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Students' appraisal of emotional and relational experience whilst collaborating online using text based communication.

Abstract

The impacts that the lack of physical cues and non-verbal cues of emotional expression has on the student learning experience in text based online environments were targeted separately in this study. A questionnaire was constructed with separate items for non-verbal cues of emotional expression and cues to physical identity. The survey also included questions about students' previous experience with technology and collaboration, and their motivations for undertaking the course. Views about their interactions with other students were also sought. The responses of two hundred and fifty students who had undertaken a text based online course where collaboration was a mandatory requirement were collected and subsequently analysed using cluster analysis. Four distinct cohorts of students were identified. Using a conceptual approach borrowed from neuroscience, modularity, it has been possible to encapsulate the effects of three distinct aspects of collaborating in text based online contexts, lack of cues to physical identity, lack of cues to emotional expression and interaction experience. These aspects were analysed alongside the student profiles for each of the four cohorts. The findings indicate that the external factors that an individual student brings to a learning context can impact on the learning experience. Neuroscientifically based knowledge that is relevant for the findings of the survey are identified and considered in terms of the questions raised from an interdisciplinary perspective.

Keywords

emotion, online interaction, collaboration, computer mediated communication, neuroscience.

1. Introduction

Learning environments hosted by computer-mediated conferencing software provide significant practical advantages for some learners. Educators who recognise the benefits of dialogic contexts for deepening understanding and knowing recognise their potential as a learning context (Hodgson 2002). (Hrastinski 2009) claims that participation and learning are intricately interrelated; in order for learners to take full advantage the participation experience needs to be satisfactory. Hrastinski describes participation 'as a complex process of taking part and maintaining relations with others' (Hrastinski,2009, p80). However it has been argued that a text based online context does not adequately provide for the emotional aspects of interacting with others, see (Walther 2006) for a review. In particular there have been persistent claims that social presence and sense of social identity are either diminished or lacking and that negative behaviour towards others (flaming) is more common (Siegel, Dubsovsky, Kiesler & McGuire, 1986). This view has undoubtedly been influenced by research into teleconferencing that conceptualises social presence as dependent on the number of channels available to the interaction (Short, Williams & Christie, 1976). Similarly studies into the development of interpersonal trust between members of a virtual team have focused on the effects of manipulating the number of channels available (Bos, Olson, Gergle, Olson & Wright, 2002). However single channel text based conferences are able to offer the practical advantages accrued from communicating asynchronously. There is no constraint on either the time or the place of the communication factors that have resulted in the widespread and persistent

adoption of the technology. As a consequence the research community has been stimulated to provide a better understanding of the socio-emotional experience that participants encounter.

2. The emotional experience of interacting with others

Psychological study of the emotional process has a long history. It has been approached from diverse perspectives including viewing emotion as occurring within an individual as a physiological response or an unconscious impulse. By contrast other researchers view emotion as socially constructed between individuals or as thoughts and appraisals about social situations and take into account the interactive and cognitive context of the emotional state. More recently another discipline area, neuroscience, has provided detailed mapping of the anatomical areas of the brain that are involved in the emotional experience. This is largely consequent on the recent development of brain imaging techniques that take advantage of increasingly sophisticated computer hardware and software. Extending the application of imaging methodology to the investigation of emotional process is more challenging although combining imaging studies with the investigation of patients with a deficit in socio-emotional processing acquired as a result of damage to brain tissue is promising. There is now a substantial body of evidence to indicate that at a functional level the more primitive brain areas which include sub cortical structures such as the amygdala, insula, and limbic system monitor sensory input for emotional content and interact with more highly evolved brain areas such as the prefrontal cortex, so that social decision making is influenced by previous experience as well as instinctive emotional response mechanisms (Blair & Cipolotti 2000; Damasio 1996; 1997; Lawrence , Calder, McGowan & Gratsby, 2002). One important feature of the neuropsychological approach is an assumption of modularity; the existence of distinct processes that are functionally encapsulated; a conceptual approach that will be applied in this study.

