The use of technology in group-work: a Situational Analysis of students' reflective writing.

Abstract

Group work is a powerful constructivist pedagogy for facilitating students' personal and professional development, but it can be difficult for students to work together in an academic context. The assessed reflective writings of undergraduate students studying Information Management are used as data in this exploration of the group work situation and what matters to students in terms of ensuring success. Situational Analysis provides the methodological framework and a number of mapping techniques are used to interrogate the data. Students reflect on the importance of communication for group work and identify the convivial tools they use when arranging meetings, working collaboratively and producing outputs. Students valued the instant communication facilitated by smart phones, but despite the immediacy of electronic communication, face-to-face meetings are still highly valued. Silences in the data reveal the lack of engagement with the Virtual Learning Environment as a tool for group collaboration. Implications for educators in supporting group work are identified.

Keywords: Group-work, collaboration, Situational Analysis, technology, Inquiry-based learning

1. Introduction

The authors have worked for some years with groups of students in the information subject area of Higher Education, and this paper is a result of on-going reflective process concerning how students work together in groups. It is widely accepted that the ability to work in teams is an important graduate attribute [1]–[3], and teamwork is a skill often sought by graduate employers and is included on popular lists of graduate skills. Employers expect Universities to offer learning environments in which students can learn this important skill. [4]. Sociocultural theories of learning assert that knowledge is (co)created through cooperation and collaboration [5]. Group working can fulfill a natural human desire to work cooperatively with others, and can lead to a feeling of empowerment and belonging where support and solutions can be provided by other group members [6]. In contrast with competitive or individual learning, cooperative learning tends to promote greater retention, increased critical thinking, creativity and problem solving, higher achievement, and transferability of learning to other situations [7]. Although group work can provide both positive and negative experiences for students in the Higher Education context, the negative experiences can have stressful and far-reaching consequences for students both in terms of the experience and also the grades achieved. Students can feel alienated within a group [6] and there are well documented issues to do with freeloading and inequality of contribution (e.g. [8])

New social and communication technologies (e.g. Google Docs, Facebook), that students can use to support their learning provide a "rich and complex" communication environment that facilitates collaborative and inquiry learning [9 p.17]. There are conflicting discourses around students' use of such technologies, with some promoting the view that all student group work is now characterized by heavy use of technology, whether in terms of the outputs or technology mediated communication [10]. However, in their review of research in the area Facer and Selwyn [11] uncovered a mixed picture of learner use of these technologies, with a lack of evidence of a radical transformation of student learning through uses of social networking.

This paper presents an analysis of students' assessed reflective writings about their experiences of group work. A recurring theme in their reflections was the students' use of technology and the impact this had on working with each other during the completion of their group assignments. As tutors a primary concern is supporting students to achieve successful outcomes in their assessed work; a concern which influenced our research focus and questions:

- What do students think "matters" in this situation of assessed group work?
- What elements and activities are identified as contributing to group success or failure?

The methodology used in the analysis of the data is Situational Analysis, an innovative approach proffered by Clarke [12] who states: "Situational analyses seek to analyze a particular situation of interest through the specification, re-representation, and subsequent examination of the most salient elements in that situation and their relations." (p. 29) Situational analysis, which is little known in many disciplines but increasingly of interest in education research [13] and in social science more widely, extends traditional Grounded Theory "around the postmodern turn" [15 p.553]. As the method is unfamiliar in some domains it is worthy of further explanation (see methodology) though the approach is well documented in Clarke's excellent publications [12],[14],[15]

In the analysis of the data in this study, it became apparent that the technological tools (defined as actants in the study) and their relationships to other elements were of particular importance in the way that students negotiated their way through the group project and supported their group working practices, and the examination of these aspect of the data forms the focus for this paper.

1.2 *Reflective writing*

Reflection is seen to be an important aspect of professional practice [16] and as such it should be included in professional education. Boud [17] states "Reflection involves learners processing their experiences in a wide range of ways, exploring their understanding of what they are doing, why they are doing it and the impact it has on themselves and

others….reflection is intrinsic to learning" (p. 23). There is a strong tradition of both reflective assignments and pedagogical research in reflection in the Information School [18]–[20] This has led to a well-developed support structure featuring a reflective writing workshop for the students where they have the opportunity to learn reflective theory. As part of the workshop students have the opportunity to practice reflective writing and receive peer feedback. The four levels of reflection model [21] forms the theoretical framework for the assessment of students' reflective writing. This model outlines the concept of depth in reflection and specifies what need to be present in the writing in order to deepen their reflections:

- Level 1: Descriptive writing - Descriptive and contains little reflection. May tell a story but generally from one point of view.
- Level 2: Descriptive writing with some reflection - A descriptive account that signals points for reflection while not actually showing much reflection. What little reflection there is lacks depth
- Level 3: Reflective writing (1) - Description, but it is focused, with particular aspects accentuated for reflective comment. Shows some analysis, some self-questioning
- Level 4: Reflective writing (2) Clear evidence of standing back from the event. Shows deep reflection. Self-questioning, and the views and motives of others are also taken into account. Observation that learning has been gained.

Students are introduced to strategies that they can use to move beyond simply describing what happened towards critical reflection. Writing with greater depth of reflection encourages a greater understanding of the learning process.

1.3 Significance of this study

There are many examples of qualitative analysis of students' reflective writing as a way to understand learning in the literature in a diverse range of disciplines (e.g [22]–[25]. There are a limited number of studies that used reflective writing as data to understand group processes and

behaviors [16],[26],[27] . This study adds to that body of work but provides originality in analytical process that has been adopted.

This paper reviews the literature on collaborative inquiry and student group working in Higher Education. How students use technology to support group working and the use of reflective approaches to support group working are also reviewed. Situational Analysis as a methodology is discussed and the findings of the research are presented using a selection of mapping and analytical techniques drawn from Situational Analysis. The discussion links the findings with previous research in the field and outlines where new insights have been achieved. Finally implications drawn from the findings for are outlined for educators who support students working in groups.

2. Working in Groups

There has been extensive research in many disciplines (e.g. Management, Education, Sociology, Linguistics, Psychology) on how people generally, and teams specifically work together and communicate. Models and theories have focused on team roles (e.g. Belbin [28]) and stages of group development such as Tuckman's "Forming, Norming, Storming and Performing" model [29]. These management theories have been applied to research in the Higher Education context. With these models, the way that individuals communicate is recognized as being central to the functionality of the group. Some features of team working found in these analytical frameworks are present in this data, but they do not provide the main focus for this review. Our focus is on recent research into student group working in Higher Education in line with the context for the study.

2.1 Group-work in Higher Education

Students recognize that group work allows them to share ideas and knowledge, develop communication skills and develop confidence in their approach to work [30] When teams work well the workload is fairly shared and this results in a sense of belonging, and related

development of trust and confidence in team members [31]. Effective teams allocate roles and responsibilities [10], and it can be beneficial to engage students in open discussions around roles and responsibilities [32]. Students are well aware that group working is an integral part of their learning experience at university [4],[30].

Conversely group projects can be a "difficult and dreaded" activity [34 p.62] Students have issues with fairness in group assessments with unequal contributions giving the same grade. Leadership in groups can be problematic, and the conflicting personal and academic commitments of individual members can have adverse affects on the ability of groups to meet face to face [30]. Although students want to achieve high grades they can be unsure of how to do this in the context of group work [4]. Groups can be unsuccessful if they attempt to break up projects into isolated tasks and do not work collaboratively with each other [26]

It is helpful for academics to design group work that mirrors 'real world' activities of students forthcoming professional roles. [32]. Students recognize that they will be working in teams when they move into employment, and challenging group situations can actually help students prepare well for conflict situations at work [34].

Students use a complex range of technology-based communication channels in their group work including face-to-face meetings [35], and can display a sophisticated understanding of the social presence and value of different forms of communication [36]. Access to mobile phones is seemingly ubiquitous with research showing that 96.4% of first year students in Melbourne had a mobile phone [37] and mobile phones are superseding other technologies such as dedicated 'clickers' in lectures [38]) Smart phones make it possible for pervasive access to learning "anytime, anywhere" [39]; facilitate multitasking behavior [40], and provide opportunities for collaboration and discussion with classmates and tutors that is supportive of a constructivist pedagogy [41]. Research has shown that it can be difficult for students to engage in synchronous communication, whether that is face-to-face or online; mobile phones are preferred when an immediate response if needed [10]. The instant accessibility and convenience of

mobile phones for communication or information seeking is an important feature for students, who value communicating more frequently but exchanging less volume of information [41]. Text messaging has been found to be more important than email for study communication as it is more likely to capture the attention of the recipient as phones are always on [42], and this has led to an expectation that responses will be received quickly [43]. Social networking sites offer spaces for socially constructed, digitally connected learning and can blur the boundaries between formal and informal learning [44]. Students seem to be adept at re-purposing social software for educational use, for example students who are heavy users of Facebook for social interactions are also more likely to use it for educational purposes [45].

