COLLABORATIVE AND INDIVIDUALISTIC LEARNING IN A SITUATED, COMPUTER-SUPPORTED CO-OPERATIVE ENVIRONMENT FOR MULTIMEDIA CONSTRUCTIONS

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To my friends and family
“No man is an island, entire of itself; every man is a piece of the continent, a part of the main”

John Donne
Abstract

In this research, we tried to investigate the conditions of learning occurred in a co-operative learning environment, constructed for multimedia and web design activities.

As a complex nexus of interactions, multimedia and web design constructions require co-operation in order to deal with complexity. We created a situated computer-supported co-operative environment, using T-Consensus Groups and jigsaw strategy as a map of distributing material and activities and we tried to search whether the observed interactivities within the group members resulted in learning through design as collaborative learning.

Based on the notion that learning occurs within the heads of individuals - although a result of co-operation- we tried to investigate if it is individualistic learning and feasible to be transferred to different contexts.
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Transfer of learning for individuals
We are at the point in the history of education when radical change is possible, and the possibility for that change is directly tied to the impact of the computer. Today what is offered in the education ‘market’ is largely determined by what is acceptable to a sluggish and conservative system.

S. Papert

During the turn of the century, computers started being one of the most wanted learning support mediums in the contemporary classroom and organizations. The hyperworld appears as a representation and a simulation that leads to abstraction using metaphors of reality (Baudrillard, 1991) while our century has come up with references to visual literature and visual thinking. We are now consumers of images and through the spatial layout, the computer as an “interactive” platform and hypertext in particular, turn the learning process into an ongoing adventure.

Several authors refer to multimedia and web construction as complex activities because of the involvement of multiple perspectives of reality as used in contemporary classrooms and organization tasks. These tasks require co-operation within members, since co-operation proved to be one of the most appropriate approaches to activities regarding computers. The complex set of decisions on required, elaborated and used information in an interactive context, might be one of the reasons why co-operation is being suggested as one of the central elements of computer supported learning environments.

Complexity arises from the large amount of information, the design options and the different views of knowledge about a given topic or structure in multimedia constructions. The associative networks work as dyads towards interaction between information and interaction within people who work towards information. The hyperstructure, based on distributed processes, facilitates capturing and communicating in
‘group mind’ phenomena and uses information and knowledge acquisition as a medium opposed to mere data. Multiple perspectives and ideas must be summarised contemporaneously in quasi-linear form, a powerful approach to joint problem solving activities. Problem solving often requires moving from a vantage point of perspective through increasing amounts of detail to a part of it, when an insight occurs and a sub-problem less complex than the total situation is mastered. This analytic and relational process exists within a specific system, when system is an environment with interconnected and interactive elements. Awareness of the situation and discussion are the nodes that hold the system together. Groupwork towards recontextualization occurs within computer-supported co-operative environments, constructed in a way to deal with the complexity either of the environment or the individuals. The design of the environment is paramount concerning either the group construction or the ways of recognising and dealing with complex patterns in simultaneously distributed processes.

Computer-supported co-operative environments provide the shared ‘situation’ of seamlessly interconnected contents and associational actions between individuals. Situated cognition and learning move in parallel, following a two ways path: understanding and learning occurs within the system and when they are generalised, the group members can test the utility in comprehending other situations, in different contexts. This transfer of learning works as a medium that shapes its message under complex levels of abstraction occurring within the heads of individuals, which reveal a basic partnership between collaborative and individualistic learning.

Chapter 2 is dedicated to review of literature. Multimedia representations of reality and hypertext provide the non-linear hierarchical orders to learners as designers. A number of researches yielded evidence for learning through design activities in computer-supported collaborative environments. Collaborative learning is connected to situated cognition and learning following the notion of distribution of knowledge in a specific shared context as necessarily situated. Working in different contexts using this knowledge indicates transfer of learning for the individuals and reveals a basic partnership between co-operative and individualistic learning while the importance of discussion is stressed as the medium for the interactions within the shared context.
We designed a computer-aided co-operative environment towards multimedia construction collaborative tasks based on the previous theories and we are going to test it in the following chapters.

Chapter 3 refers to the pilot study, the necessary modifications and the final methodology used towards two case studies. Descriptions of the design of tasks, the methodology used in Group A and Group B and the data collection draw the canvas of the research.

Chapter 4 is devoted to the main study and refers to the data collected from interviews, questionnaires and the summary of classification of the study.

Chapter 5 is focused on the second study and refers to the data collected from interviews, questionnaires and the summary of classification of the study.

Chapter 6 refers to the discussion and the comparison of the groups.

Chapter 7 provides us with the conclusions that emerged from our research.
Chapter 2

Review of literature

2.1 Creating Multimedia

If a picture is worth a thousand words, a dynamic picture of time-varying objects is worth a thousand static ones. We need dynamics at the nodes, not just static pictures and texts.

Ardries van Dam

In our century, computers are called upon to improve the quality of delivery of information, increase the individualization of learning, encourage learner autonomy and facilitate collaborative learning in joint problem solving environments. One of the possible applications of computer technology to learning is multimedia, which seems to be one with a great potential. Multimedia, hypertext and hypermedia concepts have been around for several decades. Hypertext is an extension of text; non-linear arrangements of textual material are called ‘hypertext’ and non-linear arrangements of multimedia information (combination of text, pictures and sounds) are known as ‘hypermedia’. They are not linear; learning is often non-linear; they involve the representation of material using a variety of media; they allow flexible and varying uses by the learner; learning is optimised when the learner can attune the system. The complex, composite structure, the different types of relationships that require different types of taxonomy and interrelatedness (all objects are related and depend upon the nature and strength of interrelationship) indicate that hypermedia requires control of complexity. The presence of dynamic elements in hypermedia is stressed by Oren (1990:133) in the sense that allows inclusion of active presentations within the chaotic database through decision-making.
Multimedia representations contain the richness of nonlinear ones but carry at the same time a semantic weight, in order not to risk potential intellectual indigestion, loss of goal directedness, and cognitive entropy. As such, the simplest way to present knowledge without falling into this entropy is to break it down into collections of similar data or materials (list items), jigsawing information following taxonomies and hierarchical orders (Florin, 1990:31). This activity engages users emotionally and intellectually, turns passive viewers into active seekers and transforms spectators into players. The nodes that contain arbitrary data, images and text, the links (the relationship between two nodes), the attributes (footage or a complex procedure that will be executed) lead to semantic (computer concepts and a logical structure) and syntactic knowledge (about the keyboard, commands, how to operate the activity) (Rada, 1991:27). The hierarchical view of the menu requires a tree-structured and fish eye view while focussing attention on certain things. All the elements: link taxonomy, hierarchical and non-hierarchical relation, context dependency, the fact that every link has [link-1] (back) are moving towards to the motivation of the viewer and try to make them remain on the screen.

As such, multimedia technology is thought to be a potentially powerful support for learning to become a competent member of a community of practice (Erickson & Lehrer, 1998). When students produce multimedia products, they make public artefacts that connect them to communities beyond the classroom. The prospect of having their work published on the Web or shared with the community at a public showing can engage students’ identities and excitement about learning and motivate high-quality work. Technology can also support the development of meaningful peer collaboration in joint project-based learning by allowing students to recognize diverse skills and competencies of peers (compare Cohen & Scardamalia, 1998).

Claims for the effects of the “new technology” in learning are coming from several authors. Jenkins’ (1990:114) propositions are the following: [technology] increases social interaction and cooperative learning, self-esteem, thinking, reasoning, problem-solving skills, facilitates language development and language usage, concept development and stimulates symbolic play. Hypertext activities involve multisensory learning (Hooper, 1988), multiple intelligences (Gardner, 1993) since constructing hypertext and multimedia environments can extend the sensory context, can provide multiple and multisensory learning contexts, offer a safe environment for risk taking,
experimentation, exploration and problem solving. They expose the child to multiple content and contexts as well as stimulate a variety of cognitive processes because of the non-traditional, non-linear taxonomy (Liebhold, 1990:103)

However, to date, little documented progress has been made in this area because of the significant problems of defining and evaluating learning skills and collaboration together with the time-consuming activity disadvantage. The impacts of multimedia design into learning and cooperation in a computer supported collaborative environment have been studied to a lesser extent.

Designers as learners were investigated Herrington and Oliver (1999), Collins, Brown and Newman (1989) towards higher order thinking in multimedia situated learning environments. The researchers confirmed their expectations that multimedia activities based on a situated learning approach could provide a learning environment capable of supporting and maintaining substantial levels of high order thinking. Learners as designers were being part of recent researches in project-based learning using multimedia. Penuel et al., recorded that students in Multimedia Project classrooms were more likely to spend time engaged in small-group collaboration than comparison students. The results from the observation study were evidence of students’ collaboration and involvement in decision-making processes while engaged in higher-level cognitive activities characteristic of multimedia design as described by Erickson and Lehrer (1998): dedication on the structure of the presentation, creation of multiple representations, models and analogies; arguing about or evaluating information; thinking about one’s audience; and revising or editing their work. Discourse analysis was used to describe the collaborative activities. These activities were designed towards three important effects on classroom processes: (a) it provided multiple entry for students with different skills and strengths to become involved; (b) it allowed students to define roles for themselves over time; (c) it made it possible to get the project done in an efficient and punctual way. The authors stressed the importance of working on a ‘real’ project since it required their active participation to be successful.

Another study was conducted by Betts and Hicks (2000), as part of the Multimedia Arts Education programme (MAEP) in high schools and embraced ideas presented by Salomon (1990) about the reciprocating spiral of learning. The authors found evidence concerning the development of the programme as such, the development of
students’ perceived self-efficacy, literacy skills development, evidence of aesthetic response and school-to-work skills acquisition. Data were collected using questionnaires, interviews and observation transcripts.

David Betts from the College of Education (University of Arizona) did on his own a similar research based on previous MAEP as an after school programme for middle school youth. According to his findings, students learned several professional level application programmes and did creative collaborative work. In addition, they learned to make considerations in design, develop a critical eye and revise. There were indications that the students realised their self-efficacy and felt more confident in their abilities to design and use technological tools. Observation transcripts, interviews and questionnaires collected the data from each semester. The results show 100% success of the programme, according to Betts.

Even though these researches gave evidence of actual learning, development and collaboration, they do not provide the criteria and theory implementation on their researches. An older study conducted by Carver, Lehrer, Connell and Erickson, displays evidence of learning and collaboration in a more coherent way. They used cognitive techniques to develop a model of design skills and they evaluated it in two qualitatively different hypermedia learning environments. They constructed their learning environment towards a process of design so that the students can experience knowledge as a human creation with a situation-specific function and structure. The instructional virtues of these design experiences include the opportunity to develop and coordinate a variety of complex mental skills, such as deconstructing a topic into subtopics, gathering data from a variety of sources, organizing diverse and often contradictory information, formulating a point of view, translating ideas into a presentation targeted at a particular audience, evaluating the design, and making revisions based on evaluations. Also the students were invited onto the ownership of the product. This “adventurous learning” required a clear specification of the skills students needed for the design tasks as well as the cognitive skills that students needed to acquire in design environments. In addition, they described the ways in which both teachers and technology can support students’ learning, and referred to some approaches of assessment that helped them to characterize student learning in multimedia design contexts.
In this research, teachers provided modelling of design processes as well as coaching students while they work on design tasks. They also encouraged students to articulate what they are learning, which contributes to its further development (Greeno, 1988, cited in Carver et al.: 1992). From a motivational perspective, clear feedback on performance will foster students’ engagement in learning.

The data were collected in several ways: (a) students’ self report questionnaire (Project Assessment Questionnaire); (b) methods used in personal construct psychology for depicting intrapersonal organization (Kelly, 1955; Cantor and Kihlstrom, 1987, cited in Carver et al., 1992) like content analysis of students’ tasks and strategies; (c) students ranked the relative importance of 19 design tasks; and they made an analysis of design products using three types of semantic relationships: structural, explanatory and elaborative; (d) they created bench-marks for 10 skills: question posing, planning, data gathering, data interpretation, representation, computer skills, presentation, evaluation, collaboration, and keeping a research log; (e) in addition, they used extracts from interviews, especially from the teachers that participated in the research, concerning their perceptions and beliefs about teaching, learning and the design skills.

From their perspective, it is clear that they found evidence that the design environments fostered development learning and collaboration of at least some aspects of design skills that secondary students are able to use generally, even if the assessment of such complex skills is tedious.

The latter research took place in 1992, when collaborative learning started to elaborate and the authors only scratched the surface of collaborative learning might occur in computer supported collaborative environments designed for multimedia implementations.
2.2 Approaches to Collaborative Learning

If we would seek for one word that describes society better than any other, the word is cooperation.

Montagu

Cooperative (or collaborative) learning refers to groupwork and organized learning activities in order to provide enhanced learning opportunities through discussion around joint problem activities. Peer tutoring and peer modeling are the medium of the interaction towards the previous, while individualistic learning might occur simultaneously.

A distinction between Cooperative and Collaborative Learning is recorded by Teasley and Roschelle (1993), who define collaboration and cooperation as follows:

Collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem… Cooperative work is accomplished by the division of labour among participants, as an activity where each person is responsible for a portion of the problem solving.

Teasley and Roschelle (1993:235)

We are going to use both terms -avoiding the distinction suggested by Tiessen & Ward, 1997\(^1\) or McConnell’s use with the same meaning (1994:14)- following Johnson & Johnson’s (1987) approach. Cooperative learning is the instructional use of small groups so that students can work together to maximize their own as well as each other’s learning.

2.2.1 Overview on Cooperation

Cooperative learning is a long-established idea and cooperation is central in our everyday lives. The most commonly encountered definition is the one of Argyle (1991:15) defines it as “acting together, in a coordinated way at work, or in social relationships, in the pursuit of shared goals, the enjoinder of the joint activity, or simply furthering the relationship”. The starting point was Comenius (1592-1670),

\(^{1}\) Tiessen and Ward’s (1997) suggest that both cooperative and collaborative learning involve communication i.e. the exchange of information between students and the sharing of tasks and information. Cooperation involves individuals working towards a shared goal, but alone on the particular piece of puzzle. Collaboration involves individuals working together towards a shared goal and on each sub stage to achieve it. As such, cooperation is needed while indicating a hierarchical relationship to the task.
who believed that students would benefit both by teaching and being taught by other students. In the late 1700s Lancaster and Bell made extensive use of cooperative learning groups in England while Colonel Francis Parker used cooperative learning procedures in public schools in Quincy, Massachusetts (1875-1880). Cooperative learning appeared in the work of Rousseau and Pestalozzi, in the 18th and 19th century while in the 1930s, John Dewey promoted the use of cooperative learning groups as part of his famous project method in instruction. Peer interaction was central to Vygotsky’s Zone of Proximal Development and Piaget’s social conflict model. In 1940s, Morton Deutch, building on theories on Lewin, proposed a theory of cooperative and competitive situations (cited in Johnson & Johnson, 1987: 11).

Many authors have considered about the co-operation theory that might be most helpful for the computer-supported learning environments (CSCL and CSCW) in joint activity for joint construction of knowledge (Scrimshaw, 1993b; Crook, 1994; McConnell, 2000).

The behavioral approach was the first one to be implemented in such computer groupwork learning environments since the learning environment was strictly controlled (Jones and Mercer, 1993). Skinner is well known for his principle of operant conditioning: if the occurrence of an operant is followed by a reinforcing stimulus, the strength of the response is increased. Undesirable behaviour should be ignored which will result in its eventual disappearance (Hall, 2000). Even if Integrated Learning Systems appear to be an example of a behaviourist perspective since the goal of ILS is to provide pupils with an individual learning programme, Ager (1998) recorded evidence that pupils gained most from their use when they work together.

Piagetian Constructivism is often supposed to not have taken into account the interpersonal relations (John and Mercer, 1993; Crook, 1994). Piaget himself suggested, “cooperation ... eliminates the process ... of egocentric thought” (1995:208) since cooperation is defined as “… all relations between or more equal, or believed to be equal, individuals, that is to say, all social relations in which no element of authority or prestige is involved” (Piaget, 1995:200). However, Piaget is more eager in his theory about individuals “constructing” their own understanding. He suggested that children best learn through ontogenetic equilibrium and it is this, which facilitates the essential sequential development – from the concrete to the abstract – of
more complex cognitive structures. Constructivism views the pupil as an active participant in structuring their own understanding in the form of schemata (Piaget, 1995). Papert was a great follower and he proposed that technology could be used in education. Students will create their own microworlds as settings where learners can apply knowledge in a creative way (Papert, 1980). However, little evidence had been provided about the collaboratively constructed knowledge within the microworlds.

As we can observe, both perspectives embody, although in varying degrees, an individual perception of learning.

In contrast to Piaget, **Socio-cultural perspective** in education has arisen from the ideas of the Soviets Vygotsky, Luria and Leont’ev. A communicative perspective is committed to the notion of cognitive and intellectual development occurring through induction into cultural practices and is fundamentally social in nature. It establishes learning as basically social and culturally achieved rather than an individual process. Language and tools are essential to knowledge.

An interpersonal process is transformed into an intrapersonal one. Every function in the child’s cultural development appears twice: first, on the social level, and later, on the individual level.

(Vygotsky, 1978:57)

Learning occurs in what Vygotsky introduced as the concept of the zone of proximal development: “the distance between a child’s ‘actual development level as determined by independent problem solving and the higher level of ‘potential development’ as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978:86). Social and cultural interactions might occur within the frames of z.p.d. and the potential development actually depends on these interactions. Discussion upon the subject probably indicates this interaction and is connected self-explanation through discourse. The interaction between the individual and the social experience can be described in terms of Vygotsky’s principle of appropriation as the individual process of constructing meaning from socially and contextually defined knowledge using the individual’s idiosyncratic structuring of knowledge and understanding (Billet, 1994; cited in Macaulay, 2000).
Even Bruner at the end admitted: “I have come increasingly to recognize that most learning in most settings is a communal activity, a sharing of culture” (Bruner, 1986:127).

Nowadays, several perspectives on collaboration as a social activity had derived from the previous ones. We might be able to distinguish them as “The Student Team Learning Approach” (Slavin, 1995), The “Learning Together Model” (Johnson & Johnson, 1985, 1987) and the “Group Investigation Model” (Sharan & Sharan, 1992)

Team goals and team rewards are central to “Student Team Learning Approach Model” (Slavin, 1995). A heterogeneous group uses their individual learning objectives to support the groupwork, while an instructor is constructing the learning objectives and assessment that occurs on individual and peer basis. Slavin (1997) has presented four major theoretical perspectives aimed at explaining the achievement effects of cooperative learning: motivational, social cohesion, developmental and cognitive elaboration perspectives. Miyake (1986) proposes that we do not need rewards, just common interest since research concerning collaborative learning situations shows more interest in cognitive processes than in the motivational issues.

**Group Interdependence and Individual Accountability** are common features between Slavin and the second approach in the U.S.A., the one by Johnson and Johnson. According to Johnson and Johnson, the essential components of cooperation are: positive interdependence, face-to-face promotive interaction, individual and group accountability, interpersonal and small group skills, and group processing (Johnson, Johnson and Holubec, 1993).

“The group Investigation Model” (Sharan & Sharan, 1992) is closer to the concept of collaboration, since peers are responsible for a different part of the same task. The individual transfers his/her area of specialization to the members of the group and the task is completed through a combination of their suggestions through discussion, without Johnson and Johnson’s competitive element or Slavin’s engagement in competition.

The concept of individual accountability within the field of collaboration and the interaction between them, is paramount as connected and situated in a specific
context. Transfer of knowledge from one context to another justifies the existence of
individualistic learning that springs from collaborative activities.

2.2.2 Overview of Situated Cognition and Learning

Crook distinguishes two approaches to situated learning: (a) “The first one it
corns a longstanding issue of how far learning in one situation can be expected
readily to influence the activities of the learner within other, different situations. This
is an issue of transfer of learning. (b) The second one suggests that knowledge is
always created within the circumstances of interacting with the world – in other
words, it is situated within these interactions (1994:44) “… knowledge does not exist
‘behind’ that interaction…” (1994:46) and “…[knowledge construction] is activity
always exercised in relation to the situations individuals find themselves
in…”(1994:47). While constructing the shared environment, we have to be able to
select the appropriate interaction pattern suited to the situation (Johnson & Johnson).
Within the field of situated learning, the person and the unit of analysis are
intertwined to individual knowing and social action. The physical context is being
reunited with the social, within the thought processes (Light & Butterworth, 1992:1,
cited in Wilson and Meyers) while all learning is learning ‘in situ’ (Suchman, 1993).

As such, the theory of situated cognition and learning bridged the gap between
the individual, the social and the physical unit of analysis. The stand out characteristic
of situated cognition and learning is the placement of individual learning within the
larger physical and social context of interactions and culturally constructed tools and
meanings. Social and individual are not different levels of study but inexorably
interconnected. St Julien (1997:7, cited in Wilson and Meyers) illustrated how facts,
rules and features provide the socially recognized framework within which the fully
competent can support each other in collaborative activities, working on a difficult
problem. Just a year before St Julien’s research, a study by Jacobson, et al., (1996)
had suggested that a richer view of situated computer supported collaborative
learning theory, more commonly held by researchers in this area, regards all learning-
both school-based and non-school based-- as fundamentally situated.

Indications of collaboration might be detected in three major concepts within
situated learning theory: (a) the individualistic approach; (b) the specific situation that
this learning occurs and (c) the different roles of the participants.
[we might work in] sociocultural groups, but cognitive processing occurs **within the heads of individuals** .... What really matters is the situation and the parts that people play.

Norman (1993:3-4) my emphasis

A discussion appeared to occur between Lave, Crook and Salomon. Salomon’s approach of individualistic learning together with Norman’s aspect of cognitive processes within the heads of individuals were the same time when Lave denied the individualistic aspect. As such, learning seems to be located in the process of co-participation and not in the heads of individuals.

‘Situated’ … does not imply that something is concrete and particular, or that is not generalizable, or not imaginary. It implies that a given social practice is multiply interconnected with other aspects of ongoing social processes in activity systems at many levels of particularity and generality.

