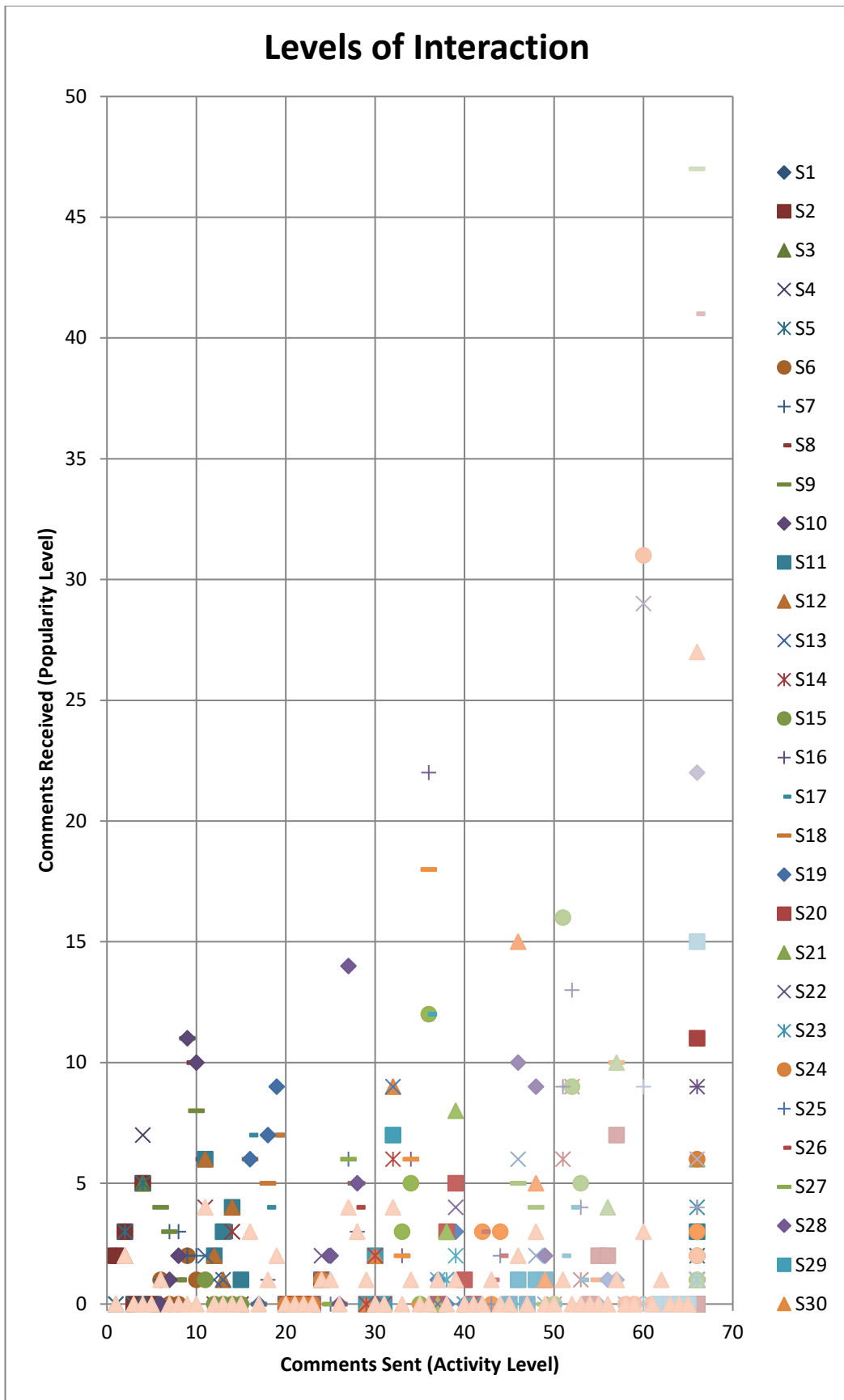


Figure 5.9. Levels of Interaction within groups. Activity levels and popularity levels.

6 DISCUSSION AND CONCLUSION

6.1 Interactivity

Interactions remain one of the key issues in online learning environments. Research has shown that studying these interactions holds a promise of understanding and revealing the extent to which these environments succeed in achieving the learning objectives.

6.1.1 *High Interactivity vs Low Interactivity*

The following are possible reasons for groups having long chains.

It is possible that the participants had more ideas to discuss, or they were more motivated and committed the learning. It is safe to predict that long chains and high interactivity could be evidence of high group motivation and task commitment.

