The interrelationship of emotion and cognition when students undertake collaborative group work online: an interdisciplinary approach.

Abstract

In order to determine how emotions and cognition are experienced during collaborative group work online students' descriptions of their learning experience were interpreted using a qualitative approach. A common feature of these accounts was reference to difficulties and problems. Four main themes were identified from this data set. Two of the themes, *'Constraints on autonomy'* and *'Reflections about collaboration'*, encapsulate the experience of engaging in group work. The other two themes *'Virtual others'* and *'Communicating online. The impact on progress and achievement'* provide some insight into what is unique about the socio-emotional experience of collaborating online and how it can influence motivation and learning. The findings were considered from two perspectives of the role of emotion in learning: the socio-cognitive model of self-regulated learning and the community of inquiry framework (COI). An interdisciplinary approach was adopted by taking into account recent research in social cognitive neuroscience. Some practical recommendations about the deployment of technologies for group work online and for empowering students' understanding of the value of collaborative learning are made. The value of verbal immediacy practices as a way of counteracting the disembodied nature of the relational experience of others online is discussed.

Keywords: group work; computer supported collaborative learning (CSCL); emotion; social cognitive neuroscience; interdisciplinary; community of inquiry (COI); self regulated learning; verbal immediacy

1. Introduction

When a learning context supports the exchange and discussion of ideas there is the opportunity for each individual to assimilate new information and to build on their current understanding by accommodating the ideas of other students (Hodgson, 2002; Laurillard, 2002). By including a requirement that learners collaborate on a shared task there are some additional pedagogical benefits. The process of co-constructing an artifact together with other students provides each learner with an opportunity to reflect on practice and to adapt practice (Laurillard, 2009; Laurillard, 2012). The development of technologies such as forums, wikis and virtual worlds, has meant that group work can take place online. Text based forums and wikis allow for asynchronous communication and therefore offer the practical advantage of flexibility as to when and where engagement with the group and the shared group task takes place; there is no requirement for participants to be co-located. For distance learners, and the tutors who support them, the impact of these technologies has been profound. Institutions can now offer opportunities to connect and learn with others at a distance in a way that was not possible previously (Gaskell, 2009). The availability of these technologies also means that workspaces are increasingly distributed and federated and there are many informal online spaces where collaboration can take place. For example, by using wiki technology 'thousands of dispersed volunteers can create fast, fluid and innovative projects that outperform those of the largest and best financed enterprises' (Tapscott & Williams, 2006, p65). Enabling students to acquire the competence to communicate and collaborate by using digital technologies benefits

economic and social capital and opens up career opportunities (Ala-Mutka, 2011). Organizations and businesses increasingly seek to recruit employees who have the ability to collaborate and work effectively within a team, including online.

However, there is a discrepancy between the conceptual view that values collaborative activities as a way to develop critical thinking and the empirical evidence that takes account of the student perspective. Some students view group work with hostility and apathy (Roberts & McInnerney, 2007) and find it frustrating (Capdeferro & Romero, 2012). Such negative views are not confined to online group work. Findings based on an analysis of the survey responses of students who had undertaken group work face-to-face led Burdett to conclude that 'group work can be hard both emotionally and intellectually' (Burdett, 2003, p 179).

The objective of this study is to carry out a qualitative analysis of students' accounts of experience with group work online in order to further our knowledge of their emotional and learning experience when required to engage in a shared task remotely using computer mediated communication (CMC).

2. Learning and the role of emotion.

This section draws exclusively on those theories of the role of emotion in learning that take into account contexts that are both interpersonal and virtual. There are two theories that fulfill these criteria the socio-cognitive model of self-regulated learning (Bandura, 1997) and the community of inquiry (COI) framework (Garrison & Anderson, 2003; Garrison, Anderson & Archer, 2010). In the concluding chapter of a recent book devoted to critical review of the role of emotion in education the editors call for inquiry in this research area to integrate and enlarge theoretical perspectives (Pekrun &Schutz, 2007). They are not alone in advocating that the time has come to consider a transdisciplinary and multilevel approach for educational research (Bransford et al., 2006; OECD, 2007). Therefore a brief review of recent developments from the relatively new area of social cognitive neuroscience (the use of neuroscience methodology to study social cognition) is also included in this section.