Lave (1991:84)

According to Lave, knowing, learning and cognition are social constructions, expressed in actions of people interacting communities. The notion of distributed cognition has been advanced, among others, by Salomon (1993), while continuing the previous discussion. It refers to the observation that much of the intelligence needed to solve complex and even not so complex everyday problems is not "inside" individual minds, but is distributed across different minds (i.e., people) as well as embodied by external artefacts. If knowledge is distributed among participants in a specific activity context, it is necessarily *situated* as well (Greeno, 1997).

In an individualistic approach, children’s growth in knowledge and skill can be interpreted as a series of stages from concrete to abstract forms of reasoning or as accumulation of procedural and declarative knowledge about the world. People make sense of their worlds by reference to schemas, mental models, and other complex memory structures and sharing these conceptions gives them the opportunity to elaborate their divination of life. Although thought and reasoning cannot exist without the other:

Inherently social activities in which talk and social interactions are not a means … but also how they engage in thinking … discourse is cognition is discourse … one is unimaginable without the other’.

Resnick, Säljö, Pontecorvo, and Burge (1991:2):

In Computer Supported Collaborative Learning area, Crook (1994:44-46) emphasizes the situated and social nature of cognition in CSCL while Donaldson and
Cole provide evidence that knowledge is situated in-between these interactions. The consequences of a strongly situated view of cognitive achievements have been considered by Jahoba (1980) and we have context specific achievements (Cole, 1990:16). The situated view makes a commitment to the idea that knowledge is created within interaction. Asymmetrical interactions occur within the ZPD in a socio-cultural perspective. As Cole (1991:412) suggested, “the precise ways in which mind is distributed depend crucially on the tools through which one interacts with the world, which in turn have been shaped by one’s cultural past as one’s current circumstances and goals” so mind is something “distributed” within an environment, rather than as a repertoire of computational processes constrained to exist only within our heads (Crook, 1994).

Salomon and Perkins tried to put the flames down by raising the issue of how individual and social learning relate to one another. Three propositions lead as a syllogism to the solution: (a) individual learning can be less or more socially mediated learning (b) learning can be distributed throughout a group or collective and (c) both aspects of learning develop in ‘spiral reciprocities’ where the one influences while supporting the other.

Interaction and communication within situated approach cannot be imagined without close attention to language, activities of individuals and groups, cultural meanings and differences, tools (including computer tools and environments) and the interaction of all these together (Wilson and Meyers (2000)). It is difficult to design and construct a computer supported collaborative environment without having in mind the situated nature of the activities and the possibility of the transfer of learning in different situations and contexts.

2.2.3 Basic Partnership between cooperative and individualistic learning

According to Johnson & Johnson (1987:19) individualistic and cooperative goal structures may be combined in three major ways:

1. task interdependence through the division of labour: depending on their interests, students used to divide their tasks on their own.
2. resource interdependence and jigsaw strategies: Aronson (1978: 26-27) suggests that a process should be created in order to make it imperative that
the students treat each other as resources since interdependence encourages students to take an active part in their learning.

3. Cooperation and individual accountability might be detected while observing the following actions (based on Johnson and Johnson, 1987:55):

- each member explains how to get the answer
- each member relates previous learning with the new activities
- everyone understands the material and agrees with the answers
- encouraging each other to participate
- listening to other group members
- each member supports their arguments
- criticizing ideas, not people

Our goals should be clarified and changed so as to adjust individual and group goals while goals are cooperatively structured (Johnson and Johnson, 1982:11). Interpersonal effectiveness and self-actualisation are both essential elements within a situated computer supported cooperative environment.

Being “in action” means being in constant flux. The awareness of the change never stops means refraining from a permanent labeling.

2.2.4 Transfer of learning

Transfer of learning is one of the concepts within situated learning theories and has been discussed a lot between theorists. Learning transfer theories are based upon the idea that knowledge can be taken from one situation to another when information is acquired, links with a new situation are recognized and information is successfully retrieved from memory. Jean Lave (1993) opposes this notion as simplistic and insists that when knowledge is brought to bear upon a situation it is always a product of the people, their activities, their interests and goals and the ways they relate to the situation they are.

Sfard (1997:9) tries to bridge this gap and refers to the transfer of knowledge within the situated activity while learning transfer means carrying knowledge across contextual boundaries.

The transfer of learning “is one of the most general phenomena of learning and, by means of its influence, almost all learned behaviour is interrelated in various complex ways” (McGeoch and Irion, 1950, referred by Fleishman, 1987:xi). The very
existence of transfer phenomena appears to have been ignored or denied in most of
the Skinnerian operant conditioning work of this period. The skills and knowledge
brought by the subject to the learning of a new task were regarded as insignificant
compared to the efficiency of the practice schedule (Fleishman, cited in Cormier and
Hagman, 1987:xiii). The decline of the theory of transfer of learning in 70’s might be
bogus because of the substitution of the terms facilitation and interference and the
emphasis on the component sources of transfer, as distinguished from overall transfer.
A practical issue derived from this notion was the teaching of Latin in order to learn
English. But the Gestalt school held that permanent learning, especially problem
solving and creative learning, is achieved by insight rather than rote acquisition.
Recently the concepts and methods were connected to the Instructional Design
System (ISD) and task analysis.

Within the instructional setting, transfer can be seen to involve and combine
three elements –learner, task and context. According to Marini and Genereux (1995),
the basic elements involved in transfer are thus the learner, the instructional tasks
(including learning material and practice problems), the instructional context (the
physical and social setting, including the instruction and support provided by the
teacher, the behaviour of other students, and the norms and expectations inherent in
the in the setting), the transfer task, and the transfer context.

Transfer is very difficult to occur and transfer occurs, when it occurs, because
of common elements in the two situations (Detterman,1993:6).

Language is a paramount concept in situated theory approach. According to
Gee (1997:255-256) discourses are sociocultural co-ordinations of people, objects
(props), ways of talking, acting, interacting, thinking, valuing, and (sometimes)
writing and reading that allow the display and recognition of socially significant
identities. Within discourses, people can exchange thoughts and explanations.
Individuals achieve a sense of continuity over the lifespan as they interpret immediate
situations in terms of past situations and find them of relevance to the here and now.
Salomon and Perkins in their article "Individual and Social Aspects of Learning"
come to articulate, clarify and distinguish the “social mediation as participatory
knowledge construction”.

The concept of awareness is important since students need to have an
awareness of their own learning process (Macaulay, 2000:6). Metacognition is the
knowledge of and regulation of cognition, involving aspects such as the planning, organisation and evaluation of learning (Cust, 1995; cited in Macaulay, 2000:10). A primary ability involved in the transfer of learning is that which allows the students to identify similarities between the new or novel situation and previous situations and a common way of describing this process is ‘generalisation’. Gardiner (1984) sees the generalization as the primary process of transfer of learning. Salomon and Perkins (1989) refer to this concept as ‘abstraction’, that is ‘the extraction or identification unit of material in a situation or behaviour’. Abstraction provides a bridge from one context to another. As mentioned before, metaphorically speaking, Baudrillard referred to the hyperworld as a representation and a simulation that leads to abstraction using metaphors of reality.

Language and discourse are essential within the theories of collaboration, situated learning and transfer of knowledge, based on the important role of the awareness and metacognition.

2.2.5 The importance of talk

In the recent years, Wegerif (1996) found that to educate children to think for themselves we should first teach them to think with others while referring to awareness. Van Boxtel et al (1997) found evidence that students who self-explained performed better. Language has a magical property: when we speak or write we craft what we want to say to fit the situation or context in which we are communicating. But at the same time, how we speak or write creates that very situation or context (Gee, 2001:11).

The concept of awareness is closely related to the ability to express ideas, opinions or suggestions in a self-reflective way. Spoken language is the most important medium for classroom education (Wegerif and Scrimshaw, 1997:1). Vygotsky (1978) described talk as a psychological tool, “a mediational means” while Mercer (1995) proposes the “main types of talk” as “social modes of thinking” available to students working together.

Wegerif’s and Scrimshaw’s sociocultural approach suggests that the construction of knowledge together is a construction of shared linguistic context through talk. They stress the importance of (a) z.p.d., (b) scaffolding (Bruner, 1978) and (c) the contexts. They refer to two ways of children’s talk around computers (a) as this talk constructs context and (b) as the elements of the context impact upon this talk.
Within the neo-Vygotskian framework they suggest, learning and problem solving are seen as context-bound process, so that the level of understanding achieved by individuals in specific settings is recognised to be, in part at least, a function of those settings as dynamic contexts for cognitive activity (Crook, 1991). The proposal of how cognition is represented in conversation (suggested by Middleton & Edwards, 1990, cited in Wegerif & Mercer, 1997) in order to construct three types of talk and it might give us a way to detect the potential for learning and understanding through the discourse.

The Social Modes of Thinking

- **Disputational** talk, which can be characterised as an initiation in various forms (e.g. proposition, hypothesis, instruction), followed by a challenge. Disagreement and individualised decision making are indications of how students define themselves.

- **Cumulative** talk, in which initiations are accepted either without discussion or with additions or superficial amendments, which do not develop previous ideas. Repetitions, confirmations and elaborations are indications of the positive but uncritical way in which partners construct common knowledge. The definition of themselves occurs through the identification of the others.

- **Exploratory** talk, in which the initiation may be challenged and counter-challenged, but with hypotheses, which are developments of that initiation. Partners engage critically but constructively with each other’s ideas while statements and suggestions in a competition of ideas and not a competition between people. In exploratory talk knowledge is made more publicly accountable and reasoning is more visible in the talk.

As such, exploratory talk is proved to be useful for the analysis of data coming from collaborative environments, since progress rests on the joint acceptance of one of the suggestions, or of a modification of what has been put forward (Fisher, 1997). Fisher proposed the IRF application (Initiation, Response, Follow-up) to interpret quantitative and qualitative data of discourse. Wegerif (1997: 102) elaborated Fisher’s proposal by adding D for Discussion and changing F for Feedback. Since the ‘IRF’ refers to the user-computer interaction via keyboard presses or mouse-clicks, we need...
the medium of exploratory talk to detect the potential collaboration around this context. Wegerif is based on the English hypothetical mode, essential to exploratory talk and interprets the words while giving a short-list of usages being adopted:

- ‘why’ used as a request for justification;
- ‘because’/’cos’, ‘if’ and ‘so’ used to link justifications to assertions;
- ‘if’, ‘might’, ‘could’, ‘would’, ‘should’ and ‘think’ used to put forward a hypothesis.

His research on SLANT project justified the IDRF coding for some forms of computer-supported discussion. According to his results, the IDRF analysis shows how groups at computers have a different potential to both individuals at computers who lack the discussion element, and to groups working with directive teachers where peer discussion is more likely to occur.

Web-construction activities require a significant amount of time dedicated to typing simple information without any discussion taking place. Is there any cognitive activity in it or does typing prevent thinking? We might be able to find evidence of Bubble dialogue, which was developed specifically to support reflective discussion-based learning (O’Neal & MacMahon, 1991 cited in Wegerif, 1997). Bubble dialogue is only concerned of repetition of the typed sentences but also reflection upon action (Schon, 1983).

The construction of a context that facilitates the situated asymmetrical relationships (occurred within the z.p.d. and expressed through talk) within web-construction activities is central in order to enable interactions that constitute the collaborative learning.

### 2.3 Effective design of collaborative tasks

Several researches were conducted towards the computer as part of the collaborative context and considering it as neither a substitute for the teacher nor a self-sufficient teaching machine (Cole, 1985; Crook, 1987, 1991, 1994; Scardamalia et al., 1989; Scardamalia & Bereiter, 1991). A situated computer supported collaborative learning environment might enable collaboration, individualistic learning, and transfer of learning in different environments in a discursive context. Within the neo-Vygotskian framework Wegerif and Scrimshaw’s suggest, learning
and problem solving are seen as context-bound process, so that the level of understanding achieved by individuals in specific settings is recognised to be, in part at least, a function of those settings as dynamic contexts for cognitive activity.

Hypertext learning environments explicitly relate abstract and case specific knowledge and prepare students to use such knowledge in new situations (Jacobson et al. 1995). Openness in the sharing of information and ideas, sharing materials and resources, acceptance and support of the fellow students, cooperative intentions and trusting behaviour are some elements that ensure freedom in communication. This kind of environment for accepting failure under specific goal structure, is stressless, safe and challenging since facilitates changes in behaviour, which are indications of learning.

2.3.1 Goal Structure

Instructional activities are aimed in accomplishing goals and are conducted under a goal structure. Since the goal structure specifies the type of interdependence among students (Johnson & Johnson, 1987: 3) our goals are specified as learning to work with FrontPage, have opinions and decision on the layout and the ability to transfer these skills in different situations. Sub-goals are the technical skills needed to justify the previous goals. These goals were set to facilitate potential interaction and enable interdependence to emerge, which, in turn, largely determines the cognitive and affective outcomes of potential collaborative learning.

The nature of instructional task is to master information and provide skills to elaborate bits of this information in a successful way. Our sub-goals are constructed as following:

1. Hypertext design and technical skills

Our research is intending:

- to provide an environment where students can practice in using a variety of new technologies
- to increase students’ familiarity with the new technologies
- to learn several applications’ programmes
- to learn how to use other computer peripherals.
- to elaborate literacy, artistic and design components towards web construction – aesthetic considerations in design
The followed design principles and questions about navigation, as suggested by Bruntlett, 1999:90) help students towards the design the menu bar:

**Design Principles** (Bruntlett, 1999:90)

- Use easy to read fonts in readable colours and a readable size
- Use short sections of text on the screen to avoid having to scroll the text to read it. If a large amount of text is needed, then split it over several pages.
- Try to use spoken sections of text to back up the written text (Welcome message)
- Use the clearest possible images even if they are in 256 colours and keep your screen layout simple.
- Try to use easy to follow symbols or words when producing the icons used to navigate through the multimedia. Be clear about their meaning in navigating (e.g. back, next, previous, last etc)

**Navigation procedure** (Preece, 1993) is required to connect the bits of information related to the questions:

- Where am I?
- How did I get there?
- What can I do here?
- Where can I get to?
- How do I go there?
- What have I seen so far?
- What else is there to see?

- to develop critical eye on their own and others’ work towards web construction (viewing several web pages, considering the hierarchical orders/taxonomies)

**2.3.2 The Design of Computer Supported Collaborative Environment towards Multimedia Construction**

Designers of collaborative learning environments might have to think about the whole system rather than individual levels of their design thinking. Our design is based on the following theoretical approaches:
1. Carver’s *et al.* (1992) model of design skills and collaboration (as presented in their research); we tried to elaborate it including the collaborative approaches of:

2. Johnson and Johnson’s (1987) essential collaborative elements for constructing collaborative environments and ensure that collaborative and individualistic learning will occur; it is based on the paramount collaboration between cooperative and individualistic learning in a situated context. The role of the teacher/expert as Johnson and Johnson proposed following four overlapping stages of pedagogy that were identified by Collins, Brown, and Newman (1987).

3. Herrington and Oliver’s (1995) characteristics for situated learning environments, bearing in mind the transfer of learning in different contexts.

4. In order to deal with the complexity of multimedia tasks, we propose the T-consensus organization of the group (Neal et al. 1981) used in the Jigsaw process (Sharan, 1995) of deconstructing the large amount of information.

These theoretical approaches are selected towards the notion of the CSCW as occurring in a system and are described as follows:

### 2.3.2.1 Design Skills for Multimedia Designers

(Carver, Lehrer, Connell, and Erickson, 1992)

A hypermedia tool developed by Lehrer, the HyperAuthor, was used to provide further scaffolding for students’ acquisition of design skills. The major thinking skills that learners acquired and used as multimedia designers are the following: (Carver, Lehrer, Connell, and Erickson, 1992: 388-89):

1. **Project Management Skills**
   - Creating a timeline for the completion of the project.
   - Allocating resources and time to different parts of the project.
   - Assigning roles to team members.

2. **Research Skills**
   - Determining the nature of the problem and how research should be organized.
• Posing thoughtful questions about structure, models, cases, values, and roles.
• Searching for information using text, electronic, and pictorial information sources.
• Developing new information with interviews, questionnaires and other survey methods.
• Analyzing and interpreting all the information collected to identify and interpret patterns.

3. Organization and Representation Skills
• Deciding how to segment and sequence information to make it comprehensible.
• Deciding how information will be represented (text, pictures, movies, audio, etc.).
• Deciding how the information will be organized (hierarchy, sequence) and how it will be linked.

4. Presentation Skills
• Mapping the design onto the presentation and implementing the ideas in multimedia.
• Attracting and maintaining the interest of the intended audiences.

5. Reflection Skills
• Evaluating the program and the process used to create it.
• Revising the design of the program using feedback.

After the description of design skills we are going to refer to the required collaborative environment in order to secure their occurrence, ensuring cooperative and individualistic learning while defining the role of the expert and co-operation as such within the system.

2.3.2.2 Johnson and Johnson (1987) approach on:

a) Ensuring cooperative and individualistic learning

Johnson & Johnson (1987:107-8) suggest 8 steps to ensure cooperative and individualistic learning:

1. Description of the needed skill from the students
2. Explanation of the skill from the expert
3. Set up of practice situations
4. Each student receives feedback from both the fellow students and the teacher on how well he is performing the skill
5. Perseverance on practicing the skill
6. Set up situations in which the skills can be used successfully
7. Integration of the skills while using them often
8. Set up classroom norms to support the use of the skills

b) The role of the teacher/expert

The teacher’s/expert’s roles were a combination of the expert, observer, intervener and overall conductor of the assemble. Sharan (1995:327) emphasizes the teacher’s circulation/availability within the groups while offering help, support or redirection of the activities. It demands five major sets of strategies according to Johnson & Johnson (1987:46):

1. Clearly specify the objective of each lesson
2. Making decisions about placing students
3. Clearly explaining the task and goal structure every time
4. Monitoring the effectiveness of the cooperative learning group and intervening to provide task assistance (such as answering questions and teaching task skills) or to increase students’ interpersonal and group skills.
5. Evaluating students’ achievement and helping students discuss how they collaborated with each other.

While working with new features, the teacher or the expert student in his/her own area follows four overlapping stages of pedagogy that can be identified as: modelling, coaching, fading, and reflecting (Collins, Brown, and Newman, 1987):

a) Modelling (Observation of expert performances). At the modelling stage, the expert proceeds slowly, commonly separating the task into separate sub-components and using a simplified version of the task.

b) Coaching (Expert guidance and help). The coaching stage involves the "tutor/aid" paradigm (Chu, 1991; Chu and Mitchell, 1993). The expert can either act as a tutor and provide direct instruction or can act as an aid and provide hints.
c) Fading (Expert assistance is gradually withdrawn). Fading involves gradually withdrawing expert involvement in the learning process.

d) Reflecting (Self-monitoring and reflecting upon past performances)

Jonassen uses a similar approach and suggests the Modelling, Coaching and Scaffolding Instructional Activities in Computer Learning Environments (CLEs).

We are going to follow a combination of the two propositions used in a research by Jacobson, M. J., Maouri, C. Mishra, P., & Kolar, C. (1996). The authors suggest that the aspects of cognitive apprenticeship include *modelling* the knowledge in an authentic activity, supporting the students doing the task through *scaffolding* or *coaching*, allowing students to *articulate* their knowledge and to confront ineffective strategies and misconceptions, and finally empowering students by gradually *fading* or withdrawing support.

**c) Cooperation**

Five basic elements that are essential in Johnson & Johnson’s research (1987: 12-13) on detecting cooperation:

1. **Interdependence** in a combination of positive interdependence (“sink or swim together”); goal interdependence (mutual goals); task interdependence (division of labour); resource interdependence (division of materials, resources); role interdependence (assignment differing roles); and reward interdependence (joint rewards).

2. **Face-to-face interaction and verbal interchange**

3. **Individual accountability**

4. **Interpersonal and small-group skills**

5. **Group processing**

**1. Interdependence**

Several authors discussed the theory of interdependence and tried to define the term towards the specific direction of dependency concerning either the group or the working environment. Intersubjectivity and interdependence introduced the interaction between the group members in a cyclic process of dependence between them.

The importance of interdependence in Computer Supported Collaborative Learning (CSCL) is stressed by Gavriel Salomon (1992) among other authors: “*the*
introduction of computers realizes an important potential: turning learning from a process of simple assimilation into a process of active construction”. He underlines the need of interdependence and suggests 3 characteristics of his “genuine interdependence”: (a) the discourse between students; (b) the students’ roles; and (c) thinking in explicit terms, which might suggests the concept of awareness.

We meet a similar concept of interdependence in Crook’s work (1994). Crook mentions intersubjectivity referring to Rommetveit (1979a, p. 187): “a state of intersubjectivity with respect to some state of affairs ‘S’ is attained at a given state of dyadic interaction if and only if some aspect ‘A(i)’ of ‘S’ at that stage is brought into focus by one participant and jointly attended to by both of them” and Davidson (1992, p. 31): “Sociality and rationality combine to produce curiosity of what is in others’ minds and motivation to formulate a fit between one’s own thoughts and the thoughts of respected others – in other words to create intersubjectivity”. Crook himself (1994:145) adds: “I believe that the concepts of intersubjectivity and socially shared cognition prove valuable in helping us bridge this gap – one between instruction as it gets modeled for theory building and instruction as it often gets practiced in institutionalized settings… Learners must be motivated to adopt intersubjective attitudes”.

As such, we have to mention what Rommetveit (1992:20) calls intersubjectivity “attunement to the attunement of the other” which is the heart of the dialogue in any social interactivity.

The theory of social interdependence started in the early 1900’s. Johnson and Johnson elaborated Lewin’s and Deutsch’s theory and applied it to education. Social interdependence exists when individuals share common goals and each individual's outcomes are affected by the actions of the others (Deutsch, 1949, 1962; Johnson & Johnson, 1989). Social interdependence creates promotive interaction. Promotive interaction occurs as individuals encourage and facilitate each other’s efforts to reach the group goals. Group members promote each other’s success as individuals and group’s goals in a co-operative environment by:

1) giving and receiving help and assistance
2) exchanging resources and information. Salomon’s first characteristic indicates similar concept: the exchanges of information between teams would make them interdependent.
3) giving and receiving feedback
4) challenging each other’s reasoning
5) advocating increased efforts to achieve
6) mutually influencing each other’s reasoning and behaviour
7) engaging in the interpersonal and small group skills needed for effective teamwork
8) processing how effectively group members are working together. Salomon’s suggestion of a pooling together of minds might meet this element: the joint activity of thinking in explicit terms that can be examined, changed, and elaborated by peers.