There is disagreement in the literature about whether students perceive there to be a barrier between using social softwares for educational work and their social lives. Ali et al. [35] found that students sought to keep social and work activities separate. However, Nortcliffe and Middleton [40] found that students do not make clear boundaries between study, life, and work due to the ubiquitous nature of smartphone technology, and this "persistent autonomous engagement" (p.201) has a profound impact on them as learners. Research in the school context has shown that Facebook can offer a "third space", i.e. a space that offers a blend of social and academic communication [35]. The choice of social software or technology may well be dependent on a "critical mass" of students adopting it [49 p.107] . The theory of convivial tools [47] asserts that people choose tools based on their ease of use, their adaptability, and independence from the establishment.

2.2 Reflection in Higher Education

Reflection and reflective practice are seen to be effective pedagogical strategies in Higher Education that enable students to not only facilitate their learning but also to develop themselves through critical self reflection [48]. Reflection is seen to be an essential feature of inquiry-based learning, and it is suggested that reflection should be built into the assessment of inquiry [49]. Clarke [27] in a phenomenological research project using student reflective diaries

as a dataset linked emotional awareness to effective reflections on team and group processes. Livingstone and Lynch [3] stress the importance of reflection in a group working environment as a means to enable students to develop and take away an understanding of the group working process.

However the relationship between reflective writing and assessment is not without debate. Creme [50] asserts that that assessing reflection is counter-intuitive to the potential benefits of self-expression and experimentation, and recommends that reflection is used only for formative feedback. Students, faced with the uncomfortable, messy and self critical situation of not being able to present their 'best' work, simply write what they think the assessor wishes to read [16],[21],[51]. It can be awkward for students to admit personal weakness, and so instead they ascribe problems to the group as a whole, or simply present a positive and non-critical account of their group work [16]. However despite these difficulties, reflective writing has been used successfully as data for research into student learning in the Higher Education context [52]

In this review the literature that explores the tension between the acknowledged long-term benefits of group working, and the potentially unfair and difficult experiences of students undertaking group has been presented. Students make extensive use of modern communication technology, and seem adept at flexibly adapting their communication practices to make the most of the affordances of the technology available to them. Although there are criticisms of the assessment of reflective writing, research has demonstrated that the opportunity to engage in structured reflection and reflective writing has benefits, and can help students understand their own practices with group work.

3. Methodology

One of the essential characteristics of Grounded Theory is that the researcher does not approach the data with a set of pre-determined concepts or themes [53], and this aspect of the

methodology is reflected in the way emerging themes in the data were surfaced over the analysis period. The philosophical roots of the Straussian framework of Grounded Theory draw on pragmatic and interactionist theories of co-creation of knowledge and self reflective research and there are undoubted synergies between this and the reflective data on collaborative inquiry that is used in this research. Corbin and Strauss [54] state "The final theory that is constructed though grounded in data is a representation of both the participants and the researcher. Another researcher could take the same data and by placing a different emphasis on the data construct a different theory. However this does not negate the validity of the theory. The most important thing is that whatever theory is produced is grounded and that it gives another insight and understanding into human behaviour"(p. 29)

Situational Analysis (SA) draws on the post-positivist grounded theory developed by Strauss that is based on a constructivist perspective of the existence of multiple realities dependent on the symbolic representation that each individual constructs. SA draws heavily on the social worlds / arenas framework proposed by Strauss which places much more emphasis on the context or situation of the action and interaction than in the original conception of Grounded Theory proposed by Glaser and Strauss. [55]. The method is characterized by a move away from looking for commonalities in the data and towards presenting variation and complexity, not in the individual as in other postmodern methods (e.g. autoethnography, ethnography, narrative analysis), but in the whole situation of inquiry. The approach uses a series of mapping techniques to chart relationships between human actors, non-human actants and discursive elements in the situation and attempt to capture the complex nature of their relationships. [14],[15]

Non-human actants are defined as the non-human elements that matter, that effect some change or transformation, that have agency in the situation; their limitations and structural conditions affect the way humans act in particular situations [14]. Actants identified in Situational Analyses are diverse, and have included elements such as schools [56]; the media, medicines and technology [57] and methods of assessment [13]. The identification of these non-human

actants is very much dependent on the situation, Clarke [14] gives the example of reliable access to electricity being of no consequence in a study situated in a first-world context, however in a third world context the unreliable nature of power supplies would have much more agency, i.e. it would matter more in this situation.