2.1 A socio-cognitive model of self-regulated learning

Bandura (1997) proposed an account of how we learn based on our capacity for observing others and our access to symbolic modes of communication; that we learn through observing, modeling and speaking with others. This social-cognitive model takes into account both the subjective influences that learners bring to a learning situation and the influence of emotion. In this model factors such as self-efficacy and beliefs about task value combine with encounters in the learning environment to mediate emotional experience. The emotions evoked are conceptualized as both an outcome and then, in turn, a causal factor that influences the way in which cognition and learning strategy are mediated by the learning context (Bandura, 1997; Bandura, 2006; Pekrun, 2006). Agency, the ability of people to self-regulate and reflect, is a key element of the socio-cognitive model. Another important element is self-efficacy; Bandura (2006, p121) attributes 'staying power', the way that some students persist despite problems and setbacks, to self-efficacy. This model takes into account that people do not exist in isolation that they need to engage in collective agency

including in online contexts 'individuals who are assured in their efficacy to manage the Internet technology are the ones who take advantage of this expansive environment' (Bandura, 2006, p119).

2.2 The Community of Inquiry (COI) Framework

The COI framework specifically addresses the socio-emotional aspects of online discussion (Rourke, Anderson, Garrison & Archer, 1999). The COI framework proposes that in order to successfully interact and communicate within online forums learners will need to adapt communicative practice so that their online presence will be perceived in a way that allows the trustful relationships that support and enhance collaboration to develop. The development of the COI was influenced by assumptions that when learning online there are some unique elements, in particular a sense of the 'realness' of other participants, that determine the quality of the learning process (Garrison & Arbaugh, 2007). Therefore the COI focuses on how teachers and students present as 'real' in online contexts and in particular the relational aspects of 'realness', that set and maintain a suitable climate for learning and support the discourse in online text based forums. The model conceptualises 'realness' as presence and assumes that participants 'must strive to recreate the social and knowledge building processes that occur via moment by moment negotiation of meaning' (Shea et al., 2010, p10). The COI has as its main focus the influence of three elements, social presence (Rourke et al., 1999), teaching presence (Anderson , Rourke, Garrison & Archer, 2001) and cognitive presence, that can combine in a way that supports a worthwhile educational experience when using text based forums (Garrison, Anderson & Archer, 2000). Proponents of the COI model argue that when social and teaching presence are satisfactory then the student learning experience is both emotionally satisfactory and pedagogically productive despite the disembodiment of all interpersonal interaction.

The provenance of these two perspectives of emotion and learning are very different. However, they are complementary in that both affirm that emotion and cognition interrelate and therefore support the view that emotional factors should be taken into account in learning design. Both perspectives recognize the influence of elements within the learning environment on emotional experience but conceptualize the motivational force as residing within the individual.

2.3 Social cognitive neuroscience and the embodied manifestation of emotional experience

An area of social cognitive neuroscience research that is relevant has as its focus the potency of the communicative cues of co specifics for influencing the experience of emotion. It takes an interdisciplinary perspective to explore psychological constructs such as mentalising (making inferences about the mental states of others) and empathy (the capacity to understand the thoughts and feelings of someone else) during face to face encounters (Walter, 2011) and in narrative texts (Coplan, 2004). This perspective takes the view that the mode of communication has implications for the way that interpersonal relationships are experienced. When learners are required to do group work online the co-presence of other members and communication with them is mediated by technology. They do not have access to non-verbal communication cues and they rarely engage in discussion concurrently. The implications of this altered sense of co-presence for the collaborative process can be

usefully considered from a social cognitive neuroscience perspective by drawing attention to the contrasts between the relational experience of face-to-face encounters, imaginary encounters with fictional characters, and online (disembodied) encounters.

3. Emotions and their sources: group work and technology

Conflict can be a source of emotion and emotions can cause conflict. In this section the inherent conflict that results from the transactional processes involved in doing group work, whether taking place face -to-face or online, will be described and discussed in the context of what is involved when learners are required to undertake a collaborative task. Frustration is another emotion that is considered in some detail. It can occur in both face-to-face groups and online. However there are some additional sources of frustration when learning is mediated by technology and these are also described.

3.1 Group work as a source of conflict

Research that focuses on the interactions that take place within groups has a long history involving studies with face-to-face groups in the workplace and in voluntary settings such as support groups (Tuckman, 1965; Tuckman & Jensen, 1977). Conflict has been identified as a characteristic component of group work. Conflict can arise from the predispositions of individual members, their personal goals, attitudes and previous experience. Being required to collaborate on a shared task is a guaranteed source of conflict. While collaborating on a shared task students will need to challenge the ideas of others, and engage in argumentation in order to achieve a shared conception of the problem space. Such processes are the essence of collaborative learning and that is why it is held in such high esteem in the learning sciences (Dillenbourg, 1999; Laurillard, 2012; Schwartz, 1999). Conflict is an important element of the collaborative process but it needs to be appropriately managed by the group members, or by the teacher. Otherwise the reports of negative experience from students who perceive engaging in group work as an additional emotional and cognitive load should not surprise us.