Social interdependence might lead to positive promoting. When positive interdependence exists, teachers tend to see students (Johnson & Johnson, 1987:126):

1. Putting their heads close together over their work
2. Talking about the work
3. Drilling each other on the material they learned
4. Sharing answers
5. Encouraging each other to learn

Positive is a characteristic of a moving interactivity towards groups’ goals. In the case of Positive Resource Interdependence, students are sharing material and use them, while in positive reward interdependence all participants get a reward for their successful interactivity. As such, Positive Role Interdependence creates the division of labour: all roles are interconnected and each member is assigned a responsibility that the group needs in order to function effectively. Salomon stresses the importance of this role assignment by proposing his 3rd characteristic of interdependence: the division of labour among team members whereby roles complement each other in a joint endeavour, the end product of which requires this pooling of different roles.

All three authors propose a notion of interaction through discussion in order to enable social, positive, interdependence/intersubjectivity, which will enable collaborative learning to emerge.

2. Face-to-face interaction and verbal interchange

Discussion is a way of communication and expression of the group’s needs, ideas or evaluation. Expression through discussion requires awareness of either group’s or
member’s state in face-to-face interaction. We meet the concept of awareness in both the theory of situated learning and interdependence.

Awareness is required for the transfer of knowledge from one context to another. Dourish & Bellotti (1992) connect this issue to shared workspaces and define awareness as an understanding of the activities of others, which provides a context for ones’ own activity. They argue that awareness information should be passively collected and distributed rather than explicitly provided by the actors through meta-communicative activities. None the less, conversation, according to Clark and Wilkes-Gibbs (1986:33) invokes a principle of mutual responsibility, which is central in group dynamics theory: “The participants in a conversation try to establish, roughly by the initiation of each new contribution, the mutual belief that the listeners have understood what the speaker meant in the last utterance to a criterion sufficient for current purposes”.

The concept of awareness also justifies Crook’s (1994) approach of articulation of ideas within the groups. Crook describes three types of processes in order to look closer at the collaborative learning processes: (1) articulation, (2) conflict, and (3) co-construction:

- Students need to articulate their thinking publicly and explicitly in order to collaborate with peers. This articulation may imply a learning process on a deeper level and this might motivate the extra effort needed in a collaborative situation. Note that here, the word "articulation" is not used in the sense "division of tasks among a cooperating group", as sometimes within computer-supported cooperative work (CSCW) (Schmidt & Bannon, 1992).
- The process of conflict occurs when peers disagree and try to resolve these disagreements. "It is a convention of conversation that disagreement should prompt discursive moves of justification and negotiation. So, the cognitive consequences of conflict might be quite productive" (Crook, 1994, p. 135).
- Co-construction is also possible when students use strategies of sharing responsibility for a common object. This is in line with Vygotsky's socio-cultural thinking.

The process of collaboration explicitly involves face-to-face interaction, and peer discourse and verbal exchange as the medium for it. Jonassen provides an important contribution to the concept of articulation in designing constructivistic learning
environments”. He proposes that learning activities are defined as activities of exploration, articulation and reflection within individuals.

3. Individual accountability

Cooperative learning is based on individual performance; individualistic learning of each member maximizes the possibilities of better group performance. The members cannot be either “free horse riders” or “slackers” but work together while interactivity helps them boost their learning and detect different and new aspects of their working subject. Intergroup cooperation requires of members to explain their work in order to circulate different individual approaches on a same or interrelated topic. Group members are responsible for learning the material while the purpose of a learning situation is to maximize the degree of achievement. Determining the level of mastery of students together with their field of interest is necessary so that students can provide appropriate support and assistance to each other (Johnson and Johnson, 1987).

4. Interpersonal and small-group skills

Collaboration needs time to develop and one of the reasons for that might be the interpersonal relations’ growth. It is our interpersonal relationships that provide the warmth, caring, support and collaboration that give life to individuals’ excitement and potential, personal fulfilment. It is in these relationships that both the origin and the solution to participants’ problems can usually be found (Johnson and Johnson, 1987:440). The qualities of these relationships form the basic nexus between interpersonal and small-group skills and help the members to deal with problems and difficult situations. Indications of the existence of the nexus and the quality of it might be behavioural changes towards the other members.

Individualistically structured learning through transfer of learning activities might be a supplement or a result of interactions within cooperative learning environment. If these interactions occur between the participants including the teacher/expert then they might be described as follows (Johnson & Johnson, 1987:68):

- Teacher-Student Interaction, as the tutor is the major source of assistance, feedback, reinforcement and support.
- Students-Materials Interaction, as all the students have to complete a set of all materials necessary to finish the work.
• Student-Student Interaction, as no interaction must occur during the individualistic learning while later on the students might be able to exchange their experiences and jointly complete the task.
• Student Role Expectations, as completing and evaluating their own process and work while they change their roles/positions and ask for advice and assessment.

The development of interpersonal skills might move towards a process of group skills, when according to Johnson and Johnson (1987:21-2) the members:

1. understand the importance of the new skill
2. understand what the skill is and the behaviours the group have to engage
3. find situations in order to practice the skill
4. getting feedback
5. keep practicing
6. load your practice towards success
7. encourage each other to use the skill
8. practice until it feels natural

Small-group skills is feasible to be connected to group dynamics theory concerning their development. An effective group has three core activities: (1) accomplishing its goals, (2) maintaining itself internally, and (3) developing and changing in ways that improve its effectiveness (Johnson and Johnson, 1987:8). The aforementioned quality requires all three interactivities and the (-1) approach to eliminate possible barriers against them. One of the most important consequences of behavioural changes is learning new skills, develop new attitudes and obtain knew knowledge, while stimulating each other’s creativity through discussion and interaction. Lewin (cited in Johnson and Johnson, 1987:16) came to an emphasis on discussing mutual experiences and behaving democratically in structuring learning situations while group processing is one of the results.

5. Group processing

All aforementioned essential elements of co-operation contribute to positive group processing. According to Johnson & Johnson (1987:143-4), there are two views of group processing, one that differentiates outcome from process goals and one that
differentiates content from process. Content is *what* is being discussed while process is *how* the group members are interacting.

Group dynamics literature on group processing provides a strong link to discussion of the process, which maximizes participants’ effectiveness (Dishon & Wilson-O’Leary, 1984 and Johnson and Johnson, 1987). Other authors (Sharan & Sharan, 1976 and Slavin, 1983) emphasize the achievement of outcome goals only during the process. As such, the group members will be engaged in a group processing when they discuss (a) how well their group is functioning, and (b) how they may improve upon the group’s effectiveness.

Group processing model works as a feedback model (Johnson, 1979), targeting on the self-efficacy and positive behaviour of the group.

These elements suggested by Johnson and Johnson (1979, 1987) will provide us with indications of co-operation as situated in a CSCE.

2.3.2.3 The Situated approach

A computer-supported co-operative context that facilitates participants’ learning indicates that this kind of learning is situated as well. Collins (1998:2) approach of situated learning as “the notion of learning knowledge and skills in context that reflect the way the knowledge will be useful in real life”, affected our design. ‘Real’ situations are central as situated learning occurs in environments, which feature the following characteristics (Herrington and Oliver, 1995):

1. **Authentic context.** They reflect the way the knowledge will be used in real-life, that preserves the full context of the situation without fragmentation and deconstruction, that invites exploration and allows for the natural complexity of the real world.

2. **Authentic activities.** The participants find as well as solve problems. It is an environment where tasks can be integrated across subject areas and it provides the opportunity to detect relevant and irrelevant material.

3. **Expert performance.** They are environments that provide access to expert performances and the modeling of processes, allowing students to observe the task before it is attempted.

4. **Multiple roles and perspectives.** The learner is provided with the opportunity to investigate multiple roles and perspectives.

5. **Collaboration.** They support the collaborative construction of knowledge.
6. **Coaching and scaffolding.** The teacher provides the skills, strategies and links that the students are unable to provide to complete the task. Gradually the support is removed (fading).

7. **Reflection.** They promote reflections to enable abstractions to be formed.

8. **Articulation.** They enable tacit knowledge to be made explicit.

9. **Integrated assessment.** They provide integrated assessment of learning within the tasks.

These principles in situated learning have no reason of existence without the actual used information and the way groups are going to work for this elaboration. Jigsawing the situated elements or information of the project would give participants the opportunity to get involved in all those different aspects of joint activities.

### 2.3.2.4 The Jigsaw strategy and T-Consensus Groups

Some researchers found evidence of the potential computers have to support educationally valuable small-group work (Light, 1993; Light *et al.*, 1994; Howe *et al.*, 1996). Jigsawing in group-work is necessary in order to deal with the complexity of the task and according to Hintz (1995:304), is the most important element of co-operative learning and helps distinguishing it from traditional groups. It is the feeling of being a group and not just individuals who happen to be sitting in close proximity.

Working with computers requires dividing the tasks around them in order to complete the enterprise. Small size and diversity (limited to three) are suggested by Hintz (1995:305) as necessary for the division of labour. The participants have to find a way of cooperation since the expert has to remain silent towards most of their questions, in order to force them elaborate social skills, especially at the beginning of the project. Discussion on trial and error procedures is one of the most prominent ways to interact.

**Jigsaw Strategy process within the T-Consensus group**

Jigsaw strategy process is based on both individualistic and co-operative learning. Jigsaw process (Sharan, 1995:329) and T-consensus group (Neal *et al.* 1981:170-173) were designed for cooperative actions within learning groups.

The problem with Jigsaw [I], first suggested by Aronson (1978), was that everything must be written and all the students must read the same material of information. Slavin (1990, cited in Totten, 1995) introduced Jigsaw [II], developed at Johns Hopkins University. Slavin stresses the fact that all group members had to take part in
all the activities. They receive a topic on which they become experts and then teach
the topic to others in a cyclic process. JIG[1] involves only a cooperative structure
while JIG[2] integrates individual accountability and group reward.

While working with computers we have to modify and adjust the narrative
form of Jigsaw [I] and [II]. Jigsawing in groups around computers towards a target
needs group structure in order to develop a co-operative attitude. T-group (Bradford,
Gibb, and Benne, cited in Neal et al., 1981:170) is a relatively unstructured group in
which individuals participate as learners. The data for learning are not outside these
individuals or remote from their immediate experience within the T-Group. A T-
Consensus group might be possible to use the previously suggested strategy, while
passing two phases towards the group construction:

(a) In phase one, the participants are acting dependently and then
counterdependently.

(b) The second phase is aptly described as an interdependency phase when
participants started to show concern for the group and the behaviour is characterized
as understanding, acceptance, consensus or cohesiveness. Peer tutoring starts to
emerge. Johnson & Johnson, (1987:110) stress the importance of peer tutoring, since
they believe that it is more effective, can develop a bond between the group, takes
pressure off the teacher, peer tutors benefit from teaching and peer tutoring happens
spontaneously under co-operative conditions, so the teacher does not have to organize
and manage it every time of its occurrence.

The preferred method for cooperative efforts is the process of consensus (Neal et
al., 1981:173), which can be analyzed into the following steps:

1. All members must express their opinion on every issue as an equal
   participation.
2. Each member might profess ideas against the point and must have extra time
to express and analyze it.
3. If there are arguments the issue is not resolved.
4. In further discussion, the proposal can be modified or dropped altogether.

Jigsaw strategy within the previous steps of T-Consensus group might be possible
to follow Sharan’s description (1995:329) of the process:

- Locate information from many sources
- Organize information according to their interests
• Share their findings with their group-mates and
• Analyze and evaluate their findings
• Determine if they needed more information in different parts and time of the project
• Interpret and integrate their findings as well as assess and evaluate them

**Potential problems in grouping**

Grouping in general is not simple since it demands a consideration of time available, the general knowledge and ability, gender issues, sociability, communication skills, computer literacy or personalities. Timing is significant in order to “attune themselves to the attunement of the others”.
Chapter 3
The Pilot study and Methodology

3.1 The research Questions

Following literature, collaboration is the most appropriate path for learning in complex group-related activities. Web design requires multimedia uses towards the hypertext and the hypertext as such is described as a complicated non-linear text. Hypertext gives students the opportunity to move in all dimensions either on the 2d environment of the programme interface, the 3d environment in the workplace and 4d environment of the situated activity if we include real time in face-to-face situated interactions. The participants will be exposed to real life situations, in specific time and space, and the learning that might occur in this shared environment is “fundamentally situated in contexts of activity” (Brown et al., 1989; Clancey, 1993; Edelman, 1992; Greeno & Moore, 1993; Lave & Wenger, 1991; Norman, 1993), since it occurs “in naturalistic settings” (Lave, 1988; Suchman, 1987).

Carver et al., found evidence that their proposition about computer-supported context concerning multimedia construction is able to support learning through design and collaborative learning. The researchers did not focus on learning through design as a result of collaboration, whether it was collaborative learning and whether the participants learnt as individuals, using their new abilities in a different context. Learning around computers remains a problem since many schools and organizations own ICT rooms but the use of them towards learning remains limited. Collaboration is one of the most useful ways of knowledge acquisition concerning several subjects. As such, our design for computer-supported collaborative work (CSCW) is proposed as a way to CSCW and we are going to use it to investigate the aporias remaining after Carver et al. research.

As such, our research investigates whether a potential computer supported collaborative environment towards a web design process is appropriate so that the
students might be able to experience knowledge acquisition towards web construction activities in a ‘real’ situated context. If successful, we aim to develop Carver et al. research questions and search whether collaboration is an important element on this learning. In addition, whether this kind of learning can feasibly be transferred into different contexts as individualistic learning.

As such, our research questions are the following:

**Research Question 1**: What evidence do we have that these students were learning through the design activity?

**Research Question 2**: Where learning through involvement in a design activity is observed, to what extent is collaborative activity an important element?

**Research Question 3**: Is there any evidence that transfer occurs for individuals to new contexts?

### 3.2 The pilot study

A pilot study was conducted to make sure that the whole procedure of web-construction in co-operative learning environment would work for the purposes of the present study. A series of essential but not trivial problems were found concerning the design of the environment, the collection of the data and the role of the expert. The students worked and developed several web pages on their own after the study and one of them built his wife’s homepage as well. As such, situated learning occurred for individuals in a different context.

Weaknesses included the collaborative environment and the observation sheets found to be incomplete and non-functional. A different approach towards the collection of data was needed since the data gathered from the activities was not particularly useful. Further weaknesses were identified in the instructions given to groups and the role of the expert appeared to be a transferor of knowledge instead of a facilitator and conductor of the process. Difficulties arose because of the insufficient interviews; they gave little evidence of collaboration and more of transmission of knowledge.

### 3.2.1 Procedure

The sample was 2 adults working with an expert in different time and place each time. The potential web-construction was their own website and they worked
using FrontPage and different computer graphics programmes for image processing. The overall activity occurred in a period of 3 to 4 hours and the subjects together with the expert decided about the layout of their websites.

During the interviews the attention of the subjects was drawn to the way they learned the web-construction procedure without any reference to collaboration. As such, changes or additions should have to be done, concerning the role of their partners.

3.2.2 Tasks

The adults had to gather the information needed in order to upload it on the Internet, sign up for free web space provision, decide about the importance of either the images or the texts and process them for the Internet.

3.2.3 Sample

Since the web-construction activity is not defined as suitable to a specific age and appropriate for heterogeneous groups of people, our sample were 2 adults students 35 and 40 years old while the experts were 30 and 33 years old.

3.2.4 Outcomes of the pilot study

As mentioned before, the pilot study indicated severe problems in two areas: the collaborative learning environment and the collection of data concerning either the interviews or the observation extracts. The expert was the one who was giving instructions and answered all the questions, without giving the chance to the participants to work and collaborate. The observation sheets and the interviews gave little evidence of collaborative learning as well.

*Modifications:* As an outcome of the pilot study, observation, transcripts and recording were found as the most appropriate way for providing evidence of learning and co-operation within the groups. The interviews were modified in order to clarify peer’s role explicitly, only in case of not referring to peer’s help. The expert should not give instructions especially in cases of problems. The construction of the collaborative learning environment seemed to be one of the most important features of collaboration and lots of work was required in advance in order to “force” peers to work together.

Moreover, students should fill in a short questionnaire in order to detect face-to-face interaction and the occurrence of collaborative and individualistic learning in
the specific and different context. Different approaches of the same target (triangulation) might be able to give specific and more focused data.

3.2.5 The Methodological Perspective

After pointing out the possible modifications, we had to change our methodological perspective. Brown & Dowling (1998) and Buma (2000), note that one of the most important elements in a research is the choice of research methodology, in order to provide reliability and validity to the research.

Our research has three concept variables, based on Carver’s et. al. (1992), research design towards a hypothesis: (a) If learning is a result of web design activities (independent variable) (b) is there any evidence of collaboration (dependent variable I) and (c) transfer of learning for individuals (dependent variable II)? As such, our research is a case study and we are looking for an association between learning through web design multimedia activities, collaboration and individualistic learning.

We tried to find a typical English School with an I.C.T. room as part of purposive sampling (Buma, 2000:121) in order to provide us with reliable information. The sample size was thought to be big enough to give us sufficient data (25 students) but even if 20 students subscribed to be part of the project, 9 students started it and 3 students were the ones who provided us the data. Since the number of students was insufficient and the research concerning collaboration is time consuming (the main study ended in early July), we tried to find a solution based on Azmitia’s (1996) results about the interactive minds of friends. Azmitia (1996:151) found evidence that collaborations between friends lead to a great equality of roles, more transactive discourse and larger increase in knowledge than collaborations between acquaintances. Furthermore they are more likely to search for solutions together and evaluate their outcomes. As such, in order to save time, we decided to use a married couple as the second group.

Working towards a qualitative research, the observer became part of what was observed. In this participant observation the degree of participation was as low as possible. The researcher was the adult expert between the students as well, but tried to remain unnoticed although not always successfully. Participant observation provided us with observation notes (note-taking) and recording (using a video camera), semi-
structured interviews and an open-ended questionnaire; all the above thought to enable the triangulation (Brown and Dowling, 1998) as a holistic approach to data collection (see Appendix A) while identifying the situated system of the potential collaborative environment. The video recordings were transcribed and turned to observation records as well, contributing to the several perspectives of the same situation.

**Measure Variables**

Observation, interviewing, examining records and questionnaires were conducted towards feasible evidence for learning through design in web construction activities and feasible evidence of collaboration within the activities.

Carver et al. (1992) provided us with the construction of a researching design for learning through web page construction activities. These activities were jigsawed (Sharan & Sharan, 1995:329) in a developing process, following the phases of the T-Consensus group. Five essential elements as described by Johnson & Johnson (1987) will be used to give us evidence as to whether these activities indicate traces of collaboration. Analysis of potential exploratory talk (Wegerif, 1997) is about to be a central contribution for indicating evidence of collaborative learning within the groups, having in mind that adults often have much more complex language than children (Gee, 2001:114). At the end, the basic partnerships between co-operative and individualistic learning (Johnson & Johnson, 1987) might be detected towards evidence of transferring this knowledge into a different context according to the situated approach and give us the final evidence that our design met the requirements adequately. Most of aforementioned needed data were thought to be collected during the second, interdependency phase.

Disadvantages of the research were: (a) only one person, the researcher, was taking notes; (b) we did not give the transcripts to the members of the groups to clarify their ideas and provide their further opinions on the data although we gave them the data as such, because of lack of time. Research bias could not be minimized this way; (c) the second group was limited as well (2 subjects) and time spent on task was limited comparing to Group A; (d) as a participant observation, with as low degree of participation as possible, the researcher did not always succeed probably because of her teaching/instructing background; (e) no girls from Group A participated in the research simply because they did not put their names on the board.
with the willing participants; and (f) it was difficult to gather all three group members at the same time while the time given was only one hour every second day during exams period. The limited time of one hour was the most important negative factor in our research, since collaboration needs time to unfold either in the micro-perspective of one session or macro-perspective of the overall time spent.

3.3 Description of Design of the Tasks

As a result of the pilot study’s outcome we redesigned the whole research as described:

Research into web design activities and collaborations has followed three routes: investigating learning via web design (Carver et al., 1992); co-operative learning (Johnson & Johnson); and situated activities in real context while transferring of learning of individuals in different contexts.

The same computer-supported collaborative environment (CSCE) was used involving two different groups from England and Greece. In order to eliminate cultural and age differences of the students and support heterogeneity, the first group (Group A) consisted of 3 English boys (Afro-American, European and Indian) 12, 14 and 15 years old while the second group (Group B) consisted of a Greek married couple, 35 and 37 years old (wife and husband).

Group A built their school’s website and Group B their respective homepages. Both groups worked in ‘real’ projects and were explicitly involved in evaluation as well. The groups were observed while developing interactions within their decisions upon the web design and qualities and modes of interaction occurred in each case, concerning the individual or group contribution to their project.

Group A was located at the Compton School, Finchley and started the research on the 21st of May, finishing on the 9th of July. The meeting with the 2nd group took place on the 11th of July and lasted 4 and half hours. The differences between the two groups were the age, the number of the members, the time spent on the project and the evaluation of their work. The work of Group A was evaluated by the members along with the teachers and the Head teacher while the second group evaluated their own work, being personal homepages. Ownership of the websites was on the
members for both groups and worked as a positive motivation, especially for Group A.

In order to accomplish our goals, we worked towards the pre-suggested design for computer-supported collaborative work. Hypertext and technical skills were gained during the first phase of the project (Jigsaw strategy) and the second phase was dedicated to interactivity.