Characteristics of Active individuals

- Presence of certain individuals who asked/ignited the discussion with comments that required further discussion
- Teacher support/presence may have stirred the group members to participate and try to answer or query the support team
- The difficulty level of the task/topic of discussion, therefore could have facilitated the discussion.
- The individuals had a better understanding of the learning environments, blog and knol, and this technical know-how made them confident to participate and interact more.

6.1.2 *The Environment*

Dillenbourg et al. (2009) propose that in the current era of CSCL, the design of ideal environments should possess characteristics that facilitate learning through effective social interactions. Some features in the environment would make it easier for learners to engage in rich and cognitively involving discourses.

The tutors in such environments would play an important role in creating instructional scaffolding, and provision of guidance and feedback. This will in turn guide the learners in collaboration and regulation.

Dillenbourg, Järvelä and Fisher (2009) identified three main categories of interactions that facilitate learning: explanation, argumentation/negotiation mutual regulation. Then it would of importance of environment developers and tutors to keep these in mind when developing learning environments and designing instructional tasks. These interactions will be manifested in two ways. First, through learner-to-learner interactions (communication structures) as they tackle the learning tasks and through learner-to-environment interactions, as they participate in the knowledge building process.

6.2 Motivation & Emotions

When an individual learner enters into a computer supported collaborated (CSCL) learning environments, s/he does this with a clear intention to acquire more knowledge (learn), to earn credits for his degree program, to share his own experiences and to build on his existing knowledge. In CSCL, the individual learner acquires adequate tools and knowledge for future work in virtual environments. Therefore, it may be correct to say that this learner has emotional connection and willingness to participate in such knowledge-building venture, within the said context, ‘willingly and with personal drive’. Therefore, motivation, the first proactive step of the learning process, is almost

indispensable for any meaningful learning to take place. Actually, no motivation could mean no learning.

Järvelä et al. (2010) highlight the fact that a learner's motivation can be two-fold: socially influenced and socially constructed. At first, the individual characteristics possessed by a learner will draw into the social learning environment and have the desire to acquire knowledge. In this case, his/her motivation will be determined by the social learning context. On the other hand, the learner, after agreeing to participate in the environment, can construct, or build new interests to interact and take part in the actual learning activities that are available in a CSCL environment. It is worth noting that the characteristics of the environment have the ability to increase (or decrease?) the learner's motivation level to interact and build knowledge in a CSCL environment.

Dillenbourg et al (2009) consider motivation as one of the neglected issues in CSCL. They point out that a lot of focus has been aimed at studying motivation at the individual learner level. With such new learning environments, studies must also shift focus and highlight the affective and motivational issues of an individual within a group-learning context. It is evident that the learner has to form working relationships with all the actors and tools of the environment. With group learning in CSCL, social challenges like group dynamics will have a negative effect on the individual motivation and may be exhibited by low participation in the environment. It is hypothesized that good relationships will lead to high learning outcomes, and the reverse is true.

Self-regulation is one of the key ways in which a lifelong learner continues to be highly motivated to collaborate in a CSCL environment. Definitely, a learner will set his/her own learning goals, and learn strategies that will help him/her to monitor, maintain and control the various aspects of the learning process. As a member of learning team, a

learner will find new ways of handling challenging situations, increasing his interest and maintaining the momentum of the whole learning process. In effect, adhering to goals, rational judgments and full participation will ensure an enriching collaborative learning experience in CSCL.

As we have seen that CSCL is an interplay of technology, shared environment and pedagogy, various ways have to be studied in a bid to enhance the whole learning experience in this new environment. The results from these studies will yield crucial information and shed light on how students develop better learning strategies, and regulate their individual and collaborative learning (Hadwin et al, 2005).

6.3 Structuring and Scripting

CSCL is the integration of different sciences - cognitive psychology, computer science and educational science. Due to this complex meeting (melting) point, there is need to design the environment in such a way that the learners thereof will achieve their intended goals through active participation and interactions, and that the environment supports the learners needs.

Scripts have been identified to guide the process and set the conditions for interactions and therefore learning. A good script support assists the learner both at the content level and the social level.

Scripts will endeavor to chart out the important steps the learner will take in the learning environment and are aimed at guiding and supporting the learners' productive collaboration. This is done mainly by assigning actions, define the set of tasks and clarify the desired goals. Well done, scripts will determine and ensure fair and full participation of all participant learners, as they interact among themselves and with the environment, in the quest for knowledge construction.

6.4 Role of metacognition

Communication is both a process and product of learning and interactions hold the key to learning. Studies have shown a strong link between metacognitive activity and the features of interaction; and metacognitive thinking is a product of well reciprocated interaction among collaborating peers in a CSCL environment (Hurme, Palonen & Järvelä, 2006). Communication (or interactions) remains a paradox: it is not everything, but there is nothing without it. There needs to be a regulation of both motivation and communication so as to achieve meaningful interactions.