At a psychological level of explanation the absence of access to bodily physiognomy of others and the non verbal signals and cues are the two factors most likely to impact on the emotional experience of interacting with others due to an altered sense of social presence. (Fridlund 1991) used an experimental design to manipulate the physical presence and the sense of presence of others. His experiment involved four different contexts for viewing a pleasant video tape, (a) with the friend physically present (b) alone but with the belief that a friend was simultaneously viewing elsewhere, (c) alone but with the belief that a friend was otherwise occupied (d) with no implicit friend. Participants' self-rating of happiness was similar irrespective of their allocated experimental condition. However when undergraduate psychology students with no experience or training in facial expression rating but with some introductory knowledge of facial expression as an indicator of emotion were asked to predict the happiness of the participants their findings were discrepant with the participant self report. When these students were questioned about their rating decisions it became clear that they had been influenced by an expectation of enhanced emotionality in the presence of others. A similar assumption, that physical presence is a necessary requirement for successful interaction, influenced some of the negative appraisals of CMC environments that were prevalent during the initial period of CMC uptake. However in a recent review of the research literature on text based CMC Derks, Fischer & Bos (2008) concluded that CMC environments are not cold and

impersonal citing the uptake of CMC and the success of internet dating and therapy in support of their conclusions. Lea, Spears & Watt (2007) demonstrated that group identity could be mediated by discussion topic a finding that also contradicts the idea that text based CMC interactions are impersonal. Other recent research has also been more positive and some studies have provided evidence that the limited channel environment can be an advantage. For example, Tanis & Postmes (2007) found that photographic cues to identity had a negative effect on the participants' satisfaction with the medium and their subjective estimation of performance. Walther, Slovacek & Tidwell (2001) manipulated the availability of photographic information to virtual work teams and concluded that for long term online encounters the availability of a photo dampens the interpersonal ratings of intimacy, affection and relational communication. On the other hand it has been demonstrated that live social interaction is necessary when infants learn a new language. Both audio and televised delivery of the same language information was less successful (Kuhl, Tsao & Liu, 2003). Taken together these somewhat contradictory findings are a realistic indicator of the considerable challenges that confront the study of emotional experience during interaction.

Much of the e-learning based research reviewed in the previous section has involved experimental manipulation of identity cues therefore the many other factors that students bring to the learning environment has not been taken into account. In contrast other studies have used qualitative as well as quantitative methodology to identify a broader range of factors that can impact on the student experience (Conole, de Laat, Dillon & Darby, 2008; Creanor, Trinder, Gowan & Howells, 2006; Timmis, O'Leary, Weedon, Harrison, & Martin, 2004). For example, by using an interpretative phenomelogical approach to gain a rich and transparent description of the individual student experience (Creanor et al., 2006, p8) were able to draw attention to the diverse nature of the experience and factors that students bring to a learning environment, ' the complicated nature of their lives, the ubiquitous nature of technology use and many external influencing factors'.

One aim for the present study is to represent diversity whilst exploring the student experience of collaborating in a text based online learning environment. The survey was conducted after the students had taken part in an authentic online text based learning experience where collaboration was a mandatory requirement for successful completion of their degree program. In online text based environments there are no physical cues to identity or opportunity to access knowledge about emotional state of others by monitoring facial expression. Much of the recent research into the implications of their absence has tended to confound non-verbal and identity cues. Therefore a further aim of this study involves taking into account the neuroscience knowledge that is relevant to the socio-emotional experience of collaborating with others by incorporating appropriate questions into the survey inventory. Neuroscientific evidence strongly suggests that whilst identity cues may be important for social cognition non-verbal cues operate as a more primitive process. Therefore non-verbal communication cues and physical cues to identity are explicitly and separately targeted alongside other factors than might impact on the student experience.

2.1 Research questions

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What is the impact of a medium lacking in non-verbal communication cues and bodily physiogamy on the learning experience?

What is the impact of a medium lacking non-verbal communication cues and bodily physiogamy on the experience of interacting with others?

In what ways does students' previous experience impact on the socio-emotional experience of learning online?

In what ways do the reasons for choosing an online study option rather than a face-to-face opportunity impact on the socio-emotional experience of learning online?

From a neuroscience perspective what might be the implications of the lack of non-verbal communication cues and bodily physiogamy on the experience of interacting with others?

3. Methodology

3.1 The participants

Seven hundred and thirty eight adult students who enrolled on a second level undergraduate project course, a Virtual Residential School (VRS), were invited to take part in a post course survey. An alternative option, a week long Residential School (RS) was available to these students. Two hundred and fifty six students took part in the survey representing approximately 48% of students who completed the course.

3.2 The survey

The survey consisted of 88 items distributed across 15 questions, three of which were open. The items chosen were based on practioner experience of both the VRS, and the RS equivalent, gained from a number of roles over a seven-year period. Some of the items were chosen with the research question in mind others were chosen for reasons of scholarship, to gain a deeper understanding of the diversity of the student who enrol on the course and their consequent experience.