Following the situated approach, the research was conducted in the real situations of authentic context: a web site for the Compton School and two homepages for Group B. Their authentic activities had followed actions of the experts (students or the researcher) in modelling, coaching and articulating their acquisitions and gradually fading their performance. Multiple roles and different perspectives were elaborated, such as a typist, an image elaborator, a sound and video specialist and a conductor and leader. All members worked together and exchanged their expert information while reflecting, articulating and assessing their actions.

The participants searched for, located and organised the information according to their interests. They worked all together while analysing and evaluating their findings in different parts and time of the project and tried to integrate the new findings into the project. Evaluation and assessment was part of both every action and the web sites in a bird’s eye view. All members were expressing their opinion and proposed ideas. Decisions were taken after an overall agreement on each subject. The groups used several computer graphics programmes such as Photoshop, Corel Draw, Paint and Photo Editor, FrontPage as the basic web design programme and Sound Recorder for recording and integrating sounds into the hypertext. The members of Group A used a digital camera and Sound Recorder for the first time while the members of Group B used a scanner for the first time.

The first phase of the T-Consensus group was the one where the participants started working on their own areas, without having the sense of a group. Half of the overall time of Group A was required to start acting as a group. Group B jumped straight to phase two since being a couple, they were able to detect each other’s reactions and thoughts. During the first phase, the expert described the basic elements on hardware, software or design, and explained the need for each skill in real situations. Combinations of them were explained as well but these tasks were left for the group members to understand and decide upon the need of their use. The situation
was set up to support and ensure that all students learnt them in either individualistic or collaborative way. It gave them the opportunity for peer tutoring and interacting in an interdependent way.

The borders between phase one and phase two are difficult to be defined. We might be able to identify elements belonging to phase two, when participants started to leave their own space metaphorically or literally, and intruded other people’s space or the use of ‘we’ instead of ‘I’ in their discussions.

3.4 Description of Methodology of Main Study

Case study of Group A: JiTu, James and MJ

In our main case study, three students left and had participated in the construction of their school’s website. The other students probably could not deal with the responsibility especially during an exam period. Number 3 was imperative, and both Aronson (1978:36) and Johnson & Johnson (1987:47) suggest that it is the minimum number to enable co-operation (Johnson & Johnson indicating dyads are possible for a teacher who never worked in cooperative learning environments before; a dyad was our second case study). We tried to ensure positive interdependence (the structure of the goals might enable all members’ performance), individual accountability (all students’ activities were assessed from each other while providing feedback), heterogeneous group (12, 14, 15 years old students with different interests but common enthusiasm on I.C.T.), shared leadership (all members shared the responsibility for completing the task) and shared responsibility for each other, task and maintenance were emphasized (all students tried to do their best), social skills were taught directly through the activity, the researcher tried to observe and intervene only when the students had difficulties with the use of the programme, the students used to “process” their effectiveness by analyzing and assessing every day’s activities. We had all the equipment and materials needed for the task while peer interaction and personal or media-assisted instruction were used to accomplish the learning objectives.

In the case of positive reward interdependence, we gave the students a special I.C.T. card, a certificate of participation in the research, tapes from our recording and we arranged to go out to see a movie (Tomb Raider).

T-CONSENSUS GROUP VIA JIGSAW STRATEGY: PHASE I
The expert showed some basic elements on computer graphics programme (Jacobson et al.) and left FrontPage to students since there was a certain degree of similarity to Word Processor. James was already familiar with basic features of FrontPage and some of web design approaches. He therefore became the leader of the group since he already has his own homepage and knew how to use specific options or has an opinion about the layout in general.

The use of these ‘expert’ approaches later on in the process of coming together, enabled the transfer of knowledge in a collaborative way and all members became experts in all fields involved. Aspects of the physical context, such as seating arrangements and placing the equipment were important to enable interactivity to emerge. Since the students were interested in computers, learning developed really fast. Sometimes just one basic demonstration of the activity was enough while most of the times they discovered the solutions collaboratively or on their own. MJ used spreadsheets for the first time without any instructions and made some pie charts while everybody was watching him.

We used one digital camera, one scanner, one laptop for the elaboration of the images and the participants were working on their own interests as jigsawing the material or writing the texts needed all together. These activities were towards Positive Resource Interdependence while Positive Role Interdependence was indicated by the interconnection of all roles. Each member was assigned a task that the group required in order to function effectively. James was the leader and had an interest in sounds, MJ liked doing difficult ‘dirty’ tasks such as typing, spreadsheets and pie charts and Jitu liked working with images. James constructed an e-group http://groups.yahoo.com/group/comptonschool in order to communicate with his peers, although they did not use it effectively. He used e-groups to communicate with his friends and exchange files. It might be useful to refer to the fact that James was not allowed to use the computers because of illegal actions and he returned into the ICT room because of his contribution to the research.

The expert introduced them to new hardware and software and tried to increase their familiarity with them and incited them to use them on their own. They learned how to use a scanner and a digital camera and elaborate the information gathered through Adobe Photoshop, Sound Recorder and FrontPage. They used several other programmes of which they already had some knowledge such as
Notepad, Word Processor, Paint and Microsoft Publisher. They started working having in mind the design principles (Bruntlett, 1999) and navigation procedure (Preece, 1993). At the beginning, James started the index page with a navigation bar on the left while the others were working on different ones.

In this phase, the participants in Group A worked towards the project management skills and research skills according to Carver et al. proposition design for multimedia.

The researcher proposed the middle of June as the date of completion of the project but since the students did not manage to assemble every day because of their exams this deadline was postponed. They gathered all the information needed for the project before starting to elaborate it and James suggested a way of combining it in the index. They agreed to ask for a welcoming message from the Head teacher and skip any undesirable information. We thought that up to this point we might be on the borders for the next phase.

T-CONSENSUS GROUP VIA JIGSAW STRATEGY: PHASE II

At this stage organisation and representation skills, presentation and reflection skills were gained. The participants had to decide upon the use of selected information. Ways of use were suggested as well as ideas for presentation and organisation of it. The index page and the navigation bar were designed from the beginning and everyone was working on them, sometimes on the same subject. Information used was subsequently linked the navigation bar and the other web pages while the students were always checking the functionality of them. They were taking decisions upon all the elements of the site and revising it appropriately. Interdependence, face-to-face interaction, individual accountability, interpersonal and small group skills, group processing was continuing to emerge.
3.5 Description of Methodology of Second Study

Case study of Group B: Theologia and Vasilis

Theo (Theologia) and Vasilis are a married couple and constituted Group B. This group was constructed because of the limited number of participants in Group A. The research day lasted 4 and half hours. The researcher had already told them to think about the information they wanted to use and the overall task was not as complicated as the previous one. They had to construct 5 web pages all together and 4 of them were texts that had to be transformed into hypertext.

T-CONSENSUS GROUP VIA JIGSAW STRATEGY: PHASE I

As expected, Group A started working together immediately. The expert introduced both software and hardware necessary for the web site construction. Theo found images interesting to work with while Vasilis liked organising the information. Personal interest was their motivation for participating in the research. Since they were not that familiar with computers, the researcher tried to show the logic and philosophy of using the specific programmes. The modes of modelling, coaching, articulating by them and at the end fading (Jacobson et al., 1996) were the expert’s approach. After a demonstration, they found that scanning an image is something really simple. They worked towards the basic design principles (Bruntlett, 1999) and the navigation procedure (Preece, 1993) while interaction with the researcher was the component of Phase I.

T-CONSENSUS GROUP VIA JIGSAW STRATEGY: PHASE II

Since Group B started working together immediately, they decided upon the timeline and the roles naturally, without assigning them. They analysed and interpreted all the information they had gathered and tried to create patterns for using it. They decided upon all information bits and the ways they were going to use them, while thinking about hierarchical orders, sequence and the way it should be used and represented according to their opinion. They had thoughts about the viewers and evaluated their actions as such and into connection with the overall web site. As such, all five essential elements for co-operation were thought to be detected within their interactivities.
3.6 Data Collection

Primary data gathering methods consisted of written notes in the form of a journal filled in with possible problems or anything interesting that might be detected related to all issues in research and not just mere curiosity. 8 videotapes of primary recorded data were collected and after careful observation desirable data and observation notes have been transcribed.

The participants were asked to fill in a 20 questions questionnaire with some open-ended questions as well as multiple choice ones. The questionnaire was designed towards group members’ reflection upon their own activities concerning the acquisition of design skills as situated, collaborative learning.

In addition, the structured interviews were more explicit and specific, which afforded an opportunity to gain valuable insights of the way delineated knowledge acquisition occurred towards collaboration and situated learning. Group members tried to reflect upon their activity; they defined the way they gained specific new knowledge and how the fellow members helped them to acquire it. All interviews were videotaped and transcribed.

3.6.1 Summarising and presenting data

Our unit of analysis was constituted by sets of actions including statements that led to these actions or interactions. Discussions between the acts were the medium for the interpretation and expression of opinions or ideas towards the actions. As such, the observation notes, the interviews, the questionnaires and the discourse analysis might place us in a vantage point to approach our research. The observation notes and the questionnaires are going to advance closer to learning through design, although indications about collaboration might be detected as well. The interviews and the discourse analysis might give more information about collaboration and investigate whether potential learning was a collaborative one after all. All data extracted from observation transcripts, questionnaires, interviews or discourse analysis were organised, coded and summarised according to three main categories: (a) learning through design; (b) collaboration and (c) situated learning that leads to individualistic learning via transfer of learning:

(a) Learning through design was the basis for the creation of a five branched tree (project presentation, organisation and presentation,
presentation and reflection skills) and each one of the branches was forked according to Carver et al.’ (1992) proposition.

(b) Collaboration category was the basis of another five-branched tree, following the Johnson and Johnson (1987) proposition of subcategories for every above essential element of collaboration. Salomon’s suggestions were integrated within them since the combination provided an increased degree of reliability. Wegerif’s suggestion to use exploratory talk in order to detect collaborative learning is central element of data analysis towards the specific subject.

(c) Situated transfer of knowledge for individuals (individualistic learning) is detected via all three data-collection methods.

3.6.2 Framework Analysis

We tried to enlarge our options of providing data using all three methods of collection. Several authors expressed their doubts about academic discourse (Halliday, 1985; Henri, 1992), which, can be disjointed and unlike everyday talk. Young (1995) also points out that ‘thinking aloud’ protocols often fail to enlighten researchers about engagement in problem solving activities, especially when the participants become quite, ‘possibly due to cognitive workload and the invasiveness of having to say what one is doing and at the same time doing it’ (p.92).

Many of the methods developed are complex, highly-specific research tools which may prove to be of little relevance or yield little useful meaning regarding the messages participants convey as they construct multimedia (Herrington & Oliver, 1999). To be helpful, the framework chosen for the present study combined the theoretical approaches towards the research questions even if such frameworks inevitably have different features, which may lead to different interpretations of meaning. As such, our process of operationalisation contains four tables. Table 1 was constructed towards learning through design (research question 1); table 2 towards co-operation while table 3 was constructed towards investigation of collaborative learning (research question 2); and tables 4 and 5 were composed towards transfer of learning for individuals in different contexts.
### Table 1
**Learning through Design (Carver et al., 1992)**

<table>
<thead>
<tr>
<th>Design Skills</th>
<th>Analytical Corroboration Definitions</th>
<th>Indicators for the purpose of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT MANAGEMENT SKILLS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Creating a timeline for the completion of the project.</td>
<td>Any statement about finishing the website.</td>
<td></td>
</tr>
<tr>
<td>2. Allocating resources and time to different parts of project.</td>
<td>Any statement or action referring to distribution of information and timetable during the project.</td>
<td></td>
</tr>
<tr>
<td>3. Assigning roles to team members.</td>
<td>Any statement or action referring to assigning roles.</td>
<td></td>
</tr>
<tr>
<td><strong>RESEARCH SKILLS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Determining the nature of the problem and how research should be organized.</td>
<td>Any statement or action which indicates analysis and suggestions upon problems and research.</td>
<td></td>
</tr>
<tr>
<td>2. Posing thoughtful questions about structure, models, cases, values and roles.</td>
<td>Any question about structure, models, cases, values and roles.</td>
<td></td>
</tr>
<tr>
<td>3. Searching for information using text, electronic, and pictorial information sources.</td>
<td>Any statement or action about seeking information concerning text, electronic, and pictorial information sources.</td>
<td></td>
</tr>
<tr>
<td>4. Developing new information through interaction.</td>
<td>Any statement or action, which indicates learning through interaction.</td>
<td></td>
</tr>
<tr>
<td>5. Analyzing and interpreting all the information collected to identify and interpret patterns.</td>
<td>Any statements or actions which analyze and recognize similarities between similar subjects</td>
<td></td>
</tr>
<tr>
<td><strong>ORGANIZATION AND PRESENTATION SKILLS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Deciding how to segment and sequence information to make it understandable.</td>
<td>Any statement or action referring to the way the viewer will understand information.</td>
<td></td>
</tr>
<tr>
<td>2. Deciding how information will be represented.</td>
<td>Any statement or action about layout that lead to a final decision.</td>
<td></td>
</tr>
<tr>
<td>3. Deciding how the information will be organized and how it will be linked.</td>
<td>Any statement or action, which expresses final decisions upon organizing information and links.</td>
<td></td>
</tr>
</tbody>
</table>
**Table 1 (continued)**
**Learning through Design (Carver et al., 1992)**

<table>
<thead>
<tr>
<th>PRESENTATION SKILLS</th>
<th>1. Mapping the design.</th>
<th>Any statement or action which recognises layouts about the design of the overall project.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Attracting and maintaining the interest of the viewers.</td>
<td>Any statements or actions that referring to the preferences of the viewers.</td>
</tr>
<tr>
<td>REFLECTION SKILLS</td>
<td>1. Evaluating the programme and the process.</td>
<td>Any statements or actions of assessment either the project or the process.</td>
</tr>
<tr>
<td></td>
<td>2. Revising the design using feedback.</td>
<td>Any statements or actions that provide feedback and revision of design as a result.</td>
</tr>
<tr>
<td>Elements for co-operation</td>
<td>Analytical Corroboration Definitions</td>
<td>Indicators for the purpose of classification</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>1. Giving and receiving help and assistance.</td>
<td>Any statement or action that expresses a cyclic process of giving and receiving help and assistance.</td>
</tr>
<tr>
<td></td>
<td>2. Exchanges resources and information.</td>
<td>Any statement or action that indicates giving and receiving resources and information.</td>
</tr>
<tr>
<td></td>
<td>3. Giving and receiving feedback.</td>
<td>Any statement or action for giving and receiving feedback.</td>
</tr>
<tr>
<td></td>
<td>4. Challenging each other’s reasoning.</td>
<td>Any statement or action that challenges a given perspective.</td>
</tr>
<tr>
<td></td>
<td>5. Advocating increased efforts to achieve.</td>
<td>Any statement or action that indicates increasing efforts concerning specific tasks.</td>
</tr>
<tr>
<td></td>
<td>6. Mutually influencing each other’s reasoning and behaviour.</td>
<td>Any statement or action that states change of ways of thinking or behaviour influenced from each other.</td>
</tr>
<tr>
<td></td>
<td>7. Engaging in the interpersonal and small group skills needed for effective teamwork</td>
<td>Any statement or action that suggests involvement in group activities towards specific tasks.</td>
</tr>
<tr>
<td></td>
<td>8. Processing how effective group members are working together.</td>
<td>Any statement seeking about group effectiveness.</td>
</tr>
<tr>
<td>Positive Interdependence</td>
<td>1. Putting their heads close together over their work.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Talking about the work.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Drilling each other on the material they learned.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Sharing answers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Encouraging each other to learn.</td>
<td></td>
</tr>
</tbody>
</table>
Table 2 (continued)
Co-operation (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>2. FACE-TO-FACE INTERACTION AND VERBAL EXCHANGE (Crook, 1994)</th>
<th>1. Articulation.</th>
<th>Any statement towards articulation and expression.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Conflict.</td>
<td>Any statement that presents dealing with problems while having different opinions about them.</td>
</tr>
<tr>
<td></td>
<td>3. Co-construction.</td>
<td>Any statement or action that indicates group work towards a same subject.</td>
</tr>
<tr>
<td>3. INDIVIDUAL ACCOUNTABILITY</td>
<td>1. Explanation of working tasks.</td>
<td>Any statement or action that demonstrates knowledge of specific task and explanation of it to others.</td>
</tr>
<tr>
<td></td>
<td>2. Provision of support and assistance.</td>
<td>Any statement or action referring to helping other group members.</td>
</tr>
<tr>
<td>4. INTERPERSONAL AND SMALL-GROUP SKILLS</td>
<td>1. Teacher-Student Interaction.</td>
<td>Any statement or action suggesting verbal exchange or interactivity.</td>
</tr>
<tr>
<td></td>
<td>3. Student-Student Interaction.</td>
<td>Any statement or action suggesting verbal exchange and interactivity between members.</td>
</tr>
<tr>
<td></td>
<td>4. Student Role Expectations.</td>
<td>Any statement or action that indicates expectations of dealing with assigned role.</td>
</tr>
<tr>
<td></td>
<td>1. Understand the importance of the new skill.</td>
<td>Any statement or action that suggests understanding of the importance of the new skill.</td>
</tr>
<tr>
<td></td>
<td>2. Understand what the skill is and the behaviours the group have to engage.</td>
<td>Any statement or action that recognises the need of the specific skill and the behaviour towards it.</td>
</tr>
</tbody>
</table>
Table 2 (continued)
Co-operation (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>SMALL-GROUP SKILLS</th>
<th>3. Find situations in order to practice the skill.</th>
<th>Any statement or action that defines situations for implementing the new skill.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4. Getting feedback.</td>
<td>Any statement or action referring to feedback.</td>
</tr>
<tr>
<td></td>
<td>5. Keep practicing.</td>
<td>Any statement or action which express an awareness of the need to continue the activity.</td>
</tr>
<tr>
<td></td>
<td>6. Load your practice towards success.</td>
<td>Any statement or action that indicates working towards a successful result.</td>
</tr>
<tr>
<td></td>
<td>7. Encourage each other to use the skill.</td>
<td>Any statement or action that expresses encouragement to use the new skill in order to complete or revise a task for a better result.</td>
</tr>
<tr>
<td></td>
<td>8. Practice until it feels natural.</td>
<td>Any statement or continuing action concerning the skill and fade out of thinking processes concerning its use.</td>
</tr>
<tr>
<td>5. GROUP PROCESSING</td>
<td>1. Outcome.</td>
<td>Any statement or action towards the final project.</td>
</tr>
<tr>
<td></td>
<td>2. Goals.</td>
<td>Any statement or action concerning the goals.</td>
</tr>
<tr>
<td></td>
<td>3. Content.</td>
<td>Any statement or action about the contents and the structure.</td>
</tr>
<tr>
<td></td>
<td>4. Process.</td>
<td>Any statement or action that expresses awareness about the overall process either concerning parts of the project or the overall construction.</td>
</tr>
</tbody>
</table>
### Table 3
**Cumulative Talk (Wegerif & Mercer, 1997)**

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Indicators for the purpose of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiations are accepted either without discussion or with additions or superficial amendments, which do not develop previous ideas. Repetitions, confirmations and elaborations are indications of the positive but uncritical way in which partners construct common knowledge.</td>
<td>1. Suggestion of a solution of a problem.</td>
</tr>
<tr>
<td></td>
<td>2. Acceptance of the suggestion.</td>
</tr>
</tbody>
</table>

### Table 4
**Exploratory Talk (Wegerif, 1997)**

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Indicators for the purpose of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>The initiation may be challenged and counter-challenged, but with hypotheses, which are developments of that initiation.</td>
<td>1. Suggestion of a solution of a problem.</td>
</tr>
<tr>
<td></td>
<td>2. Different suggestion of a solution of a problem.</td>
</tr>
<tr>
<td></td>
<td>3. A better, new solution rises.</td>
</tr>
<tr>
<td>Analytical Corroboration Definitions</td>
<td>Indicators for the purpose of classification</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>1. Task Interdependence through division of labour.</td>
<td>Any statement or action that indicates division of labour with interconnected elements between them.</td>
</tr>
<tr>
<td>2. Resource Interdependence.</td>
<td>Any statement or action that offers links between information.</td>
</tr>
</tbody>
</table>
| 3. Co-operation and individual accountability. | a) Each member explains how to get the answer.  
| | b) Each member relates previous learning with the new activities.  
| | c) Everyone understands the material and agree with the answers.  
| | d) Encouraging each other to participate.  
| | e) Listening to other group members.  
| | f) Each member supports his or her arguments.  
<p>| | g) Criticizing ideas, not people. |</p>
<table>
<thead>
<tr>
<th>SKILLS</th>
<th>Analytical Corroboration Definitions</th>
<th>Indicators for the purpose of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATING SKILLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Use of External Devices</td>
<td>Any use of a scanner, digital camera, recorder or something else.</td>
<td>Adequate use of the programme towards website construction.</td>
</tr>
<tr>
<td>2. Use of FrontPage</td>
<td>Adequate use of the programme towards website construction.</td>
<td>Adequate use of the programme towards website construction.</td>
</tr>
<tr>
<td>3. Use of Graphic Design Programmes</td>
<td>Adequate use of the programme towards website construction.</td>
<td>Adequate use of the programme towards website construction.</td>
</tr>
<tr>
<td>DESIGN SKILLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Project Management Skills</td>
<td>Any statement or action indicating using of project management skills.</td>
<td>Any statement or action indicating using of project management skills.</td>
</tr>
<tr>
<td>2. Research Skills</td>
<td>Any statement or action indicating using of research skills.</td>
<td>Any statement or action indicating using of research skills.</td>
</tr>
<tr>
<td>3. Organization and Presentation Skills</td>
<td>Any statement or action indicating using of organization and representation skills.</td>
<td>Any statement or action indicating using of organization and representation skills.</td>
</tr>
<tr>
<td>4. Presentation Skills</td>
<td>Any statement or action indicating using of presentation skills.</td>
<td>Any statement or action indicating using of presentation skills.</td>
</tr>
<tr>
<td>5. Reflection Skills</td>
<td>Any statement or action indicating using of reflection skills.</td>
<td>Any statement or action indicating using of reflection skills.</td>
</tr>
</tbody>
</table>

Frequency is defined as Frequently Observed (FO) when evidence are found more than 5 times, Observed (O), 3 to 4 times, Rarely Observed (RO), 1 to 2 times and Never Observed (NO). There were huge differences between different parts of the research concerning the frequency of existence of specific elements because of time invested in the projects (more than 5 times might be 20 times for decision making). As such, we decided to use the limited approach in order to get overall results.
4.1 Interviews

All three participants mention they learnt how to use FrontPage and *the elements that come with the construction of the web site*. Although MJ liked to explore and tried to find a solution on his own and James already had some previous knowledge, they started talking about how they learnt these things as: “*usually, by asking Jitu or James*” and “*Jitu and MJ showed me some things*”. Jitu thinks that he learnt while watching the expert and James: “*by watching and learning how you and James did it and just picked them up*”. The members said that whenever they needed help they just asked for it: “*I had to ask Jitu or James*”, “*I asked them some questions*”, “*they showed some things to me, asked them and followed whatever they did*”. James’ latter quote indicates the need for help while working on the project, without actually asking for it. Jitu refers to this ‘natural’ help as “*sometimes they just told me on the job*”. James recognises a process: “*showed me…asked them…followed whatever they did*” while Jitu refers to design as well: “*They taught me how to do it and how to design it*”.