In SA the situation itself is seen to be the unit of analysis [14]. In applying SA, The researcher selects from a range of analysis and data mapping techniques those that particularly aid with their interpretation of the data. The function of the various mapping activities is to provoke a deeper analysis of the situation and elicit the relationships between the elements that are present. [15]

Clarke [12]states that there are three main types of situational maps and analyses:

1. Situational maps to articulate the elements in a situation and interrogate the relationships between them.

2. Social worlds/arenas maps that map sites of action, and relationships

3. Positional maps that allow the plotting of positions both articulated and not articulated in the data.

The process of visually mapping the data from the ordered situational map (where the analysis is presented in a simple tabular form), allows the researcher to move flexibly and systematically around the data, and answer the "big questions" around identifying what is important and special about the situation being analysed [12]. In this mapping process the important human and non-human actants in the situation are identified and their relationships explored. The identification of these non-human elements which have agency in the situation is arguably a way in which Situational Analysis extends and develops Grounded Theory in a postmodern perspective and challenges the notion that only humans matter in a situation [13]. The maps intentionally attempt to represent the "stunning messiness" of everyday life [15 p.370] An important feature of the situational map is the identification of the "sites of silence" in the data

Clarke [12] states “What seems present but unarticulated? What thousand pound gorillas do we think are sitting in around our situations of concern that nobody has bothered to mention yet” (p. 85).

It is argued that multidimensional mapping can represent real life situations and a variety of positionalities including human and nonhuman activities and discourses within them. This visual mapping process allows us to see the data with fresh eyes and to understand the relationships between elements in a situation. [14]

3.1 Research context

The data for this research was gathered from two cohorts of undergraduate students studying the Business Intelligence module, which is offered to final year Information Management students at the University of Sheffield. The module includes an inquiry-based assessed group project where students research a business information problem proposed by a local business, entrepreneur or charity. While some time for the group project is incorporated into the timetabled teaching session for the module, the majority of the group work takes place outside of teaching time and is self-directed and self-organized. The University’s virtual learning spaces (e.g. the Virtual Learning Environment, email, enterprise Google platform) and physical learning spaces (e.g. the Library, departmental spaces and physical technological infrastructure) are available to students as potential sites of group activity, however the way in which these are to be used by groups is not prescribed. The assessment of the group project comprises of a presentation and written report, and forms 60% of the assessed work for the module. The remaining 40% of the assessment is covered by two pieces of individual reflective writing each 800 words. Students reflect on their information literacy development as an important skill for information professionals (see [59],[60]), and about their experiences of group work on the module. It is data from their reflections on their group working experiences that provided the data for this paper. The introduction of the reflective assignment on group work allows students to be given individual credit for a group task, and gives the module teaching team a rare insight

into the working practices of students, normally an area of student work that is hidden from educators. The analysis of the students' reflective writing, about their experiences of working as a group, over and above that required by the assessment process, offered the opportunity to understand in greater detail what students considered to be important about group work.

Cohort 1 (2010-11) contained 13 students, 9 of whom gave consent for their reflections to be used in this study. Cohort 2 (2011-12) contained 19 students, 16 of whom gave informed consent, giving a total of 25 participants. Across the two cohorts 16 participants were male and 9 female; 4 were overseas and 21 were home students. The data was retrieved from the VLE post submission for assessment. The assignment brief asked students to write reflectively on their experiences of working as a group on this particular module.

4. Data analysis

The data was analysed over a long period of time in a number of distinct phases, consistent with a Grounded Theory approach where the researcher seeks to continually refine, develop and compare the emerging descriptions derived from the data [61]. In the first stage of analysis initial reflections on the interesting insights revealed from the assessment of the reflective writing were discussed and recorded by the research team. In the second stage, data was organized into broad themes in tabular format Word document and memos and observations recorded in electronic and hard-copy version of the document.