3.3 The Learning Context

The VRS is offered as an online alternative to a 6-day RS and lasts for 12 weeks. During weeks 5-10 students are required to collaborate in groups of 4-7 on the design, data collection, analysis, and the presentation of a group project. All interaction depends on text-based exchanges using the CMC software First Class. Students did not know each other at the beginning of the course and there is no face –to-face contact during the course

4. The analysis

4.1. What is the impact of a medium lacking in non-verbal communication cues and bodily physiogamy on the learning experience?

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Three survey items targeted student views about the absence of non-verbal communication cues and bodily physiogamy,

1. In my online learning I would like to **provide** some extra cues about myself such as digital photograph, voice recording or video.

2. In my online learning I would like to **have access** to some extra cues about my fellow students such as digital photograph, voice recording, or video.

3. Overall by using Computer Mediated Conferencing (CMC) to communicate and learn I was disadvantaged due to the lack of Non Verbal Cues (e.g. facial expression, hand gestures).

Responses to these questions were recorded on a 5 point Likert scale with a sixth category for 'don't know/not relevant'. The survey cohort response to these questions is shown in Figure 1.

43 % of the students did not wish to provide identifying information or have access to it (40%). 33% did not consider that the absence of non-verbal communication cues had disadvantaged their learning. On the other hand 27% of students claim that they would like to provide, and 31 % have access, to information about the bodily physiogamy of others. 35% did consider that the absence of non-verbal cues to communication had disadvantaged their learning.

4.2 What is the impact of a medium lacking non-verbal communication cues and bodily physiogamy on the experience of interacting with others?

The research literature and practioner experience both indicate that there are a number of factors mediating the student experience whatever the learning context. Therefore an exploratory approach to analysis of the data was adopted using two-step cluster analysis techniques to allocate students to sub-cohorts based on their response to 6 survey items. These include two questions about the experience of interacting with other students, three items that sought student opinion about the lack of non verbal communication cues and cues to bodily physiogamy, and whether or not they would still choose to do the VRS rather than the RS. These 6 questions are listed in Appendix A.

Four distinct clusters were identified representing 75, 57, 61 and 29 students respectively (34 students who were unable to indicate a choice for all six items were omitted from the analysis). Using SPSS 16, variable importance plots and the associated t-test of significance were obtained for each variable according to cluster membership and were used to construct the schematic diagram shown in Figure 2 which represents both the student appraisal of the medium and the experience of interacting with others. The student response to questions about the lack of non-verbal cues and cues to bodily physiogamy are indicated separately in the expectation that these represent different aspects of the emotional experience. The contributions of item 1 in Appendix A (provision of cues to identity) and item 2 (access to cues to identity) were similar and have therefore been combined for the purposes of representation. Similarly the contribution of items that target the interaction experience, 5 and 6, were similar apart from cluster 4 when the experience of working

within the project group was particularly negative confirmed by inspecting the open question that invited students to comment on their overall experience.

The four quadrants of Figure 2 represent the combined experience of interaction and medium for each of the four clusters and demonstrate a dissociation between the valence of the interaction and the appraisal of the medium. Furthermore when the relative importance of non-verbal communication cues and cues to physiogamy are compared there is a dissociation. For clusters 1, 3 and 4 the availability of cues to bodily physiogamy was more important irrespective of whether the appraisal was positive or negative whereas for cluster 2 the lack of non-verbal communication cues was the more important factor.

Students were asked to indicate what they had gained from 'continuous and sustained interaction with other students'. Two aspects were targeted
  1. Increased knowledge and understanding of academic issues
  2. Emotional support

The responses recorded for each cluster are indicated in Figure 3. The overall percentage of students reporting a gain in knowledge and understanding was lower in both clusters 2 and 4. Both clusters reported a negative appraisal of the interaction experience as indicated in Figure 2. On the other hand the reported benefits in terms of emotional support were lowest in clusters 3 and 4, the two clusters that reported a positive appraisal of the medium. The most marked difference between the reports of emotional support were cluster 1 (48%) and cluster 4 (7%) despite the fact that the appraisal of the lack of non verbal cues is relatively similar between the two clusters. However the appraisal of the interaction experience was markedly different implying that the greater influence on the emotional experience on this course comes from the interaction experience.