We asked them to give us a specific example of how they learnt a specific element. James’ answer is not that clear: “*all the stuff required for the school’s website*”. Jitu and MJ refer to the hyperlink and describe how it was shown: “*…highlight it, insert hyperlink and select where to go*”; MJ cannot actually explain the process: “*they told me how to do it and that rings a bell. They just came into my screen and told me!*”.

All participants started building their own web sites just before the end of the project. Both MJ and James think that they will use all the things they learnt during the research but they will combine them with new things they might discover. Jitu thinks, “*I will use the things I learnt here. I think it is quite simple and easy*”. 
4.2 Questionnaires

All participants seemed to enjoy the activity and all asked for and provided help to the other members. “Showing” how to do several things is the word that they all use for different situations such as, tips on typing more effectively by MJ, bookmarks, links and inserting pictures by James and “some things” by Jitu. In contrast, they feel more comfortable with asking the expert for help, who gave them some tips on the layout (MJ), design (Jitu) and the actual FrontPage application (James). James thought that he could build the same web site on his own while the others do not share his opinion. They all express their willingness to participate in groups like that since they learnt more than what they knew already concerning either the software or the hardware. All members think that the actual building of the web site together with the layout and design are the most important things towards building web pages. They think that there is hierarchy concerning the most important features in a web page construction (collecting information, editing and publishing it) but MJ has not an opinion about it (he was a newcomer and missed gathering of information). All of them think that they can distinguish a solid design and functional web page. The most interesting thing in the activity seemed to be taking pictures and elaborating them for Jitu, the satisfactory feeling for MJ (“previewing after you have made it gives you a good feeling”) or the joy of learning new and exciting things for James. The reasons were several: Jitu says “it was fun and interesting”, MJ liked “see your work properly done” and James thought, “it gave the chance to develop my computer skills”. They all express their conviction that they can now create another web page or a homepage on their own. MJ added some comments concerning discussion of ideas, not people: “The people who I worked with were very nice which made it easy to discuss ideas or tell them when you don’t like an idea!”.

4.3 Summary of Classification

All types of data were summarised as described at the tables below, using different tables for each group, because of the differences between them.
### 4.3.1 Learning through Design (Research Question I)

Table 7

Chart of Classification for Learning through Design

(Carver *et al.*, 1992)

<table>
<thead>
<tr>
<th>Design Skills</th>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
</table>
|               | 1. Creating a timeline for the completion of the project. | 90a. *Jitu: We have two weeks to finish it,* 90b. *don’t we?*  
100. *James: Yes, I suppose so.* |
|               | 2. Allocating resources and time to different parts of project. | Group A created a basic guideline towards the end of June and during the process they were adding elements in their plan and the activity ended more complex than the initial one. |
|               | 3. Assigning roles to team members. | *Jitu liked to work with images, MJ liked to type and do spreadsheets and James liked organising as a group leader while always had an opinion about layout.* |
**Table 7 (continued)**

**Chart of Classification for Learning through Design**

*(Carver et al., 1992)*

| RESEARCH SKILLS | The participants have to search for information for the facilities page in several leaflets:  
120a. *MJ:* Ok, I am going to photocopy this page so to write it,  
120b. *you and James do the others.* |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determining the nature of the problem and how research should be organized.</td>
<td>The participants searched for texts in books, leaflets or getting messages from teachers. They got many pictures and small videos from the school and several classrooms using a digital camera. They recorded messages and sounds in order to integrate them in the website.</td>
</tr>
</tbody>
</table>
| 2. Posing thoughtful questions about structure, models, cases, values and roles. | 121. *MJ:* Do we need to put all the classes in the facilities page?  
122a. *Jitu:* Yes, I think so;  
122b. *we have drama, music, computers, library, chemistry,* | |
30b. *If we do all the letters in green,*  
30c. *how can we see the hyperlinks,*  
30d. *which are green as well?*  
31. *MJ:* That is true.  
32a. *James:* So we have to change the colour of the fonts,  
32b. *right?*  
33. *MJ:* Yeah! |
| 4. Developing new information through interaction. | All information was classified according to subjects after ‘throw away’ experience. Overall patterns were identified as well.  
82. *James:* They (fonts, size) have to be the same with the other pages. |
| 5. Analyzing and interpreting all the information collected to identify and interpret patterns. | 83a. *Jitu:* Yes, you are right.  
83b. *So we don’t need that one, do we?* |
**Table 7 (continued)**  
**Chart of Classification for Learning through Design**  
*(Carver et al., 1992)*

| ORGANIZATION AND PRESENTATION SKILLS | 1. Deciding how to segment and sequence information to make it understandable. | 126. MJ: What is the title for this one?  
127. Jitu: I don’t know. Let’s ask James.  
128. James: mmm… I don’t know...  
129. Researcher: What is it?  
130. MJ: it is about organizing the students. And how students have opportunities in the school. (Showing the text to the others) It could be pupil opportunities! |
|-------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 2. Deciding how information will be represented. | 122b. Jitu: We have drama, music, computers, library, chemistry…  
123a. MJ: We can take pictures of all the rooms and  
123b. put some info together with the classrooms. | 121. MJ: Do we need to put all the classes in the facilities page?  
122a. Jitu: Yes, I think so … |
| 3. Deciding how the information will be organized and how it will be linked. |                                                                                   |                                                                                   |
| PRESENTATION SKILLS | 1. Mapping the design. | The participants designed the basic structure of the website before starting to collect information and revised it continuously during the project.  
21. MJ: Do you think we have to use the 2001 resources?...  
24. Jitu: I think it is useful for the viewer to know that.  
25. MJ: Shall we do the records as well?  
26. James: Yes. | 2. Attracting and maintaining the interest of the viewers. |

**ORGANIZATION AND PRESENTATION SKILLS**

1. Deciding how to segment and sequence information to make it understandable.

2. Deciding how information will be represented.

3. Deciding how the information will be organized and how it will be linked.

**PRESENTATION SKILLS**

1. Mapping the design.

2. Attracting and maintaining the interest of the viewers.
Table 7 (continued)
Chart of Classification for Learning through Design
(Carver et al., 1992)

<table>
<thead>
<tr>
<th>REFLECTION SKILLS</th>
<th>1. Evaluating the programme and the process.</th>
<th>2. Revising the design using feedback.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>154. Researcher: So, what do you think so far?</td>
<td>186a. Jitu: You see, if you go to this one it will look strange.</td>
</tr>
<tr>
<td></td>
<td>155. Jitu: I think it is good!</td>
<td>186b. I think it is too different.</td>
</tr>
<tr>
<td></td>
<td>156a. James: If you compare it with the other’s school’s web site it is good.</td>
<td>186c. Should I change to this one?</td>
</tr>
<tr>
<td></td>
<td>156b. Think that the ICT teacher built the other one and we are just students.</td>
<td>187a. James: Yeah,</td>
</tr>
<tr>
<td></td>
<td>156c. Jitu: Everything is working so far.</td>
<td>187b. and delete the other one.</td>
</tr>
<tr>
<td></td>
<td>157a. James: Yes,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>157b. What do we do next?</td>
<td></td>
</tr>
</tbody>
</table>

All evidence concerning skills (project management skills, research skills, organization and presentation skills and reflection skills) in learning through design was frequently observed for Group A. We found some traces of learning that had nothing to do with design skills; the design activity gave the members the opportunity to clarify the use of paragraphs, spelling or the way a text should be arranged: ‘James: You need a paragraph here, since you changed your subject. Jitu: Ok, I got it’. Some design decisions about layout looked more likely to be achieved in a didactic mode, such as the use of the same fonts, fonts’ colour, size or the features of a hyperlink. Even though we did give the students some basic guidelines concerning design, they forgot to implement them during the activity. The participants found on their own that it is better to be the uniform in the overall website. They reached the same conclusions and they realized their utility in practice.

As such, we found strong evidence of learning towards design skills while following Carver et al.’ design proposition. All skills described by the authors were
present and acquired from the group members while no significant evidence of learning occurred outside involvement of the design activity was found.

4.3.2 Co-operation (Research Question II)

Chart of Classification for Co-operation and Collaborative Learning (Johnson & Johnson, 1987; Wegerif, 1997)

We are going to display examples for co-operation on table 7, cumulative talk on table 8 and collaborative learning on table 9.

Table 8
Chart of Classification for Co-operation (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>Elements for co-operation</th>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Giving and receiving help and assistance.</td>
<td>All members gave and receive help and assistance (as described on the questionnaires).</td>
</tr>
<tr>
<td></td>
<td>2. Exchanges resources and information.</td>
<td>All participants shared and were aware of all information and the process.</td>
</tr>
</tbody>
</table>
|                           | 3. Giving and receiving feedback. | 117. MJ: Just finished the statistics page. What do you think of it?  
118. Jitu: Wow!  
119. James: All right! |
|                           | 4. Challenging each other’s reasoning. | 74a. Jitu: You know contact information page...  
74b. Do we put our emails?  
75a. James: No,  
75b. because this is one is for the school.  
75c. We are going to do it in the webmaster’s page. |
|                           | 5. Advocating increased efforts to achieve. | While the deadline was close, the group members used to work faster and in accuracy, encouraging each other towards the success of the project. |
6. Mutually influencing each other’s reasoning (the e-mails should be at the webmaster’s web page) and behaviour (they tried to type faster as MJ did).

74b. Jitu: Do we put our emails?
75a. James: No,
75b. because this one is for the school.
75c. We are going to do it in the webmaster’s page.

Also, Since James and Jitu wanted to type as fast as MJ, they bought ‘Typing Tutor’ programmes.

7. Engaging in the interpersonal and small group skills needed for effective teamwork

163a. Jitu: Go to file and
163b. open the pictures we got...
163c. So you have to make them smaller
163d. and you have to think about the contrast and the light.
164a. James: Ok...
164b. I think they are Ok now...
165. Jitu: Now you have to save them for the web.
166. James: As gif?
167a. Jitu: Better as jpg, and medium quality.
167b. we won’t put lots of them in it.

8. Processing how effective group members are working together.

At the end of each meeting they used to evaluate their work while checking if everything is working since they used to work on different pages and they had to combine them afterwards.
| Positive Interdependence | Table 8 (continued)  
|---|---
| Chart of Classification for Co-operation  
(Johnson & Johnson, 1987). | The participants put their heads close together over their work, especially when someone was having a problem.  
They talked about the work even during the school breaks.  
They elaborated the material they learned while asking advice.  
14a. MJ: I want to put a hyperlink for the uniform page.  
14b. Do you know how it works?...  
15d. James: Find uniform there and select it...  
15e. Insert the hyperlink from here...  
15f. and joint uniform page...  
While using the digital camera they took photos in turns, since they realized that everybody has to know how it works.  
2. FACE-TO-FACE INTERACTION AND VERBAL EXCHANGE  
(Crook, 1994)  
We observed all three |
| 1. Articulation. | 9a. MJ: If we move this one from this folder to the other one and rename the one we are going to use,  
9c. the image will automatically be selected from the link,  
9d. right? |
| 2. Conflict. | 34. Jitu: Do you think that this one is Ok?  
35. MJ: No, the other one. |
|--------------|-------------------------------------------------------------------------------------------------|
| 3. Co-construction. | 56b. Jitu: You know what, we put the wrong link here.  
57a. James: Ok,  
57b. so we should delete the other one.  
58a. Jitu: Ok,  
58b. and we should do the hyperlink from here.  
59a. James: Yes,  
59b. and put the arrow as well.  
59c. Change it.  
60a. Jitu: This one...  
60b. Ok,  
60c. Have to save it now and  
60d. we have to put this bookmark upside down.  
61. James: Yes.  
62. Jitu: Should I delete the other one then?  
63. James: No, it might be useful.  
64. Jitu: Then have to do this...  
65a. MJ: That’s good!  
65b. We could put the map now. |
| 3. INDIVIDUAL ACCOUNTABILITY | 138. MJ: I think we need columns here.  
139a. Jitu: Ok,  
139b. go to table then and  
139c. you will find the table there. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. INTER-PERSONAL AND SMALL-GROUP SKILLS</td>
<td>1. Teacher-Student Interaction.</td>
<td>The researcher showed them how to use the digital camera.</td>
</tr>
<tr>
<td></td>
<td>2. Students-Materials Interaction.</td>
<td>All students learnt to work with several programmes for text, image and sound elaboration.</td>
</tr>
<tr>
<td></td>
<td>3. Student-Student Interaction.</td>
<td>Sometimes participants used to have eye contact to search for an answer or to verify the accuracy of their choices.</td>
</tr>
<tr>
<td></td>
<td>4. Student Role Expectations.</td>
<td>Group A combined different elements coming from member’s field of specialization.</td>
</tr>
<tr>
<td></td>
<td>1. Understand the importance of the new skill.</td>
<td>The introduction of Photoshop in order to elaborate images towards the Internet was made by Jitu.</td>
</tr>
<tr>
<td></td>
<td>2. Understand what the skill is and the behaviours the group have to engage.</td>
<td>Jitu showed why they have to use its tools in order to have the best result with the least effort and size.</td>
</tr>
<tr>
<td></td>
<td>3. Find situations in order to practice the skill.</td>
<td>The facilities page included several classrooms, represented with images and information.</td>
</tr>
<tr>
<td></td>
<td>5. Keep practicing.</td>
<td>169b. Jitu: save them (about 10 images) with a name so to recognize it afterwards. 170. James: Ok, I’ll make them.</td>
</tr>
</tbody>
</table>
Table 8 (continued)
Chart of Classification for Co-operation
(Johnson & Johnson, 1987)

| SMALL-GROUP SKILLS | 6. Load your practice towards success. | 164b. James: I think they are Ok now...
165. Jitu: Now you have to save them for the web. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Encourage each other to use the skill.</td>
<td>169b. Jitu: save them (about 10 images) with a name so to recognize it afterwards.</td>
<td></td>
</tr>
<tr>
<td>8. Practice until it feels natural.</td>
<td>170. James: Ok, I’ll make them</td>
<td></td>
</tr>
<tr>
<td>5. GROUP PROCESSING</td>
<td>They were checking each other’s work, and they used to assess every decision upon design, until they decided on a pattern for specific features.</td>
<td></td>
</tr>
<tr>
<td>1. Outcome.</td>
<td>The main goal for the group members was the construction of the website before July. As such, they use to check the overall activity towards it and adjust their actions.</td>
<td></td>
</tr>
<tr>
<td>2. Goals.</td>
<td>The content has been revised several times and became more complex in linking information when they learnt the basic functions of the FrontPage.</td>
<td></td>
</tr>
<tr>
<td>3. Content.</td>
<td>At the end of every session they used to evaluate the process and when MJ was missing they realised that his presence was important towards the final result.</td>
<td></td>
</tr>
</tbody>
</table>
Table 9
Cumulative Talk (Wegerif & Mercer, 1997)

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type Discourse 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation is provided by MJ (9a-9d), who suggests an interesting way of solving a problem with a link. They built the link for one image, but they elaborate a better image for the same link. MJ suggests they delete the one connected with the link and rename the one they want with the name of the previous, so as to have the link as well. Jitu thought that it might work and waited to see it (10) while James is more anxious since he cannot view it (11). MJ suggests to close and open FrontPage (12) so to view it and at the end James admits that it worked after all.</td>
<td>9a. MJ: If we move this one from this folder to the other one and rename the one we are going to use, the image will automatically be selected form the link, right? 10. Jitu: Let’s try then. 11. James: Can’t see anything... 12. MJ: Close the window and open it again and will see. 13. James: Ok, it works!</td>
</tr>
</tbody>
</table>
Table 10
Exploratory Talk (Wegerif, 1997)

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type Discourse 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62. Jitu: Should I delete this one (bookmark for an image) then?</td>
</tr>
<tr>
<td></td>
<td>63. James: No, it might be useful.</td>
</tr>
<tr>
<td></td>
<td>64a. Jitu: You know what we should do?</td>
</tr>
<tr>
<td></td>
<td>64b. We should delete the other one</td>
</tr>
<tr>
<td></td>
<td>64c. since there is no link there and</td>
</tr>
<tr>
<td></td>
<td>64d. create a different page.</td>
</tr>
<tr>
<td></td>
<td>65a. MJ: That’s good!</td>
</tr>
<tr>
<td></td>
<td>65b. We could put the map now.</td>
</tr>
<tr>
<td></td>
<td>66a. James: Ok,</td>
</tr>
<tr>
<td></td>
<td>66b. and I am doing the map (a different image, more suitable to the context).</td>
</tr>
</tbody>
</table>

The initiation may be challenged and counter-challenged, but with hypotheses, which are developments of that initiation. That means that no opinion should override and a new, better solution might be suggested.

Analysis

Jitu suggests deleting the unnecessary bookmark; James replies that they might find it useful in another task. As such, Jitu is changing the bookmark to an image that indicates a map. MJ, who always keeps an eye on the process, thinks that they have to do the map now, while giving positive feedback to James and Jitu (65a) towards their success. Jitu suggests they delete the image since there is no link there anymore and create a different web page for the image. MJ provides positive feedback and James agrees while proposing that they have to share the task, giving Jitu a break.

Discourse 10 represents a problem of putting a bookmark in a text or link it to a different page. The initiation has started in the beginning of Discourse 10 in the course of explaining the problem. Jitu suggests deleting the bookmark while James thinks that it might be useful. Then Jitu proposes that it might be more useful to change the bookmark with an image and create a link to another page. After this
discussion, MJ’s response is “That’s good” which stands as a positive feedback since it creates a new link to another page instead of a bookmark to it.

**Discourse 32 (exploratory talk [2])**

174a. *James*: How do I open a new window for all the favourite links?
174b. *I forgot!*
175a. *Jitu*: I don’t know!
175b. *It must be in the hyperlink window...*
176. *James*: Ok, I see it, new window, he, he.
177. *Jitu*: Simple, eh?

**Analysis**

Both James and Jitu forgot how to open a new window for a web page. Since they figure out how to search for it logically (175b), they found it out very quickly. They laugh since they knew how to do it, they forgot but again, they found it very quickly again.

After the initiation of the problem, neither of the participants has any suggestions, so the discussion is the actual search for the right click. Actively searching for it might be the actual response and the laughing is a reaction for simplicity, which indicates feedback as well.

**Bubble Talking**

**Discourse 11**

72a. *Jitu*: What does it mean by this?
72b. *How can I get rid of this hyperlink? ...*
72c. *let’s see on the preview...*
72d. *A ha! Yeah, ok, let me see if it works... now it is only one...*
72e. *Ok!*
73. *James*: Good work!

**Analysis**

Jitu seems to talk to himself. He founds a problem (72a) and thinks about solutions (72b). Thinking loudly probably helps him to be aware of the problem of a hyperlink that connects different parts of a sentence instead of being one link for one sentence. He tries to find a solution by deleting and replacing it and verifies his actions on
preview (72c). The ‘a-ha’ experience took place and satisfies him while James assesses his work and provides him with positive feedback.

Almost all the evidence was observed frequently (interdependence, face-to-face interaction and verbal exchange, individual accountability, interpersonal and small group skills, group processing) except the following subcategories concerning:

1) Interdependence: (a) Challenging each other’s reasoning, (b) processing how effective group members were and (c) encouraging each other to learn was rarely observed, while advocating increased efforts to achieve was observed.

2) Group processing for the outcome, goals and the content were frequently observed while evidence for the group process as such (without moving towards the deadline) was rarely observed.

3) Exploratory talk was observed to appear only in a total of three discussions.

Even though we have limited evidence in cases 1 and 2, we propose that co-operative activities occurred in a situated computer-supported environment. This evidence indicates collaborative activity, but we found little evidence of collaborative learning under Wegerif’s lens of detecting it, using exploratory talk. More of cumulative talk was frequently observed in Group A.

Collaborative activity proved to be a very important element towards learning through design. The design activity as such, provoked isolated activities as a time consuming one since information needs much of elaboration and typing. Jitu and MJ’s bubble talking while on the job indicates reflection upon action (Schön, 1987). Where Collaborative learning occurred, it was due to the absence of solutions. Different suggestions arose for finding solutions and various approaches to the problem gave the group members the freedom to choose the most suitable one, without being obliged to follow a single solution. More often, solutions were co-constructed from additions to the main suggestion from the members.