The third stage of the analysis of the data followed a "constant comparison" approach [57 p.7] where items of data were compared for similarities and differences, and then grouped into themes using Nvivo qualitative analysis software. These were discussed by the research team, and then the data was revisited and the codes were refined and developed. In a fourth stage both members of the research team engaged with messy mapping of the data, relationships between the elements were explored and the various maps produced were discussed and developed. Finally a focus for this paper was generated based on the student reflections of the non-human

actants that were integral to the group work process.,

5. Results

5.1 The ordered situational map

The ordered situational map that was derived from the analysis of the data is presented in table 1. Clarke [12]presents a number of section headings for use in the ordered mapping process, and the headings used for this particular map have been selected as the most meaningful or important for this particular set of data. Concurrent with the Clarke [12] approach, some core themes appear more than once under different headings; which signals the need to understand them in multiple ways.

Individual human elements/actors The student working in a group The other individual group members The lecturer The client	**Non human actants** **Ways of communicating: (**Voice call, facebook group, email, skype, whatsapp, google docs, facebook message, in person, Instant messenger, text message) **Technology:** (smart) Phones, Computers (silent), The internet (one mention) Meetings Project tasks The report Work (load) The business Time
Collectives The group The class The business	**Discursive constructions of individuals and or collective human actors** Arranging meetings Shared desire to 'do well' (Taking) leadership in the group Effective communication linked to team success Valuing each others' contribution Need for time management Developing skills in working with others for the future Developing self confidence through group working There are successful, positive outcomes from group work Individuals' work must be synthesised Information must be shared
Discursive constructions of nonhuman actants? Access to technology is ubiquitous Face-to-face meetings enhance information sharing	**Silent actors/actants** Access to mobile networks and wifi (2 mentions of internet) The Virtual learning Environment Distinction between 'social' and 'work' media Twitter Support from tutors Physical space suitable for group working Serious conflict within the team
Key events in the situation The client interview The presentation	**Spatial elements** **(silent)** Meeting rooms (locations for meetings) The Library (Information Commons)
Temporal elements Needing to respond quickly to communications Looking into the future – what employers want/will value regarding team working Working at the same pace Reflecting on past experiences of group work Time taken to arrange suitable meeting times Time keeping for meetings Being efficient	**Socio-cultural / symbolic elements** Group work is about supporting each other Group work is about negotiating a shared pathway Group work is about solving conflicts

Major issues / debates	**Related discourses**
Importance of keeping in touch with the group Importance of negotiating tasks and who is best suited to which task Challenges in selecting the 'best' method of communication Feeling that some group members have not contributed equally Feeling that the work of some group members is not of sufficient quality Importance of face-to-face communication & meetings	Discourses on team roles Discourses on conflicting priorities with other pieces of work Discourses on equal contribution Discourses on group formation and the mechanics of making the group 'work'

Table 1. The ordered map

5.2 Relational maps

The relational map diagrams the relations between elements in the situation and allows the researcher to identify the relations that are present in the data and the ones that will be further pursued in the analysis [12]. These maps are deliberately "messy" as multiple relationships are explored and mapped. In figure 1 a relational map is presented. In this map the actants (i.e. any non-human element that has agency in the situation) and temporal elements that were identified as needing further exploration are represented within shaded enclosures. The sites of silence are surrounded by dotted lines.