4.3 In what ways does students' previous experience impact on the socio-emotional experience of learning online?

It was anticipated that various aspects of student previous experience might impact on their response to the survey items listed in Appendix A. We therefore explored the student response to the following survey items
'I have taken part in discussion in face-to-face tutorials/day schools/ work related situations'
'I have previous experience of group working'
'English is my first language'
The student profiles based on their response to these three survey items are shown in Figure 4. Whilst the profiles of clusters 1 and 2 seem fairly similar cluster 3 contains the highest proportion of students with English as a first language. They also indicate the lowest uptake of the opportunity to meet with other students face to face a factor that may be implicated in their reported positive response to the study medium as demonstrated in Figure 2. Cluster 4 contained the highest proportion of students with previous group work experience and also of students with a disability.

Students were also asked about their previous experience of interacting using computer technology including use of email at home and at work, whether or not they had taken part in other online forums, instant messaging, and social networking sites

such as Facebook. A crude indicator was constructed by calculating a tally score of the number of technologies that had been previously embraced by each student. An analysis of variance based on this tally between cluster groups indicated that the mean tally score for each cluster group was equivalent; the previous experience of computer communication was similar between the sub cohorts.

4.4. In what ways do the reasons for choosing an online study option rather than a face-to-face opportunity impact on the socio-emotional experience of learning online.

The appraisals of both the medium and the interaction experience of the students in cluster 2 were negative and therefore the factors determining their choice of VRS were compared with the other three cluster groups as indicated in Figure 5. The opportunity to continue caring commitments alongside the course and the perceived convenience were the main reasons given by all four sub cohorts of students. Clusters 1 and 3 contained students who saw additional opportunity to self-pace study and develop online skills which may have indirectly impacted on their positive appraisal of the interaction experience in that they embraced the requirement to interact and collaborate online more positively from the outset. One survey item asked students whether they had chosen to do the VRS in order that they might remain anonymous, 7 students answered in the affirmative and were distributed across the clusters as follows, 2:1:2:2:

4.5. From a neuroscience perspective what might be the implications of the lack of non-verbal communication cues and bodily physiogamy on the experience of interacting with others?

Neuropsychologists who assume that brain processes are organised into modules seek evidence that demonstrates dissociation of function, that each module can work independently of all other modules. Using a hypothetical example, a claim for two distinct modules, A and B, neuropsychologists would seek evidence for impairment of module A whilst module B remains intact for patient X, whilst another, patient Y, retains intact function for module A whilst demonstrating an impairment in module B. Using this approach (Posamentier & Abdi 2003) reviewed the neuropsychological evidence for a dissociation between facial expression and facial identity (the identification of face as a cognitive process of face recognition and therefore quite distinct from identity as psychological distinctiveness). Some patients are unable to recognise familiar faces subsequent to brain damage, a condition know as prosopagnosia, despite being able to recognise facial expression of emotion. On the other hand there are patients who have problems in processing emotional facial expression whilst the ability to recognise familiar faces remains intact.

Applying the concept of dissociation to the experience of students collaborating in the text based computer-mediated context of this study the evidence, Figure 2, suggests that identity cues and non-verbal communication cues (which include facial expression) contribute separate, and therefore independent functions (modules), to the socio-emotional experience of collaboration. For clusters 1, 3 and 4 the availability of cues to bodily physiogamy was more important irrespective of whether the appraisal was positive or negative whereas for cluster 2 the lack of non-verbal communication cues was the more important factor.

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Two sub cohorts**;** clusters 2 and 4 provided negative reports for the two survey items that targeted interaction. Both reported lower gains for knowledge and understanding but differed in their appraisal of the text medium.

There is other evidence of dissociation; the marked difference between the emotional support reported by cluster 1 compared with cluster 4 despite a similar positive appraisal of the medium due to the absence of non-verbal communication cues.

5. Discussion

43 % of the students did not wish to provide identifying information, 40% did not consider that access to non-verbal cues was necessary, 33% percent did not consider that the absence of non-verbal communication cues had disadvantaged their learning. On the one hand these survey responses complement the experimental evidence for the benefits of text based online environments without photos, (Tanis & Postmes 2007; Walther et al. 2001). However there are also 27% of students who claim that they would like to provide, and 31 % have access to information about the bodily physiogamy of others an indication that individual differences can mediate the socio emotional experience as well as other factors such as the discussion context and topic. 35% of students claimed that the absence of non-verbal cues had disadvantaged their learning. It could be that some students are experienced online communicators and are comfortable with using content, including emoticons, to manage the socio-emotional component of learning. When the sub-cohorts identified by the cluster analysis were compared previous experience of interacting online was similar. However the cluster cohorts differed when other factors such as previous experience with group work, reasons for choosing an online option, were considered. This finding is consistent with the published reports of e-learning based on a student centred perspective when the impact of a wide range of factors external to the learning environment were similarly identified (Creanor et al. 2006).