We did not find any evidence where collaboration inhibited learning.
### 4.3.3 Transfer of Learning for Individuals
(Research Question III)

**Table 11**
Basic Partnership between co-operative and individualistic learning (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Co-operation and individual accountability.</td>
<td>9a. MJ: If we move this one from this folder to the other one and 9b. rename the one we are going to use, 9c. the image will automatically be selected form the link, 9d. right?</td>
</tr>
<tr>
<td>a) Each member explains how to get the answer.</td>
<td></td>
</tr>
<tr>
<td>b) Each member relates previous learning with the new activities.</td>
<td>14a. MJ: I want to put a hyperlink for the uniform page I did. 14b. Do you know how it works? 15a. James: Yes. 15b. Go to general info… 15c. Ok, 15d. find uniform there and select it… 15e. Insert the hyperlink from here…</td>
</tr>
</tbody>
</table>
### Table 11 (continued)
**Basic Partnership between co-operative and individualistic learning (Johnson & Johnson, 1987)**

|   |  
|---|---|
| c) Everyone understands the material and agree with the answers. | 106. *James* (turning his screen to *Jitu*): *Is this one of the image we need?*  
107. *Jitu*: *No, I think it is this one.*  
108. *James*: *Do you think that we should link ‘home’ to the welcome page?*  
109. *MJ*: *Yeah, I think so, why not?*  
110. *Jitu*: *What do you think about the text here?*  
111. *MJ*: *General Info I suppose.*  
112. *Jitu*: *So, what do you think about this information page?*  
113. *MJ*: *That’s all right. It should be like that!*  
114. *James*: *Mmmm…. (shakes his head in agreement).*  
|   |  
|---|---|
| d) Encouraging each other to participate. | The participants used to meet during school breaks and encourage each other to be at the session.  
During *Jitu’s* bubble talking *James* was listening his comments:  
42a. *Jitu*: *This page hasn’t got any background…mmm…*  
42b. *oups! Nothing is working today…*  
42c. *I can’t get into this James!*  
43. *James*: *Go to index.2*  
|   |  
|---|---|
| e) Listening to other group members. |  
| f) Each member supports his or her arguments. | 125a. *Jitu*: *But we won’t put any children in the images since the Head-teacher said not to.*  
125b.  
|   |  
|---|---|
| g) Criticizing ideas, not people. | 27a. *Jitu*: *Ok, I will do this page (school records) and you do the other one(statistics).*  
27b.  
28a. *MJ*: *They can compare this information with other schools, right?*  
28b. *That is why it is important.*  

### Table 12
Transfer of learning for individuals

<table>
<thead>
<tr>
<th>SKILLS</th>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATING SKILLS</td>
<td>1. Use of External Devices</td>
<td>James used a scanner, Jitu used a scanner and a digital camera, MJ used a recorder.</td>
</tr>
<tr>
<td></td>
<td>2. Use of FrontPage</td>
<td>All participants constructed several web pages on their own.</td>
</tr>
<tr>
<td></td>
<td>3. Use of Graphic Design Programmes</td>
<td>They had to consider the quality in relation to the size of the images, which was something new towards the elaboration they used to do.</td>
</tr>
</tbody>
</table>
Table 12 (continued)

Transfer of learning for individuals

<table>
<thead>
<tr>
<th>DESIGN SKILLS</th>
<th>1. Project Management Skills</th>
<th>They created their own websites simultaneously with the project and they built at a couple of web pages before July, except James who was building a more complex one.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Research Skills</td>
<td>They built their homepages (except James) and they searched for information concerning their interests and family. James searched for information about ‘Buffy, the Vampire Slayer’ including music, images and text.</td>
</tr>
<tr>
<td></td>
<td>3. Organization and Presentation Skills</td>
<td>They built their web sites bearing the viewer in mind and how s/he will have easy access and downloading.</td>
</tr>
<tr>
<td></td>
<td>4. Presentation Skills</td>
<td>Each web page was linked towards a logical way of following index.</td>
</tr>
<tr>
<td></td>
<td>5. Reflection Skills</td>
<td>All participants used to describe to each other loudly the changes that they have to make in order to make their web site more attractive.</td>
</tr>
</tbody>
</table>

None of the participants had used FrontPage before since only James has built a website (James’ website was made via geocities programme for easy building). After the project James rebuilt the whole website dedicated to ‘Buffy, the Vampire Slayer’ using FrontPage.

Our evidence is often observed for all cases either concerning the basic partnership between individualistic and co-operative learning (according to Johnson and Johnson, 1987) or the transfer of design skills. We seldom detected the encouragement for participation (the fourth element of co-operation and individual
accountability of ‘Basic Partnership’ – similar to interdependence element). In contrast to frequently observed elements, we noticed that the quality of design skills was different: the way the web pages and information were connected was simple; we did not have any arguments so the members used the first available solution to the problems; they used to ask each other for assessment of their work; research for information was limited for Jitu and MJ; and revision through reflection upon their actions was not as frequent and accurate as working in groups.

Mostly based on our observation notes, we noted that simple skills (the operational ones) were transferable from the group situation to the individual situation with the same software and environment (as we saw in the case of James, he transferred his knowledge of design skills from one situation to another without losing the quality of it). But more complex skills – for example research and reflection skills – are less likely to be transferred so readily (as we saw Jitu and MJ were unable to transfer the research and reflection skills to the individual context).
Chapter 5
The Second Study

5.1 Interviews

According to Group B, both members learnt how to create a web page in general; the basic elements, FrontPage, the use of the scanner and everything that comes with it: “I learned about FrontPage, signing for free web space, the basic elements to build a website, the hyperlinks, how to move from one folder to another, how to do encoding, how to use the scanner, the elaboration of the images...”. Theo thinks that she learnt these things while helping Vasilis, since they had to agree in every decision because of the common goal in creating a webpage: “I think I learned these things while helping each other...It was a common page and we had to agree in every element...”. Vasilis agrees and adds that whenever they did not know the importance of some things, like encoding or adding a link to their respective email addresses, “I think we worked together...but we did not know exactly what is important”, the expert told them so and they worked together to find the way of doing it. Two examples of finding answers together, according to Theo, were (a) the background information and (b) the encoding necessity. Vasilis, referring to the layout “the size and the type of the letters, the type and selection of the background”, mentions trial an error method, discussion and communication with his partner while making suggestions: “...we talked a lot with my partner, we discussed and communicate about it and we made suggestions on the purposes... after a while it became easier to decide”.

Both members continued to create several web pages using FrontPage; according to Theo “I’ll definitely use some methods...Beyond that point, I will try some alternatives as well”. Vasilis adds, “...after getting familiar with this process, I will try new techniques, and we might finally combine the two”. 

5.2 Questionnaires

According to the questionnaires, Vasilis seemed to fairly enjoy the activity while Theo liked it a lot. Theo clearly specifies the exchange of help: she did not know how to carry out the activity, so she had to seek help and she explained some features to Vasilis. Vasilis gave negative responses concerning the exchange of help. Both of them seemed to prefer getting the answers from the expert. They are not positive whether they can build the same web site on their own and they learnt something more than they already knew concerning both the Internet and the web design (“the most important thing is the kind of information and the size”, “a user friendly web site and the links”). In detail, they learned how to elaborate images and texts, the use of the scanner, FrontPage and Paint Pro programmes. Both refer to a hierarchical order towards basic stages of web site construction but only Theo refers to a “logical” reason of doing so. They know how to distinguish a well-designed web page after the activity. Theo finds that collaboration as such was the most interesting element of the project because of “having the chance to exchange opinions”. Vasilis refers to the actual actions and uses of the programmes “the FrontPage and the general structure”. Group B are not sure whether they can construct more web pages.
5.3 Summary of Classification

5.3.1 Learning through Design (Research Question I)

Table 13
Chart of Classification for Learning through Design
(Carver et al., 1992)

<table>
<thead>
<tr>
<th>Design Skills</th>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT MANAGEMENT SKILLS</td>
<td>1. Creating a timeline for the completion of the project.</td>
<td>Group B knew that the time we had was limited, about 3 to 5 hours.</td>
</tr>
<tr>
<td></td>
<td>2. Allocating resources and time to different parts of project.</td>
<td>They had found their information and created a guideline (developing researcher’s suggestions) before the project started.</td>
</tr>
<tr>
<td></td>
<td>3. Assigning roles to team members.</td>
<td>Vasilis liked to organise information and give instructions on the layout while Theo was actually building the web site.</td>
</tr>
</tbody>
</table>
Table 13 (continued)
**Chart of Classification for Learning through Design**
*(Carver et al., 1992)*

<table>
<thead>
<tr>
<th>RESEARCH SKILLS</th>
<th>While building the creative writing page, they had to find text and images to follow the text, so they searched on the Internet for them.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determining the nature of the problem and how research should be organized.</td>
<td>9. Theo: How about left navigation? 10. Vasiliis: Yes, I think so, the other one is too classic. It should be sophisticated.</td>
</tr>
<tr>
<td>2. Posing thoughtful questions about structure, models, cases, values and roles.</td>
<td>The participants have their own texts to put on and they searched for images on books, photos and the Internet.</td>
</tr>
<tr>
<td>3. Searching for information using text, electronic, and pictorial information sources.</td>
<td>58. Theo: I think it was better the other way. 58b. If you put this background, nobody will able to read it. 59. Vasiliis: Ok, just put the same one then. 59b. It is not the background that we want to see...</td>
</tr>
<tr>
<td>5. Analyzing and interpreting all the information collected to identify and interpret patterns.</td>
<td>58. Theo: I think it was better the other way. 58b. If you put this background, nobody will able to read it. 59. Vasiliis: Ok, just put the same one then.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORGANIZATION AND PRESENTATION SKILLS</th>
<th>Group B decided to build a first common index connected to links on their own homepages.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deciding how to segment and sequence information to make it understandable.</td>
<td>26. Theo: Come on; tell me, what do you want me to write? 27. Vasiliis: I am thinking of creative writing, study skills and thinking skills.</td>
</tr>
<tr>
<td>2. Deciding how information will be represented.</td>
<td>26. Theo: Come on; tell me, what do you want me to write? 27. Vasiliis: I am thinking of creative writing, study skills and thinking skills.</td>
</tr>
<tr>
<td>3. Deciding how the information will be organized and how it will be linked.</td>
<td>26. Theo: Come on; tell me, what do you want me to write? 27. Vasiliis: I am thinking of creative writing, study skills and thinking skills.</td>
</tr>
</tbody>
</table>
Table 13 (continued)
Chart of Classification for Learning through Design
(Carver et al., 1992)

<table>
<thead>
<tr>
<th>PRESENTATION SKILLS</th>
<th>The participants designed the basic structure of the website before starting collecting information and revised it continuously during the project.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mapping the design.</td>
<td>24. Theo: English or Greek? 25. Vasilis: English, we are getting international!</td>
</tr>
<tr>
<td>2. Attracting and maintaining the interest of the viewers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REFLECTION SKILLS</th>
<th>We frequently observed the existence of project management skills, research skills, organization and presentation skills, but we rarely observed reflection skills concerning the evaluation of the programme and the process for Group B. We have no evidence that the adults did not have the specific skills in general, but their previous knowledge was not towards the Internet regarding reflection skills. As such, we found evidence of learning towards design skills with limited cases of reflection skills.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Evaluating the programme and the process.</td>
<td>66. Theo: What do you think? 67. Vasilis: I think it is Ok, we can do it better though.</td>
</tr>
<tr>
<td>2. Revising the design using feedback.</td>
<td>34. Theo: Well, we can always change it if we decide that we don’t like it! 34b. How about the blue one? 35. Vasilis: No, it is the same with the background. 35b. Try that one. 36. Theo: Ok, I like that green as well.</td>
</tr>
</tbody>
</table>
5.3.2 Co-operation (Research Question II)
Chart of Classification for Co-operation and Collaborative Learning
(Johnson & Johnson, 1987; Wegerif, 1997)
We are going to display examples for co-operation on table 14, on table 15 and collaborative learning on table 16.

Table 14
Co-operation (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>Elements for co-operation</th>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Giving and receiving help and assistance.</td>
<td>Both members gave and received help and assistance according to our observation notes</td>
</tr>
<tr>
<td></td>
<td>2. Exchanges resources and information.</td>
<td>Both participants shared and were aware of all information and the process.</td>
</tr>
<tr>
<td></td>
<td>3. Giving and receiving feedback.</td>
<td>62a. Theo: Ok, 62b. I know, 62c. we will see it whether we like it or not. 62d. What do you think? 63a. Vasilis: Ok, 63b. just put the same one now ... 63c. Very good, well done!</td>
</tr>
<tr>
<td></td>
<td>4. Challenging each other’s reasoning.</td>
<td>11. Vasilis: I think it should be sophisticated. 12a. Theo: Nope, 12b. I think it is too much. 12c. How about this one? 13a. Vasilis: This is not a man’s website! 13b. I don’t want cats and dogs or flowers as a background.</td>
</tr>
<tr>
<td></td>
<td>5. Advocating increased efforts to achieve.</td>
<td>We have no evidence.</td>
</tr>
</tbody>
</table>
Table 14 (continued)
Co-operation (Johnson & Johnson, 1987)

| INTER DEPENDENCE | 6. Mutually influencing each other’s reasoning and behaviour. | 58a. Theo: I think it was better the other way.
58b. If you put this background, nobody will able to read it.
59a. Vasilis: Ok,
59b. just put the same one then.
It is not the background that we want to see... |
|------------------|-------------------------------------------------------------|------------------------------------------------------------------|
|                   | 7. Engaging in the interpersonal and small group skills needed for effective teamwork. | 46. Theo: How am I supposed to do it?
47. Vasilis: Try help, dear!
48a. Theo: Ok, I got it!
48b. Web options, encoding...
48c. Did it! Let’s see what we built. |
|                   | 8. Processing how effective group members are working together. | We have no evidence. |
### Table 13 (continued)
**Co-operation (Johnson & Johnson, 1987)**

<table>
<thead>
<tr>
<th>Positive Interdependence</th>
<th>Both participants put their heads close together over their work and lean on the screen.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>They talked about the work long before and during the project.</td>
</tr>
<tr>
<td></td>
<td>They elaborated the material they learned while asking advice.</td>
</tr>
<tr>
<td></td>
<td><strong>46. Theo:</strong> How am I supposed to do it?</td>
</tr>
<tr>
<td></td>
<td><strong>47. Vasilis:</strong> Try help, dear!</td>
</tr>
<tr>
<td></td>
<td><strong>48a. Theo:</strong> Ok, I got it!</td>
</tr>
<tr>
<td></td>
<td><strong>48b. Web options, encoding...</strong></td>
</tr>
<tr>
<td></td>
<td><strong>48c. Did it! Let’s see what we built.</strong></td>
</tr>
<tr>
<td></td>
<td>Theo tried to use the scanner first and then encouraged Vasilis to use it.</td>
</tr>
</tbody>
</table>

#### 2. FACE-TO-FACE INTERACTION AND VERBAL EXCHANGE (Crook, 1994)

We observed all three aspects of Crook’s verbal exchange in two levels: (a) in different parts of the project as separated and (b) all together within a specific incident. Since we are going to focus on the latter while analyzing such discussion using Wegerif’s lens of exploratory talk, we are going to refer to examples concerning the former.

<table>
<thead>
<tr>
<th>1. Articulation.</th>
<th>54. Theo: How about the colour and the links?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55a. Vasilis: Yes, it is Ok.</td>
</tr>
<tr>
<td></td>
<td>55b. but we have to changes the subtitles, the colour actually.</td>
</tr>
<tr>
<td></td>
<td>56. Theo: You are right, black titles, blue links.</td>
</tr>
<tr>
<td></td>
<td>57a. Vasilis: Ok,</td>
</tr>
<tr>
<td></td>
<td>57b. but bold, exactly like this one.</td>
</tr>
<tr>
<td></td>
<td>58a. Theo: I think it was better the other way.</td>
</tr>
<tr>
<td></td>
<td>58b. If you put this background, nobody will able to read it.</td>
</tr>
</tbody>
</table>
Table 14 (continued)
Co-operation (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>2. FACE-TO-FACE INTERACTION AND VERBAL EXCHANGE (Crook, 1994)</th>
<th>3. INDIVIDUAL ACCOUNTABILITY</th>
<th>4. INTER-PERSONAL AND</th>
<th>1. Teacher-Student Interaction.</th>
<th>The researcher suggested that they have to put their emails as well, so they did.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Conflict.</td>
<td>1. Explanation of working tasks.</td>
<td>Theo explained to Vasilis how to use the scanner;</td>
<td>1. Vasilis: Yes, how about putting an oval frame?</td>
<td></td>
</tr>
<tr>
<td>3. Co-construction.</td>
<td>2. Provision of support and assistance.</td>
<td>1. Theo: Do you want it for the creative writing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Vasilis: Yes, it is for the creative writing this one.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Theo: What do you want to choose?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Vasilis: Let me see...</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Theo: What do you think about this one? Is this better?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Theo: If I put this one, it will turn like this.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Vasilis: I can see that.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Theo: How about left navigation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. Vasilis: Yes, I think so, the other one is too classic. It should be sophisticated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Student-Student Interaction.</td>
<td>Both participants maintained eye contact to search for an answer or to verify their selections.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Students-Materials Interaction.</td>
<td>Both participants learnt to work with several programmes for text, image and sound elaboration.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMALL-GROUP SKILLS</td>
<td>4. Student Role Expectations.</td>
<td>Vasilis organized the information and gave instructions while Theo was following and arguing about them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Understand the importance of the new skill.</td>
<td>They understood that the use of a scanner would enable the introduction of their own photos into their website.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Understand what the skill is and the behaviours the group have to engage.</td>
<td>They understood the way they have to scan and elaborate their photos.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Find situations in order to practice the skill.</td>
<td>They built 2 web pages using their photos.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 4. Getting feedback. | 43c. Vasilis: *This green with black letters is fine.*  
44. Theo: *Do you like it?*  
45. Vasilis: *Perfect!* |
| 5. Keep practicing. | After settling on the basic style for their design they use during web construction activities. |
25a. Vasilis: *English,*  
25b. *we are getting international!* |
| 7. Encourage each other to use the skill. | When Theo learnt how to use the scanner she asked Vasilis to do it. |
| 8. Practice until it feels natural. | Vasilis continued scanning images until it seemed easy to do it. |
| 5. GROUP PROCESSING | 1. Outcome. | After finishing every web page they used to view it alone and in combination with index. |
| | 2. Goals. | They realised and talked about the way research has to be conducted regarding information for the Internet. |
| | 3. Content. | 26. Theo: *Come on, tell me, what do you want me to write?*  
27. Vasilis: *I am thinking of creative writing, study skills and thinking skills.* |
Because of limited time, Group B had to build the most fundamental web pages first (according to their opinions).

Table 15
Cumulative Talk (Wegerif & Mercer, 1997)

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type Discourse 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiations are accepted either without discussion or with additions or superficial amendments, which do not develop previous ideas. Repetitions, confirmations and elaborations are indications of the positively but uncritically way that partners construct common knowledge. The definition of themselves occurs through the identification of the others.</td>
<td>54. Theo: How about the colour and the links?</td>
</tr>
<tr>
<td>55a. Vasilis: Yes, it is Ok,</td>
<td></td>
</tr>
<tr>
<td>55b. but we have to change the subtitles, the colour actually.</td>
<td></td>
</tr>
<tr>
<td>56. Theo: You are right, black titles, blue links.</td>
<td></td>
</tr>
<tr>
<td>57a. Vasilis: Ok,</td>
<td></td>
</tr>
<tr>
<td>57b. but bold, exactly like this one.</td>
<td></td>
</tr>
</tbody>
</table>

Analysis

Group B discuss the colour and the links for the background and the subtitles. Vasilis suggested that if they use the specific ones (55a), they have to change the colour of the subtitles as well (55b). Theo concurred and summarized their actions (56). Vasilis agreed with the summary (57a) and thought that they have to use the same bold letters as they previously did (57b). Additions led to co-constructions.
Table 16
Exploratory Talk (Wegerif, 1997)

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11. Vasilis: I think it should be sophisticated.</td>
</tr>
<tr>
<td></td>
<td>12a. Theo: Nope,</td>
</tr>
<tr>
<td></td>
<td>12b. I think it is too much.</td>
</tr>
<tr>
<td></td>
<td>12c. How about this one?</td>
</tr>
<tr>
<td></td>
<td>13a. Vasilis: This is not a man’s website!</td>
</tr>
<tr>
<td></td>
<td>13b. I don’t want cats and dogs or flowers as a background.</td>
</tr>
<tr>
<td></td>
<td>13c. How about a map?</td>
</tr>
<tr>
<td></td>
<td>14a. Theo: No,</td>
</tr>
<tr>
<td></td>
<td>14b. actually I don’t know.</td>
</tr>
<tr>
<td></td>
<td>14c. How about this one?</td>
</tr>
<tr>
<td></td>
<td>15a. Vasilis: Mmm,</td>
</tr>
<tr>
<td></td>
<td>15b. I like it.</td>
</tr>
<tr>
<td></td>
<td>15c. But what about the classic one?</td>
</tr>
<tr>
<td></td>
<td>16. Theo: It is stupid after all.</td>
</tr>
<tr>
<td></td>
<td>17a. Vasilis: How do you know?</td>
</tr>
<tr>
<td></td>
<td>17b. Let’s see it.</td>
</tr>
<tr>
<td></td>
<td>18. Theo: I think the other one is better.</td>
</tr>
<tr>
<td></td>
<td>19. Vasilis: Yes, Ok, this one!</td>
</tr>
</tbody>
</table>

The initiation may be challenged and counter-challenged, but with hypotheses, which are developments of that initiation. That means that no opinion should override and a new, better solution might be suggested.

**Analysis**

Vasilis suggested a sophisticated style for the index page, but Theo thought it might be too much and suggested one with cartoons. Vasilis argued since they want a professional one they should choose a world map. Theo again did not like it and actually did not know what to use and suggested a background image. Even though he liked it, Vasilis proposed something more classic but Theo found the idea stupid. At the end they agreed to use the classic one.
Almost all the evidence was observed frequently (interdependence, face-to-face interaction and verbal exchange, individual accountability, interpersonal and small group skills, group processing) except the following subcategories concerning:

1) Interdependence: we had no evidence concerning (a) processing how effective group members are working together and (b) advocating increased efforts to fulfill the task. We rarely observed loading practice towards success.

2) Exploratory talk was observed in four discussions.

We think that the evidence we found was adequate to suggest co-operative environment. The design activity in Group B was not a time consuming one since the participants had typed the texts already. Cumulative talk was frequently observed while exploratory talk was noted and collaborative activity facilitated learning through design. More than two suggestions were made in each case and the participants were choosing the most suitable one (according to their opinion).