3.2 Emotions when group work is mediated by technology

When group work takes place online the overall emotional experience is compounded by various factors including some universal problems that can occur when using technology. There can be technical breakdowns and disruption to online services (Jaques & Salmon, 2007), alongside problems that can arise from the way that the online learning space has been designed; for example, broken navigational links (O'Regan, 2003) and difficulties with interpreting and following instructions (Hara & Kling, 1999). Some research has specifically identified the emotions that can occur; for example, accounts of negative emotions such as frustration and fear when using online technologies (Hara & Kling; 1999; O'Regan, 2003). Alongside the convenience and flexibility that online discussion forums offer to students there are some pedagogical benefits; there is time to reflect, to adapt practice, and to compose a response (Poole, 2000). However some students become frustrated with the inherent response delay when participants are not simultaneously present (Haythornthwaite, Kazmer, Robins & Shoemaker 2000; Kear, 2010; Sproull & Kiesler, 1991).

3.3 Frustration with group work, online and face-to-face

Frustration is a unifying feature of many of the student accounts reviewed in the previous section. However, technology is not the only source of frustration when students undertake group work. A perception of a commitment imbalance amongst group members and a lack of participation are the main sources of anger and frustration. Other sources include organizational problems, an imbalance in the quality of contributions, and problems with negotiation skills (Burdett, 2003; Capdeferro & Romero, 2012; O'Regan, 2003). It is important to emphasise that these sources of frustration occur irrespective of whether group work takes place face-to-face or online.

3.4 Group work online; what are the unique factors that might impact on socio-emotional experience?

There are reports that learners find 'online environments impersonal, resulting in low levels of engagement and participation, and hence less effective learning' (Kear, 2010, p1). Several problems that impact negatively on the socio-emotional experience of learning collaboratively were articulated by ten students who were interviewed after undertaking a course that involved using online text based forums; the tone of some messages, messages that could easily be misconstrued, students who dominated forums, and a lack of information about peer students (Kear, 2010). There are some distinctions that can be made between the two modes, face-to-face and online (asynchronous) that are relevant for these findings. Firstly, the communication medium, speech, has been replaced by writing. Secondly, co-presence, the way that participants interact with and experience the presence of other learners, is altered. In order to understand how the student experience of group work online might differ from face-to-face we need to know more about the impact of these factors.

3.5 In what way is research in social cognitive neuroscience relevant?

We know that a successful collaboration will of necessity involve conflict and disagreement, otherwise there would be no scope for reflecting and adaptation, and that participants will vary in the characteristics that they bring to a group. Communicating in a way that optimally manages the socio-emotional effects of conflict and disagreement requires an individual to make inferences about the mental states of others (mentalise) in order to predict and attribute their actions (Frith, 2007). A range of psychological tasks have been developed to probe the concept of mentalising; the study of these, and the cortical brain areas involved, are described and illustrated in a recent article by Blakemore (2012, p113). When group work takes place face-to-face there are some non-verbal cues such as facial expression, tone of voice and whole body movement that can help the process of mentalising about the emotions, desires, goals and intentions of others, as can knowledge about their long-term disposition. None of these cues is available to the student who is collaborating online with other learners whom they have never met face-to-face. Social cognitive neuroscience draws attention to the importance of such information for social cognition and is therefore a valuable additional perspective to adopt.

In education the interrelatedness of emotion and cognition is increasingly recognised (Cooper, 2011; Schutz & Pekrun, 2007). There are many sources of emotion when learning including the salience of the task, self-appraisal of ability, interactions with teachers and peers, and the learning context (Hascher, 2010; Järvenoja & Järvelä,

2005). For group based learning an additional source of emotion arises from the nature of the transactional processes involved. When group work takes place online the spectrum of emotional stimuli with potential to influence learning widens due to the mediating effect of technology. The aim of this study is to further untangle the source of the difficulties and problems that students experience by undertaking a qualitative analysis of students' accounts of doing online group work

4. The study: A thematic analysis of students' unsolicited accounts of emotion and cognition when engaged in a collaborative task online.

4.1. The methodological approach

The study is based on a data set comprising students' unsolicited accounts of group work online. The chosen method, thematic analysis, has been described and evaluated by Braun and Clarke (2006). Thematic analysis is a poorly demarcated research method therefore this section begins with a description of the research stance. The approach to thematic analysis described by Braun and Clarke (2006) has been widely adopted therefore the intention for this study is to adhere to their recommendations.