Text based online communication has been widely adopted; for business applications, national and local government forums, health related forums informal interest groups, as well as Education. The ubiquitous status of the medium as an environment for interaction is reflected in the research literature by the range of disciplines involved. The research questions tend to reflect the disciplinary application of text based CMC for example the interest in the development of trust in virtual teams in the business community, media effects, impression formation, social presence, are just some examples. Although there is much to be gained from multi disciplinary input it is important to acknowledge disciplinary focus and also discrepancies in the use of terminology or even concept. In particular there has been a tendency to confound the influence of identity cues with other non-verbal communication cues such as facial expression, tone of voice. By contrast, the survey items used for this study explicitly target identity cues as a separate issue to non-verbal communication cues. An important outcome of the subsequent analysis was support for a dissociation between the effects of identity and non-verbal cues.

It can be useful to consider the activation and influence of non-verbal cues from an evolutionary and comparative perspective both in terms of the communication process and relevant brain structures. Argyle (1988) drew attention to the similarities between non-verbal communication in animals, particularly primates, and humans. For

animals non-verbal signals are key to their survival. Most animal communication is instinctive and stereotypical. Similarly some human non-verbal communication is involuntary ' it is possible, but difficult, to control emotional expression. The face is controlled best, voice and body below the neck are less well controlled (so called leaky areas)' (Argyle, 1988, p.78). On the other hand conscious manipulation of facial expression and other non verbal cues can also occur (Goffman 1959).

Although non-verbal cues remain an important component of the communication repertoire humans are able to communicate information using language and they also use language to construct a meaningful reality. In text based CMC contexts impression management, self-expression and emotional expression are all under the conscious control of the individual through the content of the text medium. In a recent review (Derks et al. 2008) drew attention to a prevalent assumption; that a textual account of emotional state and description of identity can replace the face-to-face experience.

In this study the student cohort that was most positive about the lack of cues to bodily physiogamy was in cluster 3, the cohort with the lowest uptake of face-to-face opportunity. In text based contexts a lack of bodily physiogamy may be equated with disembodiment. At a psychological level of explanation Tanis & Postmes (2007, p. 956) suggest that 'disembodiment obstructs certain social outcomes whilst enhancing others'. It may be that the students in cluster 3 represent a cohort who prefer to avoid situations in which social stereotyping might apply for a range of reasons including disfigurement, race, disability, low self esteem about appearance and age. In the absence of cues to bodily physiogamy students are able to rely on textual exchange to construct and present cues to identity.

By referring to bodily physiogamy as distinct from visibility it is deliberately implied that visibility (knowing) can occur through content. Lea et al. (2007) described text based CMC that lacked concurrent video information as an anonymous context. There is an alternative argument; that the absence of physical cues to bodily physiogamy does not necessary result in anonymity (deindividualisation), as online collaborators will come to know each other as they communicate and interact online. Does knowing another person depend on knowledge of physiogamy? or does knowing involve a time dimension for the interaction? (Walther et al. 2001) demonstrated that the availability of photographic cues to identity can be detrimental to text based interactions that take place over time and concluded that when individuals are committed to a text based collaboration they will be motivated to affiliate and therefore use the medium to manage positive impression formation.

At a simplistic level text based computer mediated communication can be regarded as another example of a lesion (damaged brain) study in that the usual sensory information is not available to activate the emotional neuro circuitry. From a neuroscience perspective this should impact on the operation of the complex two-way connections between sub cortical (more primitive) brain structures and the cortical (higher) brain structures that recent neuroscience research has identified as mediating the ultimate responses in a communicative exchange. Therefore a question arises concerning the neural pathways that are involved when the incoming information has a textual representation. Prensky (2001, p1) in an article identifying those born into the Internet generation as a distinct group has claimed that since 'the brain organises

differently based on inputs' we can expect differences in neural connectivity for this group'. There have been other similar claims in the media with the majority relying on assumption rather than direct evidence. However such claims are not unreasonable. Humans have not always been able to read and write yet there is an extensive research literature documenting the neuronal processes involved. At some point in our evolutionary history appropriate neural systems have evolved to subserve these functions. The current research into brain plasticity ' the idea that the cerebral cortex of the adult brain is capable of massive reorganization, once virtually unthinkable, is now firmly established' Steven & Blakemore (2004, p. 1243) may be relevant when it comes to understanding the brain processes that underpin the socio-emotional experience in CMC.