We did not find any evidence where collaboration inhibited learning.
### 5.3.3 Transfer of Learning for Individuals
(Research Question III)

#### Table 17
Basic Partnership between co-operative and individualistic learning (Johnson & Johnson, 1987)

<table>
<thead>
<tr>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Task Interdependence through division of labour.</td>
<td>Vasilis’ suggestions for the layout and the headlines guided Theo towards the construction of the web pages.</td>
</tr>
<tr>
<td>2. Resource Interdependence.</td>
<td>Images and texts were combined following each time the basic subject.</td>
</tr>
<tr>
<td>3. Co-operation and individual accountability.</td>
<td></td>
</tr>
<tr>
<td>a) Each member explains how to get the answer.</td>
<td>48a. Theo: Ok, I got it!</td>
</tr>
<tr>
<td>b) Each member relates previous learning with the new activities.</td>
<td>48b. Web options, encoding...</td>
</tr>
<tr>
<td>c) Everyone understands the material and agree with the answers.</td>
<td>Group B was familiar with Word Processor and used its options through FrontPage towards web construction.</td>
</tr>
<tr>
<td>d) Encouraging each other to participate.</td>
<td>Vasilis hesitated at the beginning of the research but Theo encouraged him to participate.</td>
</tr>
<tr>
<td>e) Listening to other group members.</td>
<td>Both members were carefully considering each other’s suggestions, most of the times putting their hand under their chin.</td>
</tr>
<tr>
<td>f) Each member supports his or her arguments.</td>
<td>35. Vasilis: No, it is the same with the background. Try that one.</td>
</tr>
<tr>
<td>g) Criticizing ideas, not people.</td>
<td>15b. Vasilis: But what about the classic one? 16. Theo: It is stupid after all.</td>
</tr>
</tbody>
</table>
### Table 18
Transfer of learning for individuals

<table>
<thead>
<tr>
<th>SKILLS</th>
<th>Analytical Corroboration Definitions</th>
<th>Example of Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATING SKILLS</td>
<td>1. Use of External Devices</td>
<td>Group B learned the use of a scanner.</td>
</tr>
<tr>
<td></td>
<td>2. Use of FrontPage</td>
<td>Both participants familiarised themselves with FrontPage.</td>
</tr>
<tr>
<td></td>
<td>3. Use of Graphic Design Programmes</td>
<td>Group B was not familiar with the use of any Graphic Design Programmes and yet managed to elaborate their images for Internet use.</td>
</tr>
<tr>
<td>DESIGN SKILLS</td>
<td>1. Project Management Skills</td>
<td>They continued the activity with more complex combinations and uploaded the webpage the same night.</td>
</tr>
<tr>
<td></td>
<td>2. Research Skills</td>
<td>They searched for information concerning either their professional interests or their family.</td>
</tr>
<tr>
<td></td>
<td>3. Organization and Presentation Skills</td>
<td>They built their web sites with regard to the viewer and how s/he will have easy access and downloading.</td>
</tr>
<tr>
<td></td>
<td>4. Presentation Skills</td>
<td>They considered easy access, downloading and the layout for the viewer.</td>
</tr>
<tr>
<td></td>
<td>5. Reflection Skills</td>
<td>They reflected upon all decisions either concerning each action or the overall activity regarding the Internet.</td>
</tr>
</tbody>
</table>

None of the participants had used FrontPage before and they continued building their homepages after the project.

Frequently observed evidence concerns either the basic partnership between individualistic and co-operative learning (according to Johnson and Johnson, 1987) or the transfer of design skills. We rarely observed the encouragement for participation (the fourth element of co-operation and individual accountability of ‘Basic Partnership’ –similar to interdependence element). Following our observation notes, the participants continued to communicate and exchange ideas and feedback after the project. We observed a different level of independency after the project. Both group
members worked on their projects alone, but always requested feedback from each other. Limited time was a negative element in proportion to the complexity of the project during the research.

As such, both operating and design skills were regularly present due to simplicity of the project for Group B. They developed design skills towards the use of FrontPage. They continued searching for more information, they reflected on and revised all pages as well as checked the logical links between them.

Both simple skills (the operating ones) and design skills were transferable from the research situation to another situation with the same software and within the same environment.
6.1 Discussion on Group A

We are going to discuss our evidence for Group A following the research questions.

6.1.2 Design Skills for Multimedia Designers (Research Question I)

Following Carver’s et al. model (1992), we found evidence that all skills described by the authors were frequently observed and developed in our research. Participants developed skills pertaining to design and learnt how to use FrontPage and process images, text and sound with a view towards the Internet.

Project management skills concerning time, allocation and students’ roles emerged as they were making decisions about when to construct several elements and who is responsible for doing it. “I’ll do this page you do the other one” but “we can’t do it today, we can do it tomorrow” while they “have two weeks to finish it” referring to the web pages construction. As such, research skills appear to develop since the students had to search for information using several resources – especially pictures and texts. They had to find numerous papers about the school, take some pictures of it, get the welcome message from the Head teacher and decide upon specific bits of information explicitly needed. Research was organised around the facilities page and linked several pages such as music, discotheque, sports or the gallery and had to be properly represented as facilities. They discussed the structure of the overall web site, trying to find the best background for it, the proper fonts and font size or the size of the images, having in mind viewer’s accessibility. All this new information was developed and integrated into the main index. This integration took place after analysing, testing or interpreting the data they had: “What is the title for this one?… I don’t know...(searching in the papers) how students have opportunities in the school... could be ‘pupils’ opportunities!” and “Do we have to put all the classes in the facilities page? I think so...”.

Chapter 6
Discussion
Organisation and representation skills became more tangibly apparent on both discourses and questionnaires. The participants spoke of hierarchy and importance of several elements and features and how information should be organised, represented and linked in order to make sense. Jitu suggests changing the title and the link for a web page since “if you go to this one it will look strange”, because “they can compare this information with other schools, right?”. They had to save all the parts in one single folder so as to organise them in different folders of images, sounds and html files.

Presentation skills appear towards design and implementation of several ideas concerning design with an emphasis on the viewers: “I think it is useful for the viewer to know that... if we do all letters in green how can we see the hyperlinks?”.

Group members seemed to reflect upon their work in every action, activity and overall work quite often: “I think it is good!... If you compare it with other schools’ web sites it is good!... Everything is working so far!”.

6.1.3 Co-operation (Research Question II)

We are following Johnson and Johnson’s proposition for the essential elements in co-operation. Next, we are going to use Wegerif’s IDRF mode of exploratory talk to find indications of collaborative learning within co-operative activities.

1. Interdependence: As described above, all members gave and received help and assistance as frequently as was recorded in the questionnaires: “Normally, when I asked them” and “Showed how to do bookmarks, links and insert pictures”. All participants shared the information and exchanged it so that they could edit and elaborate it into hypertext. Feedback was mostly exchanged in the form of expressions such as “Good work!” , “Ok!” , “Yes” or “That’s it!”. They challenged each other’s reasoning in order to find the suitable solutions: “Do we put our emails....?” , “No, because this one is for the school...”. They were advocating increased efforts to achieve the desirable result. For example MJ was working hard on the statistics page and the reactions were “Wow!” and “All right!”. Each member was watching the other member during the activities and sometimes they picked up interesting tips from each other. As Jitu describes in the interview: “I just picked up!” and MJ refers to the typing
tips he gave them concerning “typing more effectively”. Interpersonal and small group skills are already referred to since they functioned towards design and construction. They used to process how effective they were at the end of each session and made possible arrangements. We observed students working together while putting and holding their heads together, talking about the work inside and outside the ICT room and trying to find answers for other problems: “James, do you remember how to insert a bookmark?” or “…just copy the text, make the arrangements you want and put it back”.

2. **Face-to-Face Interaction and Verbal exchange**: We can detect either Crook’s approach on articulation, conflict and co-construction or Wegerif’ s suggestions of cumulative talk and collaborative learning. An example came from Discourse 10 (62-65b); the problem is an upside down bookmark: “...we have to put this bookmark upside down... -Should I delete the other one then? –No, it might be useful. –Then have to do this... -That’s good, we can put the map now!”. The problem was articulated from Jitu and the solution suggested was to delete the superfluous link. James had a different opinion since they might use it. So Jitu had to put a link and both of them were able to work on the page.

3. **Individual accountability**: All participants seemed to be responsible on this project and the fact that it occurred in ‘real’ situations led them to behave frequently in appropriate and accurate ways in order to fulfil their goals. James had the idea of copying texts from the Internet for the favourites’ page: “I’ ll copy the first lines of the introduction here”. All participants were sure about their decisions either individually taken or within the group.

4. **Interpersonal and small group skills**: Interactions between the expert and the participants are clearly expressed in the questionnaire. All members said that they prefer the expert’s opinion for elaborating and ‘interacting’ with the material. Interactions were articulated or expressed with body language; they used to keep an eye on others’ work, eye contact was very frequent especially in problematic cases and in appearance of something really interesting they gathered in front of one desktop and observe the activity. In addition, they swivelled the monitor screens around in order to show something and shook
their heads either in agreement or disagreement or even singing on their own. All participants met the expectations of their roles.

Jitu showed James how to elaborate images using Photoshop. We can detect the stress of importance of the new skill while using it for the specific situation of building web pages for school’s facilities web pages and the specific behaviour and process that James had to follow. Jitu was providing him with feedback and James continued to practice it until all images were elaborated successfully.

5. Group processing: As mentioned before, evaluation of their work occurred either on individual action or on the whole project in view of suggested goals. In Discourse 29 we find a satisfactory level concerning the project; they started to think immediately the next steps “What do we do next?” to improve and integrate new information to the facilities page. Comments on their actions are indicating from phrases as “Yes, much better this way”, “Good work!” or “we don’t need that one, do we?... -Probably not...”. These quotes refer to actions either to continue the activity or change it.

6.1.3a Collaborative Learning (Wegerif, 1997)

During the previous discussion we found evidence that co-operation took place within the situated computer-supported co-operative environment. We are going to investigate whether this type of learning was a result of co-operation or evolved naturally as an individualistic approach to something new. We are going to follow Wegerif’s suggestion on IDRIF model of detecting exploratory talk, which might lead us to collaborative learning.

The initiation begins with Jitu, as Jitu and James were working on the map for the school. They face a problem with the information page since there were 3 images and text that explained the directions to the school; Jitu asked: “Should I delete this one (bookmark for the map picture leading to information) then?” James directly challenged/questioned him “No” and provides the explanation that “it might be useful”. Jitu counterchallenged him and suggested a different solution concerning a different link for a map: “You know what we should do? We should delete the other one since there is no link there and create a different page”. Instead of adding a bookmark, they decided to create a different web page that leads them to the map of
the school. James finds that it is a good idea: “Ok, and I am doing the map” and suggests that he can do it (co-construction and decision making by James).

Differences and similarities were found concerning exploratory talk (IDRF, Wegerif, 1997) and co-construction (Crook, 1994).

Cumulative talk was frequently observed as described by Wegerif & Mercer (1997), starting from even the 2nd Discourse. MJ is suggesting a way of changing the link to an image without deleting and rebuilding the web page:

9a. MJ: If we move this one from this folder to the other one and
9b. rename the one we are going to use,
9c. the image will automatically be selected form the link,
9d. right?
10. Jitu: Let’s try then.
11. James: Can’t see anything...
12. MJ: Close the window and open it again and will see.
13. James: Ok, it works!

The other members accepted the solution without any discussion, conflict or addition to the initial suggestion. There was no critical manner of acceptance and construction of common knowledge seemed to occur (Wegerif & Mercer, 1997:54).

6.1.4 Individualistic Learning (Research Question III)

We found evidence, which indicates the partnership between co-operative and individualistic learning. Following Johnson and Johnson (1987) in their way of detecting this partnership, we start with the division of labour as the members did it. MJ while on his way out says: “I am going to photocopy this page, so to write it...You and James do the others”. We are able to detect resource interdependence following the way they organised the web pages around two main indexes, the main index and the facilities. For example, they had to decide whether the Barnet logo should figure on the map or the index and they had to arrange all facilities and the links for them on the other pages. Emails should be where their web pages is: “Do we put our emails?... No... we are going to do it in the webmasters page”. Titles are very important to connect with main text with the viewer’s first impression. Each member explains how to get the answer: “If I move this one from this folder to the other one... the image will automatically be selected...”. All participants were familiar with Word Processor and it was quite easy for them to work with FrontPage since the basic options were the
same. They did not have questions on these options but searched for specific tips concerning web design. As such, the participants related previous learning to new activities.

Everyone seemed to understand the material and have an opinion upon the importance of it: “Do you think that we should do the pie chart?... Definitely... Put some music on?... Yes, why not?” The members had problems with their participation in the research because of the exam period, but they always contacted each other in the school during the breaks to ensure that they would be participating. Positive feedback was a way of encouraging them to continue their activity. They used to listen to each other carefully and sometimes looking into each other’s eyes to find an answer or detect possible reactions to their work. Each member used to support his argument by giving reasonable explanations: “...save them (pictures) with a name so to recognize it afterwards”. They were criticising their actions, elements or ideas and we have no evidence of each other’s criticism: “What do you think of this arrow? It seems nice!” and “They can compare this information... right? That is why it is important!”.

Following their answers on the questionnaires and interviews, the participants were confident about their design and construction skills and they started building their own web sites just before the project ended. The transfer of learning to a different context indicates an individualistic capture as well. As we observed, simple skills were transferred but more complex skills such as research and reflection skills were difficult to be transferred for two of the members (MJ and Jitu).
6.2 Discussion on Group B

We are going to discuss our evidence for Group B following the research questions as in Group A.

6.2.1 Design Skills for Multimedia Designers (Research Question I)

Following Carver’s et al. model (1992), we found evidence that not all skills described by the authors were developed for Group B. Participants developed skills towards design and learnt how to use FrontPage but we have no evidence for one element concerning the evaluation of the programme in reflection skills’ development towards design for the Internet.

Project management skills concerning time, allocation and students’ roles were frequently present, as members were aware of time limitations and created their own guideline before the research started. They divided their roles as Vasilis liked to organise information and give instructions on the layout while Theo was actually building the web site.

Research skills were frequently observed relating to: (a) the organization of the activities for the construction –search for information--; (b) posing thoughtful questions concerning essential parts of the layout; for example Theo suggests “How about left navigation?”; (c) they searched for their own texts and images to be used in combination; (d) they developed their information through interaction: “If you put this background, nobody will be able to read it” as Theo explains and Vasilis agrees with her “Ok… It is not the background that we want to see…”; (e) after analysis and interpretation they found a pattern for the background: “Now, I know… light one, blue probably, with black letters.

Organization and presentation skills were frequent regarding (a) understandable display of information as described by Theo “If you put this background, nobody will be able to read it”; (b) they decided to represent information concerning their own interests after building a first common page and (c) link them on it as ‘Vasilis and Theologia’ towards “creative writing, study skills and thinking skills” and “environmental education, family and friends”.

Presentation skills were already present as the members (a) created a map of design before the project started and (b) wanted to capture the interest of the viewers
while attracting as many as possible: “English (language), we are getting international!”.

One element of reflection skills concerning the evaluation of the programme and process was not as frequently observed as the other evidence. Even though they revised the design using feedback “we can always change it if we decide that we don’t like it!” and overall evaluation was observed, non-existing previous experience with web-construction programmes deterred critical references concerning the software as such.

We did not detect any traces of learning that had nothing to do with design skills. The use of the fonts, background colour, size or hyperlink’s features were time consuming and might be more easily achieved in a didactic mode in the adult group.

6.2.3 Co-operation (Research Question II)

As previously in Group A, we are going to follow Johnson and Johnson’s suggestions to prove the co-operation within the environment. Next we are going to use Wegerif’s IDRF mode of exploratory talk to detect whether there are any indications of collaborative learning.

1. **Interdependence**: (a) following questionnaires, Theo seemed to give and receive help and assistance as stated in the questionnaires; whenever she did not know the way of doing something she asked for help. Vasilis gave negative responses in contradiction to discourse analysis, where he was clearly exchanging help and opinions in problematic situations:

   42. Theo: Oups, another background!
   43. Vasilis: Yes... This green with black letters is fine.
   44. Theo: Do you like it?
   45. Vasilis: Perfect!

(b) members exchanged and were aware of the information used as well as the procedure of processing; (c) giving and receiving feedback was found and “Very good”, “well done” or “You are right” were phrases recurrently observed; (d) they used to challenge each other’s reasoning. One of Theo’s responses was “I think it is too much” and Vasilis was joking while disagreeing with Theo, “I don’t want cats and dogs or flowers as a background”; (e) we have no evidence concerning advocating increased efforts to achieve; (f) they mutually influenced each other’s reasoning. When
Theo explained “If you put this background, nobody will be able to read it” Vasilis thought she was right about it and concurred, even though he had a different opinion at the beginning, “Ok, just put the same one then”; (g) they engaged in the interpersonal and small group skills needed for effective teamwork and we saw the way they used Help options to solve encoding problems: Vasilis suggested “Try help, dear!” and Theo followed his advice “Ok... I got it!”; (h) we have no evidence of processing how effectively they were working together.

Positive interdependence was frequently observed as the members (a) put their heads close together over their work and lean toward the screen; (b) talked about the work long before and during the project; (c) used to elaborate the material they learned while asking for advice; (d) were sharing the answers “Did it! Let’s see what we built”; and (e) encouraged each other to finally use the scanner they had for a long time without using it.

2. **Face-to-Face Interaction and Verbal exchange**: as in Group A, we can detect Crook’s approach on articulation, conflict and co-construction.

54. Theo: How about the colour and the links?

55a. Vasilis: Yes, it is Ok,

55b. but we have to changes the subtitles, the colour actually.

56. Theo: You are right, black titles, blue links.

57a. Vasilis: Ok,

57b. but bold, exactly like this one.

58a. Theo: I think it was better the other way.

58b. If you put this background, nobody will able to read it.

Articulation of the problem (54) came after a different approach to the main colour and links. Vasilis agreed with this change but he thought that they had to change more elements and supplemented while following Theo’s suggestion (56) in a co-constructive way. Cumulative talk is present up to this point but conflict is following with Theo not wholly agreeing with his suggestion. Exploratory talk is detected at the end of the conversation.

Conflict as such was found in other situations as Vasilis suggests “…how about putting an oval frame?” and Theo’s negative response is “Look,
“this is not a gallery, dear!” while suggesting a different font size: “Do you like this size?” Vasilis’ immediate reaction is “No!”.

3. **Individual accountability**: (a) both members explained their work either in relation to the thinking process for suggestions or showing how hardware and software should be used (scanner and FrontPage); and (b) they provided support and assistance to each other since they frequently used phrases as “Do you like it?” or “Perfect!” as response.

4. **Interpersonal and small group skills**: Following the questionnaires, both members expressed their preference to seek help from the expert. Interactions outside and within the group were observed either in discussions or expressed through body language. Indications of the latter were the sameness in movements especially when they were contemplating on a problem. They both used to touch their lips while thinking or lean toward the screens in exactly the same time.

They found common patterns concerning several levels of the project (gathering information from the Internet, elaborating images, using information to express their beliefs etc) while dividing their work in accordance with the jigsaw strategy.

5. **Group processing**: Awareness and reflection upon the outcome, the goals and the content was frequently observed but we have but random evidence concerning the discussions and meta-cognitive approach regarding group process. They evaluated either each web page (during and after its construction) or the links in relation to the index; they conducted the research of information and their activities towards the goals; the content was discussed as “I am thinking of creative writing, study skills and thinking skills”; limited time pressed members to organize their activities and refer to group processing frequently.

**6.2.3a Collaborative Learning (Wegerif, 1997)**

As discussed before, learning through design and co-operative activities occurred in a computer-supported environment. We are going to investigate whether learning was a result of these activities following Wegerif (1997). As in Group A, we are going to detect exploratory talk as the basic element of collaborative learning using the IDRF model.
The example we are going to use refers to the selection of a background design for Group B. Initiation and original suggestion came from Vasilis, who thought that the background design “…should be sophisticated.” Theo did not like the suggestion “Nope, I think it is too much” and the discussion continued with both members producing different suggestions each time: “How about this one?”, “This is not a man’s website! I don’t want cats and dogs or flowers as a background. How about a map?”. Theo continued to disagree with Vasilis and proposed another solution: “No, actually I don’t know. How about this one?”. Discussion continued: “But what about the classic one?” and Theo’s response was “It is stupid after all”. After five different suggestions, they both agreed on the fourth suggestion. Theo suggested, “I think the other one is better” and Vasilis agreed “Yes, Ok, this one!”. All five suggestions were followed by responses, “Nope”, “No”, “This is not a man’s website” or “It is stupid after all”, and feedbacks, “I think it is too much”, “…actually I don’t know” or “I think the other one is better”.

Initiation and articulation of the background design problem led to discussion and produced conflict within the group. The process of responses and the feedback that ensued led to the co-construction and final decision upon the background design.

Bearing in mind the limited time for Group B, we observe that exploratory talk is clearly indicated in four discourses; the first one that was used as our example was the second discourse in a row. This fact suggests explicitly the launch of phase II of T-Consensus group.

As in Group A, cumulative talk (Wegerif & Mercer, 1997:54) is frequently observed.

54. Theo: How about the colour and the links?
55a. Vasilis: Yes, it is Ok,
55b. but we have to change the subtitles, the colour actually.
56. Theo: You are right, black titles, blue links.
57a. Vasilis: Ok,
57b. but bold, exactly like this one.

In this example, Theo needed help for the colour and the links. Vasilis suggested changes in the colour, the size and the type of subtitles while Theo responded positively but uncritically to his suggestions, indicating common knowledge.
As in Group A, differences and similarities were found concerning exploratory talk (IDRF, Wegerif, 1997) and co-construction (Crook, 1994).