The epistemological aim is to give voice to the student, to unravel the reality of the student experience by identifying the patterns of meaning in their accounts. Therefore an inductive approach is adopted. In order to achieve a rich description of the entire data set the research question is broad and exploratory and analysis is undertaken at a semantic level with a focus on prevalence. The approach is inductive, it does not rely on using a priori categories, therefore consistency and dependability of the themes rather than reliability is the aim.

The approach to thematic analysis follows the six-stage process recommended by Braun and Clarke (2006). The entire data set was read many times, approximately ten, with the subsequent analysis involving the stages recommended by Braun and Clarke (2006), familiarization, generating codes and reviewing codes, searching for themes and reviewing themes. During the review stage the themes were assessed using three criteria. The first of these is coherence; do all the coded extracts for a theme cohere together. If they did not the whole process of coding and identifying themes was carried out again. The second criterion is the distinctiveness of each of the main themes and involves being able to articulate what is the essence of each. Finally the coded extracts that contribute to a theme are checked for internal consistency. After a considerable amount of recursive analysis the main themes and their sub themes were defined and named.

4.2 The Research question

What do students' accounts of undertaking a group collaborative task in online text based forums contribute to our understanding of how emotional experience and cognition interrelate in these contexts?

4.3 The Data set. Students' reflexive accounts of group collaboration online.

The data set comprises unsolicited accounts of the experience of engaging in group work online from distance learning students who had been required to collaborate on a qualitative psychology project during a 6-week period. Each account represents an individual student's interpretation of their experience of engaging in group work

online. These accounts are described as unsolicited for the following reason. Although students undertaking qualitative project options are required to contribute a reflexive account of their subjectivity as part of their individual project report, a copy of the guidance is included in Appendix A, they are not expected to comment on the mode of study. However, some students do so. These unsolicited accounts of student experience were among the scripts allocated to the researcher as part of formal assessment procedures. All such accounts are included in the data set of this study. There were 40 accounts in total. Accounts 1-11 became available in 2002, accounts 12-28 in 2005, and accounts 29-40 became available in 2010; the course is presented once a year.

4.4 The participants

The participants are adult distance learning students studying part-time for a British Psychological Society (BPS) accredited award in Psychology. The reasons why some students choose to study with the VRS rather than attend Residential school include caring responsibilities, a better opportunity to self-pace participation, work or family commitments, and convenience.

4.5 Tutors

Tutors work in teams of four during the preparatory and plenary sessions. For project work they work in pairs, or singly, and may supervise up to 8 project groups. The students are provided with guidance on what they are expected to achieve in any one week. The tutor role involves checking on progress and advising on design, analysis and presentation of the group project as appropriate. They are advised to take a facilitative rather than a directive approach to these duties.

4.6 The Learning Context

The Learning context is a Virtual Residential School (VRS) that requires students to collaborate online, in small groups of 4-8 students, using text-based forums. The students never meet face-to-face. The VRS takes place online over a period of 10 weeks with two further weeks allocated to the preparation of individual project reports. This Virtual Residential School is offered as an alternative to a 6-day Residential School (RS). Currently, approximately 50% of the eligible student cohort opts for this mode of study.

4.7 The collaborative task

There is a mandatory requirement for each student to collaborate with three to seven other students to design and carry through a psychology project. There are eight options offered, four require quantitative methodology and four qualitative methodologies. After forming into project groups, based on their individual project options, the first stage of collaborative work involves agreeing on a research question and design. Subsequent stages involve data collection, analysis, and preparing a group presentation for an online plenary session.

4.8 The technologies

The computer conferencing software, First Class®, (OPENTEXT) was used to support the discussion forums. The majority of students used the client version of this software and therefore had access to the full functionality that was available at the time that they undertook the course.

During the first four weeks of the course the students undertake seven preparatory activities. For these activities the students are allocated to sites of 45-55 students with the students at each site randomly divided and sub-divided into smaller group forums (15-20) for each of the preparatory activities. Therefore students have the opportunity to have some contact with other students at their site before project groupings are formed. At end of week 10 students reassemble in a site plenary forum.

During week 4 the students form into project groupings. Each project group is then allocated a dedicated discussion forum and a Live Chat (Instant Messaging) facility.

There are also forums which can be accessed by any student enrolled on the course, a help forum, forums for optional activities and a chat forum. These forums aim to provide the support, social and enhancement opportunities that are valued by the students who attend Residential school.

The students involved in this study used proprietary software to prepare the project proposal, collate results, and present their findings at the plenary session. This information is exchanged through attachments to messages posted into the appropriate forum (project group or site plenary).