Another question for neuroscience concerns the implications of a context that lacks both involuntary and voluntary channels for the communication of non-verbal cues to emotional state? At an anatomical level LeDoux (1998) claims that the unconscious route is largely constrained to more primitive structures of the brain and does not involve higher brain structures, such as the frontal cortex. The suggestion that there are different routes available for conscious and unconscious processing of non verbal communication is relevant (Le Doux, 1998: Posamentier & e Abdi 2003) but there is currently insufficient knowledge to formulate an account that would convincingly link neuroscience, psychological formulation and the socio-emotional experience of text based collaboration.

Two sub cohorts**;** clusters 2 and 4 provided negative reports for the two survey items that targeted interaction. Both reported lower gains for knowledge and understanding but differed in their appraisal of the text medium. Hrastinski (2009) stressed how participation and learning were intricately interrelated and therefore a superficial interpretation of these findings would be supportive of this view. Although participation' relies on interaction the two concepts are not synonymous, it would also be reasonable to assume that satisfaction with the medium would encourage participation. However the findings in this study have shown a dissociation between the student appraisal of the medium and their reported emotional experience of collaborating and interacting with others so that a linear relationship between participation and positive appraisal of the medium plus satisfaction with the interaction cannot be assumed.

6. Conclusion

The four sub cohorts identified by the cluster analysis depend on an a priori choice of survey items; a different of choice of survey items could lead to alternative classifications (Everitt, Landau & Leese, 2001). The item choice was influenced by neuroscience as well as the research literature on computer assisted collaborative learning. By employing an exploratory approach to the survey responses combined with a conceptual approach, dissociation, it has been possible to encapsulate three distinct aspects, the interaction experience, the lack of non-verbal cues, and the impact of access to physical identity cues. The findings regarding the impact of non verbal cues are consistent with the idea of at two separate neural networks, voluntary and involuntary, for emotional processing at a primitive level (Argyle 1988; LeDoux 1998). Furthermore the outcomes of the study indicate that a multidisciplinary approach, e-learning, psychology and neuroscience, could make a useful and valid

contribution to our understanding of the emotional experience of communicating with others online. For example, research on social cognition and decision-making and the mediating role of neocortical areas on incoming socio-emotional information is relevant, (Phelps, 2006) as is the recent interest in brain plasticity (Steven & Blakemore 2004).

The findings from this study that demonstrate that external factors and experience can impact on the student experience of learning are relevant to the 'digital natives ' debate, recently reviewed by (Bennett, Maton & Kervin. 2008). (Bennett et al. 2008) express concern that there is insufficient empirical evidence to support the claim that education, and in particular teachers who have been cast as digital immigrants, is not equipped to cater for digital natives. All the students taking part in this survey were adult distance learners and therefore most fell outside the age criteria of a 'digital native' yet they demonstrated significant differences in the ways in which they experienced the medium. Furthermore much of the 'digital native' debate has focused on engagement with the technology rather than engagement with others when using technology and therefore represents a limited view of the scope of the Internet for Education.

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Appendix A. Items used for the cluster analysis

1. In my online learning I would like to provide some extra cues about myself such as a digital photograph, voice recording, or video. (Likert scale: strongly agree=1, strongly disagree=5)

2. In my online learning I would like to have access to some extra cues about my fellow students such as digital photograph, voice recording or video. (Likert scale: strongly agree=1, strongly disagree=5)

3. Overall by using Computer Mediated Conferencing (CMC) to communicate and learn I was disadvantaged due to the lack of Non Verbal Cues (e.g. facial expression, hand gestures). (Likert scale: strongly agree=1, strongly disagree=5)

4. Overall if I were making a choice between the Residential school and the Virtual Residential course I would choose the Virtual Residential course again. (Likert scale: strongly agree=1, strongly disagree=5)

5. Working within a group to design and carry out a research project increased my sense of engagement with an online community. (Likert scale: strongly agree=1, strongly disagree=5)