6.2.4 Individualistic Learning (Research Question III)

The basic partnership between co-operative and individualistic learning (Johnson & Johnson, 1987) was present according to our evidence. Task interdependence through the division of labour indicated by the way Group B worked together. Vasilis’ suggestions for the layout and the headlines guided Theo towards the construction of the web pages. Resource interdependence enabled the combination of text and images while co-operation and individual accountability were towards the following elements: (a) explanations of getting the answers as Theo described, “Ok, I got it! Web options, encoding...”; (b) each member related their previous knowledge about Word Processor with the new features of FrontPage; (c) Group B understood the material and agreed with the answers. Vasilis had a different opinion “but we have to change the subtitles, the colour actually” and Theo agreed, “You are right” and suggested “black titles, blue links”. Vasilis agreed with latter “Ok...”; (d) encouragement of participation as such was rarely observed, but we might consider positive feedback as encouragement, “Very good, well done!”. Vasilis hesitated to participate but Theo encouraged him by explaining the benefits; (e) both members listened attentively to each other, most of the times putting their hand under their chin and lean toward the screen; (f) they supported and sometimes insisted on their arguments as Vasilis contradicted Theo: “No, it is the same with the background. Try that one”, while (g) criticizing ideas and not each other. For example they discussed a different background and Vasilis suggested a “classic one”. Theo replied, “It is stupid after all”.

Following interviews and questionnaires we observed that Group B learnt the basic elaboration of an image from scanning to inserting the image on the web page and were confident about building web pages with FrontPage. Basic operating skills were present together with simple design skills. They continued their activity (project management skills), while searching for more information either concerning images or texts towards the construction (research skills). They always considered the viewer and the logical, easy way to follow their links (organization and representation skills) while considering the aesthetic aspect as well (presentation skills). After the research,
they seemed to reflect either upon everything they built or the new pages and specific actions that they had to take in order to represent and express their information.

We frequently observed decision-making processes that were either a result of cumulative or collaborative learning. Again time as well as the limited number of the participants was a negative element.

We believe that Group B got involved directly into the second phase of T-Consensus Group.

6.3 Discussion

All design skills for multimedia designers were developed in Group A and Group B, while in Group B we did not observe much of evaluation of the programme and the process, possibly because of the limited amount of time within the members had to complete a specific number of web pages. No signs of oppositional interaction (Johnson & Johnson, 1987:30) were found. Our evidence for both groups confirmed the model for learning through multimedia design suggested by Carver et al. (1992).

The ‘real’ situation of web design activities helped the participants to be more responsible and served to explain their thinking process towards decisions while articulation as such and body language indicated the importance of interpersonal interactions. The suggested literature by Johnson and Johnson (1987) was very helpful in defining the appropriate conditions of co-operation but was vague in some areas when approaching the practical aspect of the research concerning the specification of detecting the elements for co-operation.

The suggested situated computer-supported collaborative environment using jigsaw strategy and T-Consensus groups enabled co-operative activities and learning. The members of both groups used to seek help when faced with a problem they could not solve on their own. That was because: (a) they did not have simple operational skills concerning the functions of the programme; (b) there was a problematic situation and a solution was not readily available; or (c) they did not want to decide on something since they thought the group’s confirmation was necessary. When they suggested solutions for a problem, there were some differences of opinions, but most of the times, when a member suggested a solution, all accepted it as the most suitable one as Wegerif and Mercer suggested for cumulative talk (1997). A process was detected while the groups were trying to learn something new: they used to ask a
question expressing the specific problem and one of the partners was presenting and elaborating on the task. This ‘expert’ was both analysing the activity in parts and articulating the steps while the other person was actually doing it. Explanations and feedback usually followed concerning the need and subsequent success of the activity.

Members’ different personalities were useful for the overall activity; for example, in Group A, Jitu used to point out the problems, James suggested accurate solutions and even when MJ was working most of the time on his own, he was doing some work that was difficult for the others to carry out.

Co-operative activity appeared to be an element of paramount importance in developing learning through design, even though some elements concerning interdependence were rarely observed in Group A or were totally absent in Group B. These elements are parts of meta-cognitive processes concerning the group process and development and suggest that members did not have clear awareness of their co-operative activities. One member of the second group responded negatively in the questionnaires concerning the co-operation as such while discourse analysis, observation notes and the interview proved the opposite. Co-operation proved to emerge out of their reflection upon actions and activities while the lack of group processing is present in both groups. As such, we have to consider the reasons why and the limitations of the study concerning the somewhat inadequate evidence of exploratory talk. Time was really pressing during our project. The number of participants was limited, and if one of the members was not very talkative (e.g. MJ), we had even less members with whom to collaborate.

Learning through design using T-Consensus groups and jigsaw strategy helped learning in a co-operative environment but overall we found little evidence for collaborative learning while following exploratory talk. Crook (1994) and Wegerif (1997) seemed to agree on an underpinned process of detecting collaborative learning through verbal exchange (Johnson & Johnson, 1987) but the final point of the process seemed to be missing.

Following both authors and their approaches towards collaborative learning we observed co-constructive activity (articulation, conflict and co-construction, according to Crook, 1994) and collaborative learning (exploratory talk according to Wegerif, 1997). Wegerif’s proposition seems to be an elaboration of Crook’s initial proposition. If we explore one particular situation, we need articulation, conflict and
as a result, co-construction in order to have collaborative learning (Crook, 1994). If articulation moves in the same path as Initiation and conflict means different opinions on a subject, then it is similar to discussion (D) while Response and Feedback might be the two elements of co-construction. Wegerif explicitly suggests that there must be a new, better and different solution, other than the one the members first suggested as development of their discussion. Co-construction is not referring to such deterrence and it might include cumulative talk as well. This final point might be the decision for the accepted solution in co-construction (Crook, 1994) or after feedback (Wegerif, 1997). None of the two authors refer to similarities to decision-making activities as part of co-construction or as a result after Feedback.

In an endeavour to fill this gap, we found that Erickson and Lehrer (1998) recorded evidence of collaboration and involvement in decision-making processes as a result of collaboration in their observation study. Multimedia activities require decision-making with a view towards the completion of a project in a microscopic and macroscopic level. As we observe at the following examples, all members agreed on the final decision:

3. Jitu: What do you think about this background image?
All gathered around his monitor screen and had a look on it.

4a. James: Yeah,
4b. that’s nice. Good work!

5. Jitu: Shall I put it on then?

And Group B:
1. Theo: Do you want it for the creative writing?
2a. Vasilis: Yes,
2b. it is for the creative writing this one.
3. Theo: What do you want to choose?
4. Vasilis: Let me see...
5a. Theo: What do you think about this one?
5b. Is this better?
The decision point might occur after feedback from all members. The process of consensus (Neal et al., 1981:173) provides the solution for this discrepancy since jigsaw process suggests that the final proposal can be modified or dropped altogether after the overall discussion. An example comes from the very first lines of their discussions:

Evidence of direct introduction to phase II of T-consensus group comes from the very first Discourse 1 in Group B. They are discussing about the creative writing page and distinguish information as Theo says, “What do you think about this one? Is this better?” Vasilis agrees and Theo follows with two more suggestions about an image and left navigation and again Vasilis thinks that it is better the way Theo proposed while increasing the strength of the decision by giving an explanation: “Yes, I think so, the other one is too classic. It should be sophisticated.”. Cumulative talk (Wegerif & Mercer, 1997) and co-construction (Crook, 1994) was present in discourse 1. As such, Azmitia’s suggestion for closer co-operation between friends can be amply verified.

Theory does not provide common ground for detecting collaborative learning as such. Johnson & Johnson’s approach (1987) for identifying the basic partnership between individualistic and co-operative learning was proven insufficient regarding the quality of what was transferred. Even though all suggested elements were frequently observed, following our observation notes simple skills needed in web design could be transferred from one context to another but more complex skills, which were the result of co-operation, were not as easily transferable from one situation to another.
In our research we tried to find evidence of learning through design activities in a proposed situated computer-supported co-operative environment for web design and multimedia construction. We searched whether there was co-operation in such an environment, if this learning came from collaboration and if individuals were able to transfer this learning into different, new contexts.

We found strong evidence of learning through the design activity and the Carver et al. (1992) model proved to be useful for goal construction planning towards learning through design. Jigsaw strategy and T-Consensus group provided us with a specific plan of working towards co-operation and implementation of our goals while the suggested situated computer-supported co-operative environment facilitated the process of co-operation.

Group members seemed to not be familiar with co-operative activities and to not be aware of them in a meta-cognitive level. Awareness of co-operative activities proved to be an important element towards understanding the significance of co-operation as such. This awareness might provide the small group members with the ability of improving and developing group skills towards collaborative learning.

Co-construction process and exploratory talk were very helpful in our research towards collaborative learning but more elaboration and development seemed to be required in order to define the exact nature of collaborative learning, especially concerning the concluding point of the final decisions as an outcome of co-operative learning activities in every occasion.

The immediate co-operation observed in the second group and the weak awareness of group processing towards co-operation for both groups suggest the importance of initial face-to-face meetings between group members and the
significance of building relationships, so as to be familiar with each other’s character and way of thinking.

Transferability of skills from one context to another was depending on the simplicity or complexity of the needed skills in each occasion while the absence of co-operative activities with other members limited the multiple perspectives of the subject and provoked immediate decisions.

The discrepancy between authors concerning collaborative learning and the fact that co-operation does not necessarily suggest collaborative learning suggest that more research either on the theoretical or practical level needs to be conducted in order to identify specific co-operative interactions and collaborative learning as the outcome of the previous, while individualistic learning needs to be researched further within these co-operative activities.
APPENDIX I
Data Collection Sheets
STRUCTURED INTERVIEWES

- What do you think you learned during this project?
- How did you learn these things? (if no reference to fellow students then I have to ask the next question)
  - Did your fellow students help you to learn these things?
- Give a specific example of something new that you learned during the course of this project from your fellow students and explain how you learned this new thing
- If you were in a situation outside of school and you needed to use some web-design skills do you think you would remember back to thinks we have learned here or do you think you would use your own methods?

QUESTIONNAIRES

1a. Did you enjoy working with others in the computer room?

☐ VERY MUCH ☐ FAIRLY ☐ NOT MUCH ☐ NOT AT ALL

1b. Do you think that you could do it in your classroom?

☐ YES ☐ NO ☐ DO NOT KNOW

2. Please tick the number of the students that helped you during the activity:

☐ ONE (1) ☐ TWO (2) ☐ THREE (3)

3a. Did you seek any help/advice during the activity?

☐ YES ☐ NO

If yes, is it possible to specify why? .................................................................

.................................................................

3b. Did you help anybody?

☐ ☐
4. Do you think the expert helped you?

☐ YES    ☐ NO
If yes, in what way? .................................................................
..............................................................................................

5. When did you feel more comfortable while searching for answers to your questions? While asking the …

Expert    ☐

Fellow-student    ☐

Searching by yourself    ☐

6. Was it possible to construct the same website all by yourself?

☐ YES    ☐ NO    ☐ DO NOT KNOW

7. Would like to participate in a group like that again?

☐ YES    ☐ NO    ☐ DO NOT KNOW

8. Have you ever designed a web page in the past?

☐ YES    ☐ NO

9. Did you learn anything more than you already knew about:

The Internet    ☐ YES    ☐ NO
10. According to your opinion, what seems to be the most important things while designing a web page?

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

11. Did you learn how to elaborate some of the following towards the web page construction?

Texts  □ YES □ NO
Images □ YES □ NO

Sounds □ YES □ NO

12. Did you learn how to use:

HARDWARE
A digital camera □ YES □ NO
A scanner □ YES □ NO
A recorder □ YES □ NO

SOFTWARE
NOTE PAD □ YES □ NO
PAINT PRO □ YES □ NO
WORD PROCESSOR □ YES □ NO
FRONT PAGE □ YES □ NO
13. Can you tick three (3) of the most important features in a web page construction?

- Fontsize
- Length of text
- Images
- Logos
- Symbols
- Sounds
- Overall size

14. Can you tick three (3) basic stages towards the web construction activity?

- Gathering material
- Publishing
- Discussing
- Planning
- Redrafting
- Editing

15. Is there any order between the stages of your choice?

- YES
- NO
- DO NOT KNOW

If yes, can you think of any reasons? .................................................................

.................................................................

.................................................................

16. Do you think that the activity might have helped you to distinguish a well designed web page?

- 
- 
-
17. What seemed to be interesting in the overall activity?

…………………………………………………………………………………………
…………………………………………………………………………………………
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…………………………………………………………………………………………

Why?
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

18. Do you think that you can create your own homepage now?

☐ YES  ☐ NO  ☐ DO NOT KNOW

19. Any other comments?

…………………………………………………………………………………………
…………………………………………………………………………………………
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Thank you very much!
APPENDIX II
Notes Given to Group Members

Working process (Scrimshaw, 1993:100)
1) Planning
2) Drafting
3) Creating
4) Redrafting
5) Editing
6) Publishing

Design Principles (Bruntlett, S. 1999:90)\(^2\)
- Use easy to read fonts in readable colours and a readable size
- Use short sections of text on the screen to avoid having to scroll the text to read it. If a large amount of text is needed, then split it over several pages.
- Try to use spoken sections of text to back up the written text (Welcome message)
- Use the clearest possible images even if they are in 256 colours and keep your screen layout simple.
- Try to use easy to follow symbols or words when producing the icons used to navigate the multimedia. Be clear about their meaning in navigating (e.g. back, next, previous, last etc)

Navigation (Preece, 1993)
- Where am I?
- How did I get there?
- What can I do here?
- Where can I get to?
- How do I go there?
- What have I seen so far?
- What else is there to see?

Producing a piece of multimedia (Bruntlett, S. 1999:92)
- Begin to think about the index and the menu
- Produce the pieces of text using a word processor,
- Scan the photos using a scanner,
- Produce a piece of graphics using a drawing or painting package
- Record speech or sound using a microphone
- Make pieces of logos – drawings or paintings
- Save all the files on disks ready for use and choose names easy to be found
- Use a web-construction system
- Drop the texts, images and sounds as decided
- Link the material according to the design principles
- Try out the screens with other teachers and students and have them evaluate what you have produced

\(^2\) Bruntlett, S. Selecting, Using and Producing Classroom-based Multimedia
Schedule of the research

1) First meeting of all groups: We will have a first approach, briefing on the following:
   - The web construction of their school’s website is interesting because they will search for texts, they will shoot photos, they will use their own paintings and songs and they will publish them (internal motive)
   - It is related to their lessons and other topics
   - They will learn technical skills and they will collaborate with the other students (explain the learning objectives)
   - How we will approach the objectives
2) Provide preliminary exercise, provide prior teaching if necessary
3) Decide whether they will continue to work on the website together with their teachers and integrate the activity within the overall school activities.

EPISTEMOLOGICAL VALUES
   i. Demonstrate my own commitment
   ii. The groups will decide their own method of work and follow it
   iii. Discussion how we all cooperate and help other students learn

ACADEMIC LOGISTICS
   1) amount of material
   2) scheduling of contact hours
   3) access to relevant material
   4) administrative and technical support (from teachers)

Action
   1) Grade the importance of material (essential, important, optional, etc)
   2) Ensure that students have good access to relevant material
   3) Ensure that have adequate administrative and technical support

RESOURCES
   1) teachers’ support
   2) administrative support
   3) technical support
   4) equipment provision
   5) facilities provision (space to work etc)
   6) material publishing (on the net and on a CD-Rom)
   7) materials duplication (on a CD-Rom)
   8) maintenance of material (on the net and on a CD-Rom)
   9) security of equipment
### APPENDIX III

**Frequency of Set of Actions and Statements**

**Table I**

**1. LEARNING THROUGH DESIGN**

<table>
<thead>
<tr>
<th>PROJECT MANAGEMENT SKILLS</th>
<th>Observed Frequently (OF), Observed (O), Observed Rarely (OR), Never observed (NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Creating a timeline for the completion of the project (PMS-T)</td>
<td></td>
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<tr>
<td>2. Allocating resources and time to different parts of project (PMS-A)</td>
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<tr>
<td>3. Assigning roles to team members (PMS-R)</td>
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</table>

**RESEARCH SKILLS**

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>1. Determining the nature of the problem and how research should be organized (RS-P)</td>
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<tr>
<td>2. Posing thoughtful questions about structure, models, cases, values and roles (RS-Q)</td>
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<tr>
<td>3. Searching for information using text, electronic, and pictorial information sources (RS-I)</td>
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<tr>
<td>4. Developing new information through interaction (RS-D)</td>
<td></td>
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<tr>
<td>5. Analyzing and interpreting all the information collected to identify and interpret patterns (RS-A)</td>
<td></td>
</tr>
</tbody>
</table>

**ORGANIZATION AND PRESENTATION SKILLS**

<p>| | |</p>
<table>
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<tr>
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<tbody>
<tr>
<td>1. Deciding how to segment and sequence information to make it understandable (ORS-DI)</td>
<td></td>
</tr>
<tr>
<td>2. Deciding how information will be represented (text, images, sounds) (ORS-DR)</td>
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<tr>
<td>3. Deciding how the information will be organized (hierarchy) and how it will be linked (ORS-DO)</td>
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</table>

**PRESENTATION SKILLS**

<p>| | |</p>
<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Mapping the design (PS-D)</td>
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</tbody>
</table>
2. Attracting and maintaining the interest of the viewers (PS-I)

### REFLECTION SKILLS

| 1. Evaluating the programme and the process (RS-E) |
| 2. Revising the design using feedback (RS-R) |

### 2. COLLABORATION

#### 1. Interdependence

| 1. Giving and receiving help and assistance (J-1.1) |
| 2. Exchanges resources and information (J-1.2) |
| 3. Giving and receiving feedback (J-1.3) |
| 4. Challenging each other’s reasoning (J-1.4) |
| 5. Advocating increased efforts to achieve (J-1.5) |
| 6. Mutually influencing each other’s reasoning and behaviour (J-1.6) |
| 7. Engaging in the interpersonal and small group skills needed for effective teamwork (J-1.7) |
| 8. Processing how effective group members are working together (J-1.8) |

**Positive interdependence**

| 1. Putting their heads close together over their work (J-1+1) |
| 2. Talking about the work (J-1+2) |
| 3. Drilling each other on the material they learned (J-1+3) |
| 4. Sharing answers (J-1+4) |
| 5. Encouraging each other to learn (J-1+5) |

| 2. Face-to-face interaction and verbal interchange |
| OF | O | OR | NO |
1. Articulation (J-2F1)
2. Conflict (J-2F2)
3. Co-construction (J-2F3)

### 3. Individual accountability

<table>
<thead>
<tr>
<th></th>
<th>OF</th>
<th>O</th>
<th>OR</th>
<th>NO</th>
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<tbody>
<tr>
<td>1. Explanation of working tasks (J-3I1)</td>
<td></td>
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<tr>
<td>2. Provision of support and assistance (J-3I2)</td>
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### 4. Interpersonal and small-group skills

#### INTERPERSONAL SKILLS

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<th>OF</th>
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<tbody>
<tr>
<td>1. Teacher-Student Interaction (J-4I1)</td>
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<tr>
<td>2. Students-Materials Interaction (J-4I2)</td>
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<tr>
<td>3. Student-Student Interaction (J-4I3)</td>
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<tr>
<td>4. Student Role Expectations (J-4I4)</td>
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#### SMALL-GROUP SKILLS

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<th>OF</th>
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<tbody>
<tr>
<td>1. Understand the importance of the new skill (J-4G1)</td>
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<td>2. Understand what the skill is and the behaviours the group have to engage (J-4G2)</td>
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<td>3. Find situations in order to practice the skill (J-4G3)</td>
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<td>4. Getting feedback (J-4G4)</td>
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<td>5. Keep practicing (J-4G5)</td>
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<td>6. Load your practice towards success (J-4G6)</td>
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<td>7. Encourage each other to use the skill (J-4G7)</td>
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<tr>
<td>8. Practice until it feels natural (J-4G8)</td>
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### 5. Group processing

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<th>OF</th>
<th>O</th>
<th>OR</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outcome (J-5GP.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Goals (J-5GP.2)</td>
<td></td>
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<tr>
<td>3. Content (J-5GP.3)</td>
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<td>4. Process (J-5GP.4)</td>
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</table>
### BASIC PARTNERSHIP BETWEEN COLLABORATIVE AND INDIVIDUALISTIC LEARNING

<table>
<thead>
<tr>
<th>Basic Partnership between cooperative and individualistic learning</th>
<th>Observed Frequently (OF), Observed (O), Observed Rarely (OR), Never observed (NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Task Interdependence through division of labour (C+I.1)</td>
<td></td>
</tr>
<tr>
<td>2. Resource Interdependence (C+I.2)</td>
<td></td>
</tr>
<tr>
<td>3. Co-operation and individual accountability (detecting the following actions) (C+I.3)</td>
<td></td>
</tr>
<tr>
<td>a) each member explains how to get the answer (C+I.3a)</td>
<td></td>
</tr>
<tr>
<td>b) each member relates previous learning with the new activities (C+I.3b)</td>
<td></td>
</tr>
<tr>
<td>c) everyone understands the material and agree with the answers (C+I.3c)</td>
<td></td>
</tr>
<tr>
<td>d) encouraging each other to participate (C+I.3d)</td>
<td></td>
</tr>
<tr>
<td>e) listening to other group members (C+I.3e)</td>
<td></td>
</tr>
<tr>
<td>f) each member supports their arguments (C+I.3f)</td>
<td></td>
</tr>
<tr>
<td>g) criticizing ideas, not people (C+I.3g)</td>
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</tbody>
</table>

### CUMULATIVE TALK

<table>
<thead>
<tr>
<th>Cumulative talk</th>
<th>Observed Frequently (OF), Observed (O), Observed Rarely (OR), Never observed (NO)</th>
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<tbody>
<tr>
<td>Cumulative talk (CT)</td>
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### EXPLORATORY TALK TOWARDS COLLABORATIVE LEARNING

<table>
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<tr>
<th>Exploratory talk</th>
<th>Observed Frequently (OF), Observed (O), Observed Rarely (OR), Never observed (NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OF</td>
</tr>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
APPENDIX IV
Web Page Images from Group A

Image 1: Welcome to Compton School

Image 2: Index

Image 3: Facilities
References

The references in the text that do not display specific year and page come from web pages and the authors do not provide us with this information.


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