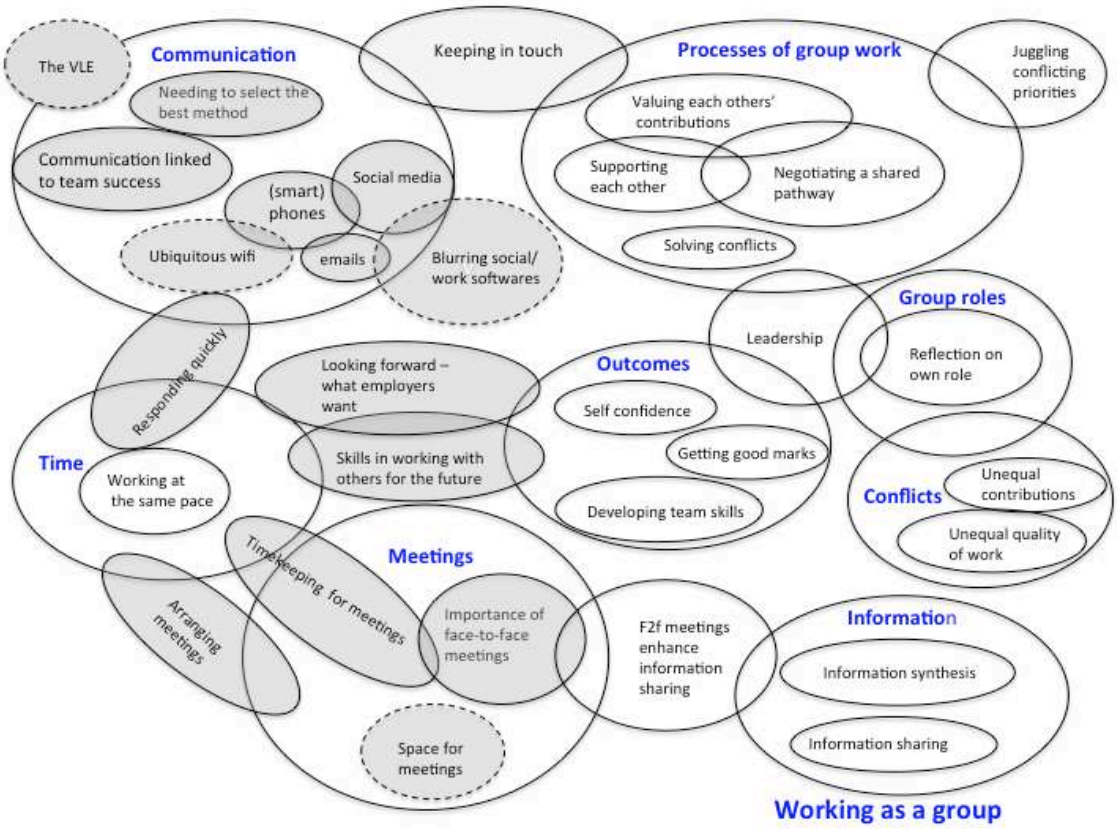

Figure 1: the relational map

Figure 2 presents a further aspect of the relational mapping between the elements identified as significant for this particular paper.