6. Experience of working with other members of the group to collect data/evidence. (Likert scale: 1=very difficult, 5=very easy)
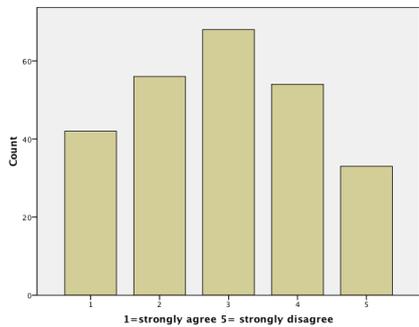
Figure 1. The student response to questions about access to non-verbal communication cues and cues to identification.
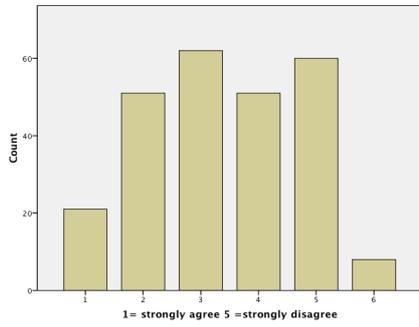
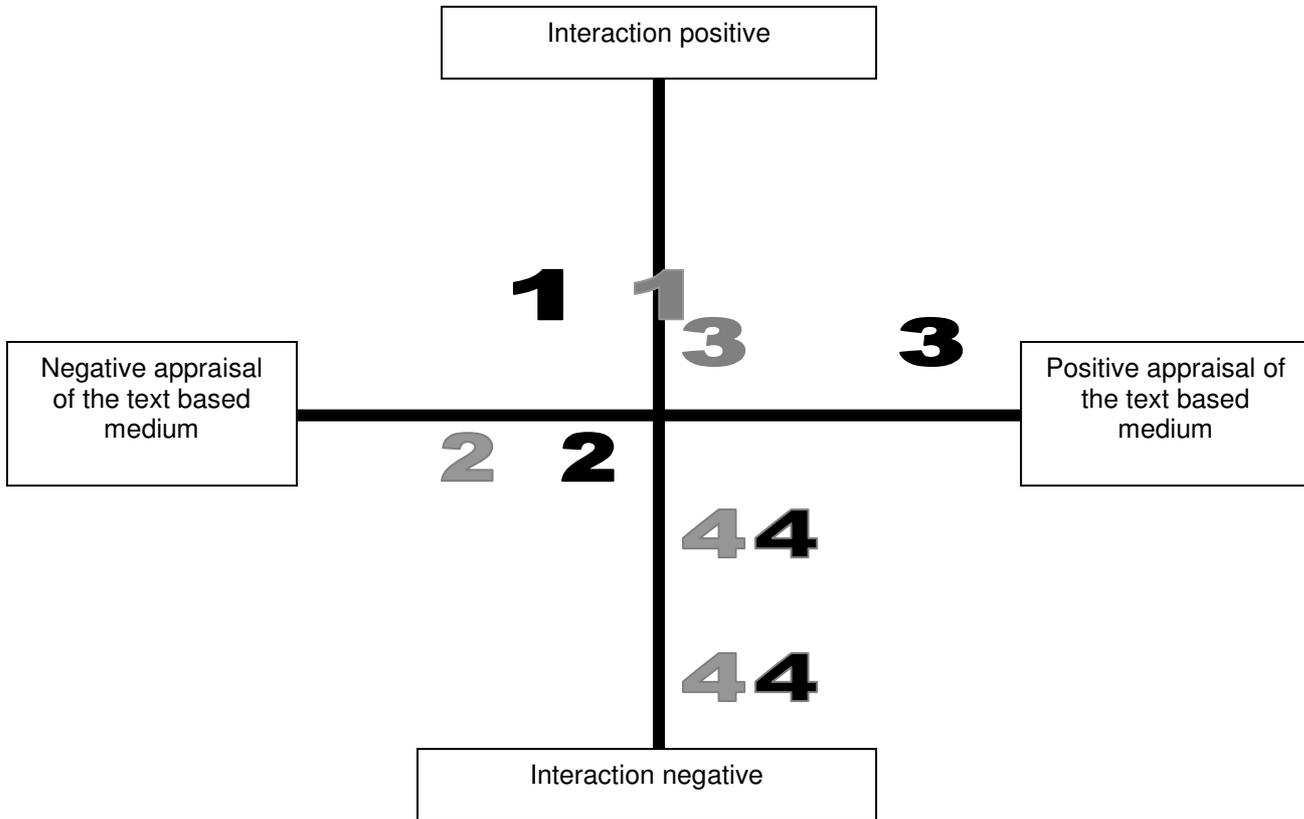
Provide cues to identity of others
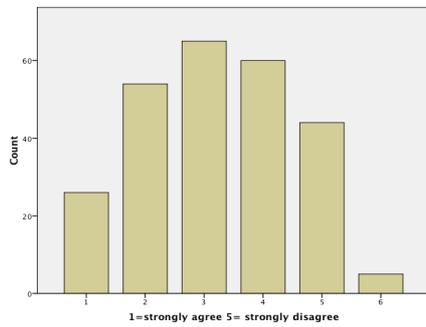
Access to cues to identity of others