5. Findings

The overriding impression from the initial readings of the student descriptions of experience was that they had experienced constraints and difficulty as a consequence of doing group work online. It may explain why they had included this information in their reflective accounts. Individual student accounts include descriptors such as ‘difficult’, ‘limiting’, ‘challenging’, ‘not easy’, ‘constraining’, ‘inhibiting’, ‘trying’, ‘problematic’, ‘obstacles’, ‘concerns’, ‘frustrating’; 35/40 of the students used at least one of these terms.

On subsequent reading a number of codes were identified; inadequate participation by fellow students delays in making decisions, problems with communication, problems with technology, being unable to meet synchronously, a lack of familiarity with other students, motivation, emotions, feelings, dependency, a need to meet face to face, and oddness.

After an extensive and recursive process of review four main themes and some sub themes, as illustrated in Figure 1, were subsequently identified and named. The sub themes indicate the hierarchy of the meanings.

Theme 1: *Constraints on autonomy*

Collaboration on a group task is a mandatory requirement of the course yet students are required to provide an individual report for assessment purposes. This theme, and it's sub themes, encapsulates the ways in which working with other students, and using technology to do so, can frustrate and limit students at an individual level. There are aspects of the learning situation that the student is not able to control.

Dependence on other group members

'as a member of a group I was dependent on other researchers getting online and communicating their thoughts' (15)

Participation

'one member only logged on once, another not much more. It meant a lot of time was wasted posting messages for them and waiting for replies before the group consensus could be agreed upon' (38)

'there was evidence of researchers not responding or reading messages and not seeming to accept the method of research' (33)

Skills and experience

'I found the process to be frustrating in part because other group members had less experience and confidence.' (13)

'this project was carried out online by researchers unfamiliar with the method and relatively inexperienced in computer technology.' (28)

Dependence on technology

'Technical problems were also an issue with each of the team experiencing difficulties at one time or another especially in relation to downloading each others work.' (31)

'This project was done via an online course. This involved FC and was dependant on Internet connection.' (37)

Theme 2. ***Reflections about collaboration***

The students who contributed to the data set are accustomed to studying alone and at a distance. Students' retrospective views about the value of collaborative learning varied. This theme represents their views about collaborative learning alongside descriptions of their emotional and motivational experience whilst doing so.

' I found it useful to read the comments from the other researchers. It was interesting to see what we had agreed on and the points we had seen differently. This helped me to focus on and rethink my ideas as I looked at the work from a slightly different angle' (1)

'I sometimes found discouraging the need to renounce my vision and abandon an interpretation in order for the group to reach a consensus. It made fully engaging with the project even more difficult.' (2)

' For most of the time we were happily in agreement but sometimes it was very frustrating that our opinions and ideas clashed a little.' (9)

'I found this aspect of building on each others ideas a strength in the on-line discussions, and was motivated by the way I was able to confirm or adapt my arguments and feelings by using the input of others.' (37)

Theme 3. ***Virtual others***

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This theme captures the essence of the phenomenological experience of working closely with disembodied team members who they have not previously met.

The major challenge was the fact that communication between fellow researchers occurred over the internet. It had an impersonal or contrived feel about it. Not being able to meet the other participants and knowing extremely little about them felt rather odd. '……. 'Ultimately the impersonal nature of working in the group led one to feel as if you were working in a vacuum.' (15)

'I also found it hard to express myself and my opinions online as we had never met and knew nothing about one another. I felt that had we been working face to face we would have had a better sense of who each of us was.' (20)

'communication over computers can be impersonal' (22)

Theme 4. ***Communicating online. The impact on progress and achievement***
This theme encapsulates how the mode of communication can impact on the collective experience of the group. By focusing on the group experience this theme is clearly differentiated from the other three main themes that focus on the individual.

Delays in progress
'Some of the difficulties presenting themselves online were difficulties coming to agreement on issues, when an individual made a suggestion it sometimes took days to get a group consensus.' (24)

'some students had more time available than others and awaiting approval of others online when you wanted to push ahead can be difficult to get used to.' (21)

Constraints on the group discussion
'The manner in which you could present your thoughts and feelings on a subject simply did not have the freedom that direct personal contact would produce'. (26)

Using online forums as the site for interaction and text as the tool of communication
'As we worked on this project via online, this made communication difficult and ambiguous.' (5)

'Contact was by text on online forum, and this made the research process clumsy and impeded the communication process. It was difficult to argue some points without causing offence or undermining others due to the impersonal, bald nature of text.' (13)

Gaps and delays in the conversation
'people log on at so many different times conversation is very staggered.' (22)

> 'Working collaboratively online involved confusion and frustration as it was difficult to negotiate commonly agreed goals and meanings when the timing of communications was unstructured.' (28)

5.1 The findings in context

Based on these findings some supplementary information about the student characteristics and the support and administration of the course is relevant.