6.5 Limitations

There exist a number of limitations that were identified in the LeCoTec. Without doubt, such factors will. Generally, irregular collaboration, lack of organization, imbalanced level of commitment, the issue of collective grades and other communication and motivation issues can adversely affect the quality of interactions and intended outcomes (Capdeferro & Romero, 2012).

6.5.1 Time

The LeCoTec course was constrained by time. Considering that the students had other courses to study, the three weeks allocated to collaborative learning and writing may nothave been enough. Veermans and Cesareni (2005) suggest that for collaboration to be more effective and productive, the courses could be organized for longer periods, such as complete academic terms. This way, the participants will have more time to learn to collaborate, develop trust and effectively critical thinking.

6.5.2 Offline Interactions

With the internet age and mobile communication, multiple channels of communication are available to the learners. Even in such courses like LeCoTec which endeavored to

restrict communication and interaction to its two environments, a lot of learners may have resorted to other means of communication, such as Skype, email, telephone, and Facebook. This definitely resulted in a loss of critical interactions.

6.5.3 Grading

The fact that the course was evaluated on a Pass/Fail scale, coupled with collective grading, could have led to a lack of seriousness, commitment and motivation.

6.5.4 Usability assessment

The two environments, especially the Knol environment may have not been understood by other participants. This was evident by the fact that some interactions were inserted in the article writing area, and some sections of article inserted in the comments area. The former were lost in the final version of the article. The latter aspect led to unnecessarily very long chains.

6.6 Conclusion

Research in CSCL has helped to highlight the importance of constructivist theories, and community of inquiry presences. In addition, these studies have been important in reinvigorating educational and learning practices, especially in our Internet-age. Therefore, CSCL should not be restricted or constrained to compensating face-to-face (F2F), but rather opening the arena for dynamic possibilities that can enhance learning through effective use of technology.

CSCL is *born and bred* at the intersection of other fields (psychology, education and technology), which are themselves undergoing continuous change, the fully integration of the CSCL practices into mainstream learning becomes such a daunting challenge. The fact is that educational science is quickly adopting technology. A word of caution is that this integration will have to be done in such a way that it enhances learning, and it should

not be counterproductive. Therefore, the assimilated technology should support the learners' collaboration in and consequently deliver an effective online learning. (Larusson & Alterman, 2009, Stodel et al, 2006).

After all is said and done, there remain a couple of questions and issues the developers of environment, with little pedagogical knowledge, taking advantage of CSCL gains to market their products. This could be corrected by further research and collaboration with all stakeholders in the fields of educational sciences, technology and psychology.

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Appendices

Appendix 1

Assessment criteria for the essay (adapted from EDU s7, LLEES, 2010)

Rating/Scale	Characteristics
5 (excellent)	<ul style="list-style-type: none"> • Exceptionally mature handling of the issue. • Concept and terms used correctly and applied with distinction on own topic. • Questions and problematizes issues and own examples; places literature, own arguments, and class discussions / lectures into a fruitful and interesting dialogue. • Is written understandably, logically, the text “flows”
4 (very good)	<ul style="list-style-type: none"> • Well structured, relevant handling. • Concepts and terms used correctly. • Own examples and arguments support the literature review • Questions and problematizes evaluation as represented in research and illustrated by own experience • places the literature, own arguments, and class discussions / lectures into a dialogue • Is written understandably and logically.
3 (good)	<ul style="list-style-type: none"> • Good handling, “quite OK” • Concepts and terms mostly used correctly, but sometimes in a shaky or even faulty manner. • Reasonably relevant handling, may at times be shallow • Mostly more or less relevant reviewing of literature and lectures • At times more opinions than argumentation • Does not really question or problematize literature • Is written reasonably coherently, but sometimes the “plot” of the essay may be difficult to follow.
2 (satisfactory)	<ul style="list-style-type: none"> • Some concepts and terminology presented correctly and applied to own work without serious gaps. • Contains clear mistakes, is shaky and opinionated, rather than argumentative • Truncated, shallow treatment of literature • Is written illogically; bits of text don’t connect but are isolated quotes or summaries of literature or other sources
1 (weak)	<ul style="list-style-type: none"> • At least something matches the task and the sources • Basically very shaky and unbalanced treatment of literature, no dialogue with literature and other sources • Incorrect and faulty treatment • Arguments mostly based on opinion rather than literature • Writing incoherent, illogical, sporadic • “has at least tried”
0 (fail)	<ul style="list-style-type: none"> • Makes no sense; no relevant comparisons or arguments • Use of concepts and terms totally faulty • Writing impossible to understand • Ignores instructions totally (overtly short or long, blatantly late)