The lack of non-verbal cues to communication

Figure 2 Cluster analysis of student appraisal of the text based medium and the valence of online interactions, a schematic view.

	Interaction positive

| Negative appraisal of the text based medium | | Positive appraisal of the text based medium |

1 1
3
3

2 2

4 4

4 4

| | Interaction negative |

■ Student appraisal of the lack of cues to bodily physiogamy

■ Student appraisal of the lack of non verbal communication cues
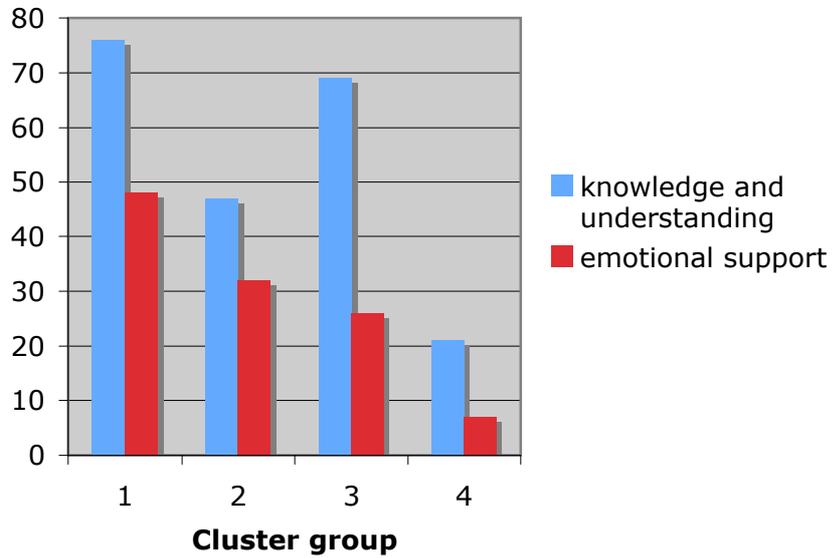
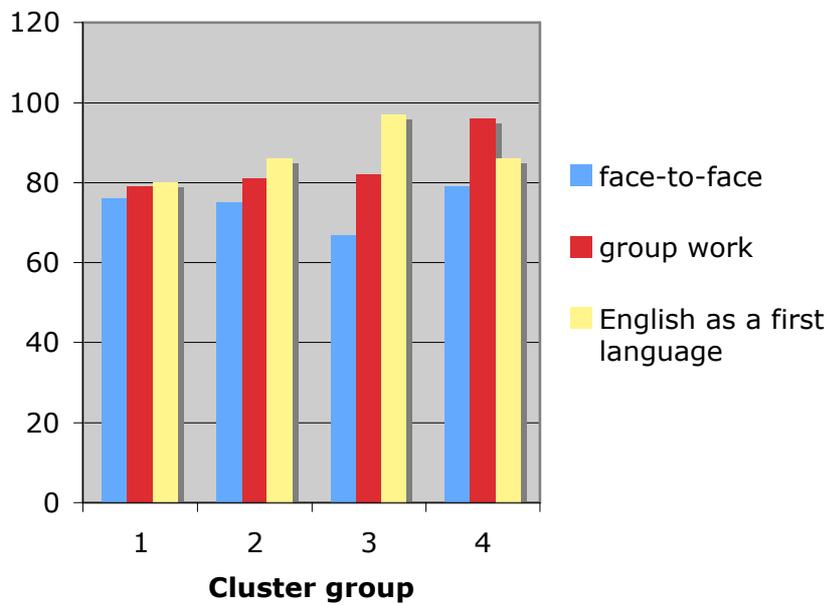**Figure 3 Student reports of gainful experience from**

Figure 4 Previous relevant experience

Figure 5. Factors determining the choice between VRS and RS