The data set includes accounts from students who studied in 2002(11), 2005(17) and 2010(12). While there is no information available about the characteristics of the individual students concerned there is some information, from another source, about the characteristics of students who choose the VRS rather than RS as their mode of study for this course. Based on survey data from students enrolled on the VRS in 2007 it is known that only 45% of students had previous experience of group work and 61% had no previous experience with online forums and many did not have experience of using Instant Messaging (IM). If the 2007 survey is representative of the student cohort who opts for the VRS then it may be that a lack of experience of group work and/or using online technologies is impacting on the student experience of undertaking this course.

Before enrolling students are provided with a resource to help them make an appropriate choice between Residential School and the VRS and some guidance about collaborating online using text based forums is included in their study guide. Nonetheless 50 % students report that the asynchronous nature of the communication was problematic. A common source of frustration was the delay in exchanging ideas and information and reaching a consensus. 50% of the student accounts suggested that collaboration and communication would be improved if they were given the opportunity to meet face to face despite the fact that they had opted for the VRS since they were not in a position to meet face to face. At a practical level the fact that there is no requirement for students to be simultaneously present allowed them the flexibility they sought; they could engage with the group project work when and where they chose and therefore fit it around their other commitments and personal circumstance.

6. Discussion

This study gives voice to the student experience of collaborative learning online. Four overarching themes, and a number of sub themes, that encapsulate the attributions that students make about the experience of online group work were identified as indicated in the thematic map in Figure 1. Themes 1 *, 'Constraints on autonomy'* and Theme 2 ' *'Reflections about collaboration'* and their associated illustrative comments, provide a description of socio-emotional experience as an inherent part of group work whereas themes 3 *' Virtual others'* and Theme 4 *'Communicating online. The Impact on progress and achievement'* are unique to group work online. Theory and research that takes into account the interrelationship of emotion and cognition will be interrogated in the context of the thematic map and recommendations made for practice.

6.1 The sources of emotion while doing group work

Themes 1 and 2 represent students' accounts of engaging in group work; comment on these themes represents the initial phase involved in untangling the problems and difficulties that students experience whilst undertaking a collaborative group task online using text based forums. Apart from one sub theme, *'dependence on technology'* (that technology, including institutional systems, does not always work as it should), the views encapsulated by theme 1 *'constraints on autonomy'* and theme 2 *'reflection about undertaking a group task' w*ould also apply if students were doing the group work face-to-face. Taken together, themes 1 and 2 support the view that engaging in group work is a source of emotion irrespective of whether group work is undertaken face-to-face or online.

Theme 1 describes the student view of how group work impacts on their autonomy and therefore can be linked to ideas of agency. When other group members do not have the appropriate skills or commitment achieving a satisfactory task outcome is constrained and compromised. They describe the personal stress and frustration that results. The sub theme *'lack of participation'*, that an apparent lack of participation of other group members is a source of frustration that can lead to resentment, is also a very common finding in the research literature. Although a lack of participation is commonly raised in the context of online forums it is not a problem that is confined to online groups. Lack of participation is a perception and does not necessarily reflect the other learner's approach to group work. There are many reasons why a student may be perceived as not participating including that student's self-appraisal of academic inferiority. In online groups a student may be assiduously reading the forum messages but self –evaluate his/herself as being inferior to others in the group.

When group work takes place online there are ways in which the technology could be used to help those students who lack confidence to contribute to the group work. For example, by offering tagging tools, tools that are hints and suggestions to learners as to how they might compose the next contribution. The implementation of such tools would need to rely on artificial intelligence (AI) methods, such as InterLoc (InterLoc, 2010), and educational data mining (EDM) techniques (Baker & Yacef, 2009) so that the students who might benefit from access to such tools can be identified. At the same time these data could be used to alert the tutors to students who are actively participating by reading messages but who are not contributing to the discussion. Tutors could then intervene on a one-to-one basis to offer help. There are other reasons why students may lack the confidence to contribute to group work; they may lack the required digital literacy skills. The technological problems that occur may be due to a student's lack of appropriate digital skills or be caused by hardware breakdowns. Providing a helpdesk and a dedicated forum within the course where students can seek help from the course support team and from each other can be of great value for students grappling with these types of problems.

Theme 2 describes student retrospective interpretations of the value of doing group work. Some students do realize that exchanging and debating ideas with others benefited their knowledge and understanding. However, there are others who do not perceive any benefit and these students are left with a negative impression of the group work experience. From the research literature we know that students' views about the value of collaborative learning in face-to-face contexts can also be mixed.

Providing more clarity and detail about why group based learning is important and therefore a mandatory component of some courses should raise students' awareness of the pedagogical value of group work for them personally. Knowing how important this competency is for both life and career should be another source of motivation for students (Ala-Mutka, 2011).

6.2 Doing group work online; some additional sources of emotional experience.

A review of some CSCL (Computer supported collaborative learning) research literature, and current perspectives regarding the inter relationship of emotion and cognition, led to the identification of four unique issues that arise when groups engage in a collaborative task using text based asynchronous forums; participants may not have any prior knowledge about other members of the group, contribution to the discussion is not simultaneously accessed, text is the sole means of communication, and there are no nonverbal communication cues. The unsolicited accounts of experience from students who had just completed a learning task that required collaboration between small groups of learners confirm that these issues are salient and represent what is unique about collaborating online. Themes 3 and 4 represent an interpretation of how students make sense of the experience of engaging with other students online.

Theme 3, *'Virtual others',* reflects both the nature and quality of how students experience others online. The student comments represent a phenomenological account of how other group members, who they have never met, and who are not co-present in either time or space, are experienced and how this can impact on their learning. For example, 'strange', 'impersonal', 'feel as if you are working in a vacuum' are some of the descriptors used. A design challenge involves identifying ways of addressing the relational elements of online group learning that students find strange. Some students report that due to unfamiliarity with others they were reluctant to engage in discussion that might lead to conflict or cause distress for others. This is where a social cognitive neuroscience perspective can inform. Haythornthwaite and colleagues (2000) suggest providing technology that allows students to offer a visual representation of themselves and Kear (2010) that students are encouraged to provide a résumé as a way to contribute to social presence. From a social cognitive neuroscience perspective arrangements such as these are unlikely to suffice. There is research that suggests that for mentalising to occur an *ongoing* phenomenological experience of another human is required. In text-based forums the ongoing rich sensory experience that is a characteristic of the embodiment of face-to-face interactions, the movement and positioning of peers, the non-verbal expressions of emotion and intention, are not available. It is therefore credible that phenomenological experience is entirely different and that mentalising might be disrupted in some way. When other group members are experienced as disembodied it could interfere with a student's ability to infer their intentions, cognitions and emotions in the way described by Blakemore (2012), Frith (2007) and Frith & Frith, (2010).

How can online learners, restricted to communicating using text, evoke a perception of agency so that others are able to get a sense of them as embodied? Although the conceptual status of social presence as a key component of the COI framework has been challenged recently by Annand (2011) the student accounts as described by

theme 3, *'Virtual others'* support the idea that social presence is important for students. In the original formulation of the concept of social presence two aspects of relational experience were explored: *intimacy*, which could be compromised by the medium, and *immediacy*, the social psychological distance between communicators (Short, Williams & Christie, 1976). These authors argue that immediacy need not be compromised since it depends how individuals communicate and how they adapt and appropriate the medium in order to support relational communication. Based on a psychological definition of immediacy as the way in which psychological closeness is expressed (Mehrabian, 1971) there is some promising research about how immediacy can be communicated through text (verbal immediacy). Immediacy can be communicated verbally by adopting an informal writing style, using slang, abbreviations and colloquialisms, by describing ongoing thoughts about ambitions and impressions, by describing life events even though they are unrelated to the task in hand (Murphy, 2005; O'Sullivan, Hunt & Lippert, 2004; Swan, 2002) and by using figurative language (Delfino & Manca, 2007; Manca & Delfino, 2007). For example, ' it's a nail biting time' an expression that refers to a bodily action to convey the interoculator's current state of anxiety or agitation. Students could include descriptions of their physical actions whilst engaged in group work, and some do, for example *'going off to read that section in the study guide again'*. Suggestions such as these are supported by experimental studies with the readers of fictional texts, as described by Coplan (2004). The findings of those studies support the view that empathy, or a related psychological process, can be engendered by a written characterisation.

Theme 4 *'communicating online, the impact on progress and achievement'*, and its sub themes is the most complex. The sub theme 'delays in progress' could be interpreted at a purely practical level, that the convenience of studying when and where they wish is not without cost. One solution that has been proposed is to provide technology for synchronous discussion alongside the asynchronous discussion forum (Haythornthwaite et al., 2000; Kear, 2010). However, it is important to be aware of the negative consequences of embedding a synchronous technology within a learning context that has been designed for student flexibility. All the members of a group should be able to access and contribute to the discussion, albeit not simultaneously. When a student is unable to attend a synchronous session online their opportunity to contribute and to be involved in the resolution of conflict is compromised a situation that can have emotional implications for the students concerned. For example, students may experience anger and resentment at being excluded from any decisions that are made. The students involved in the VRS did have access to a dedicated live chat (Instant Messaging tool) within their project group forums; the problem lay with the fact that due to personal commitments and circumstance it was rare for students to be able to congregate together simultaneously. There are other issues to consider when deciding whether or not being able to communicate synchronously will advantage group work. The inbuilt delay of asynchronous technology means that students have time to reflect before responding and this can benefit both task and relational aspects of group work.

Some other issues can be discerned as factors underlying the sub themes of theme 4. One concerns motivation. The outcome of this course is very important for the future career plans of the students involved and therefore it is unsurprising that a timely

achievement of the group task is so important for them. Another issue pertains to the mode of communication. The threading facilities provided by the software allow for multiple conversational threads to be displayed simultaneously and the asynchronous nature of this mode of communication disrupts any notion of conversational turn. As a consequence online conversations are a very different experience. Students who have little experience will need practice and help in getting used to this new way of communicating.

6.3 Doing group work online; the influence of Web 2.0 technologies.

Interestingly a growing familiarity with communicating online in the general population, for example using social networking technologies such as Facebook and Twitter, does not seem to influence the experience of learning online. The accounts of difficulty were consistent across the three cohorts of students from 2002, 2005 and 2010. Based on a recent report, a collective case study of six independent and diverse implementations of Web 2.0 technologies, this should not surprise us. The authors of this report provide perceptive comment about the lack of alignment between Web 2.0 practice and educational practice (Bennett, Bishop, Dalgarno, Waycott & Kennedy, 2012). Although forums are generally considered to be a Web 1.0 technology, the expectations and skills required for group collaborative learning are quite different from those involved when making contributions to a public or community forum online.

6.4. Limitations of the study.

It is important to acknowledge three limitations of this study. Firstly, the provenance of the data set is unusual. Originally these accounts were archived as a data source for reviewing the course. Over time it became apparent that they were also a useful data set for researching the interrelationship of emotion and cognition while learning. Secondly the course has a high stakes outcome and it is acknowledged that those students who contributed to the data set used in this study may have done so in order to influence the assessment process. The third limitation concerns the method of analysis. In producing these accounts the students have already interpreted their learning experience. This means that the researcher's interpretation represents yet another layer based on these decontextualised accounts from students. Nevertheless some implications of the findings for the interrelationship of emotion and cognition have been identified and recommendations about practice offered. For all these reasons further research that progresses our understanding of what is unique about the emotional experience of group work online is required.

7. Conclusion

Group work, whether undertaken face-to-face or online, is a source of emotion. By focusing on the way that psychosocial and psychobiological perspectives of relational experience could be integrated theoretically some emotional experience that is unique to group work online has been highlighted. In face-to-face group work interpersonal information and knowledge are interwoven and integral to the topic discussion and there are many additional cues available for making inferences about others. While some students, who are required to engage in group work online, will occasionally use emoticons to signal an emotion or intent this report argues that it is not sufficient. Students need to provide other group members with a much more detailed textual description in order to fully simulate the communicative richness of a face-to-face

encounter. Based on this knowledge it is recommended that students who are required to engage in group work online adopt a range of verbal immediacy behaviours so that their peers can get to know and trust them.

Taking the view that theory can be progressed by a reciprocal relationship between learning science and social cognitive neuroscience there are some questions for social cognitive neuroscience that arise out of this report. Neural correlates of perspective taking for emotional, cognitive, and bodily orientation have been identified. The question that arises from this study is whether the brain areas and neural processes that have been identified as important for mentalising are similarly stimulated if students engage in verbal immediacy behaviours.

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Appendix A. Extract from the assessment guidance

Reflexive Analysis

'In this section you need to offer some analysis of your position as a researcher; the subjectivity that you have brought to the research project. Your reflexive log is crucial here in providing you with relevant material for this section of the report. This should include an exploration of your involvement or position as a researcher on the topic being studied, the methods used and the analyses produced as a result of your own life experience. You have worked as a group to analyze the results and therefore it is important to comment on and acknowledge the subjectivity of the other group members.

Please note that it is not simply an account of your personal experiences of undertaking the study or working with other group members, unless these impinge on the appropriateness of the methods chosen, results obtained or interpretation provided. This means that you need to be explicit about the effects of any such experiences on the outcomes of the study. You need to consider how the interpretive demands of qualitative research necessitate this reflexive honesty. You might refer to your reflexive log to show where this was most important in the key moments in the research cycle. Managing 'bias' is something that quantitative methods achieve in their designs by a process of elimination or control; in qualitative research you declare your 'bias'. Subjectivity is intrinsic to qualitative research methods and cannot be eliminated but is accepted and declared and is sometimes called your orientation.'