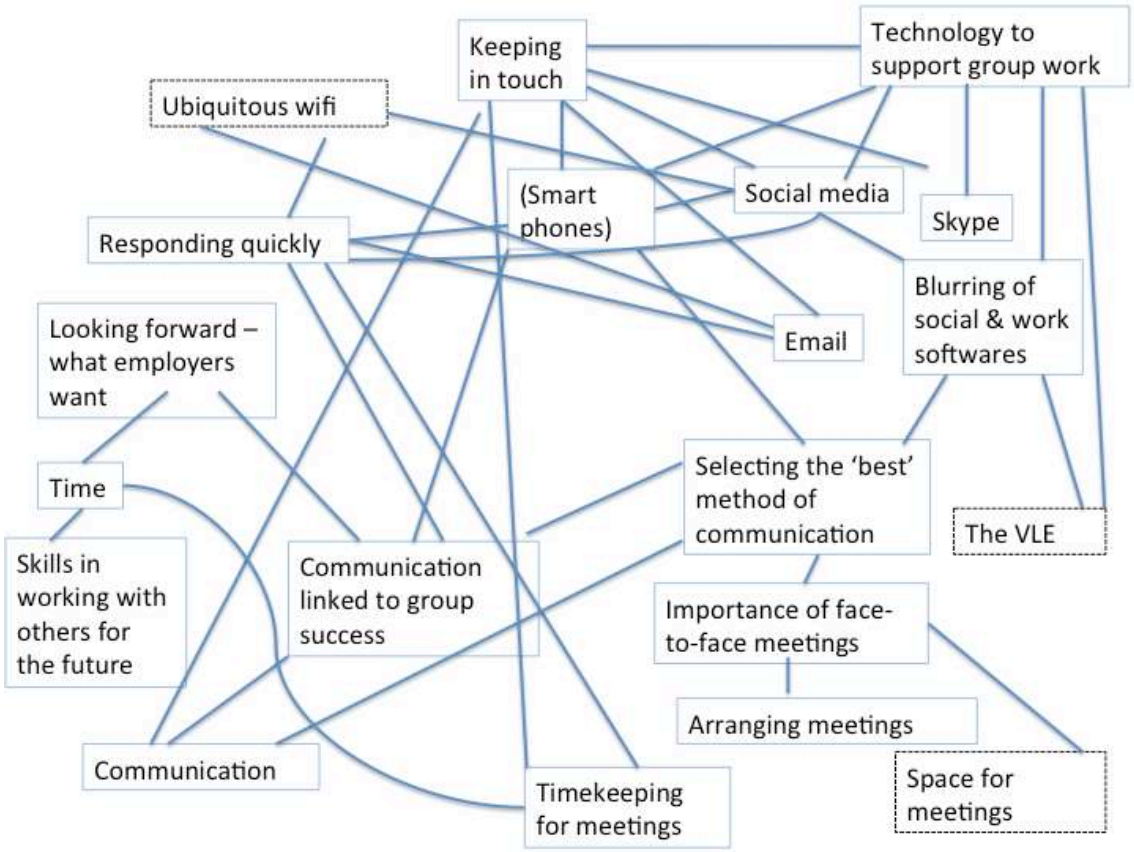

Figure 2: a revised version of the relational map.

In this map we begin to see the centrality of (smart) phones to the technological support of students working in a group and the importance of effective communication to the success of group work. Again in this diagram the sites of silence are surrounded with dashed lines, and their relationships explored as for the elements that are not silent.

The elements are more fully explored in the section below with evidence from the students' writing and this is followed by a discussion in relation to the literature.

5.3 Actants

The non-human actants comprising of communication methods facilitated through technology came through very strongly in the data and there were both casual descriptions of their use as well as significant deep reflection on their relative uses and merits. Students discussed using specific apps or software (e.g. Google Docs; Whatsapp; social networking sites),

> "We used E-Mail and skype to sort out logistical issues such as arranging meetings, and also updating of work progress and file sharing. This method of communication has been really effectively for our group, as SKYPE's instant messaging service facilitated the sharing of information despite not being physically together." (2)

Many of the software applications were used on mobile (smart) phones, as students referred specifically to their use e.g. with texting and calling and the use of mobile specific applications. Some communication and work presumably took place on desktop or laptop computers although the use of these is implied as use of these actants was identified as a site of silence in the data.

Mobile phones seem to be a key chosen communication channel in groups because of the continual contact that they can facilitate:

> "We primarily used messaging on the social network at this stage because it was agreed that we all have access to it 24/7 through mobile devices; therefore it was sensible and proved efficient at the time. Moreover, another reason was that it was difficult to match our timetables and hence we stuck with online messaging before and during Easter." (20)

The face-to-face meetings were identified as a non-human actant, the importance of these despite the electronic communication methods was stressed by a number of students. The report, the final outcome of the group work, and the work-load were ascribed sufficient importance in the students' reflections for them to achieve the status of actants.

The processes by which face-to-face meetings were arranged was a significant point of description of the group processes, and also reflection on difficulties experienced and lessons learned:

> "Communication was more effective face to face; however it was unrealistic to think we could arrange that many meetings around five individuals' timetables. Therefore meetings and decisions were discussed through more than one medium: the telephone, SMS text messaging, email, face to face and 'Whatsapp'" (17)

The sheer amount of time and various communications need to arrange meetings was problematic, leading to the identification of this factor as a 'temporal element' in the ordered situational map.

> "This proved irritating as it would take a prolonged period of time to organise group meetings, especially when getting hold of one group member who was particularly difficult to correspond with. This would usually mean any suggested times for meetings would often change at the last minute causing confusion and having to move around plans to suit group members." (16)

However there was also reflection on what the "best" method of communication should be for that group e.g.

> "These were effective methods because by phoning and instant messaging your co-worker we got instant responses from each other therefore we always knew what was going on. E-mail was a less effective method because we didn't regularly check them meaning we were late to responses which delayed us ever so slightly." (21)

Students reflected on the properties of different tools and also the personal preferences of both themselves and other group members. Students seem accepting of each others' electronic communication preferences. "Keeping in touch" was identified as a way to make group work more efficient, and the students' reflective writing revealed a multifaceted and multi-channel approach to communication, and this was facilitated largely through technology.

Despite the excellent communication functionality of the tools, difficulties were still experienced with them due to the human natures of those using them. The processes by which groups communicated, and the need to have effective communication were identified as two of the key success factors to group work, with poor communication practices linked to failure either of the individual in terms of their functioning within the group, or the group as a whole. The plethora of communication tools used by these students and the negotiation practices that took place among them to choose the 'best' tool indicate a flexible and situation-driven approach to communication using technology

5.4 Sites of silence

An essential feature of SA is to identify the sites of silence, and to reveal elements that are expected, but not present in the data. In the case of this data set, although there was much discussion about the methods of electronic communication, there was absolutely no mention of the availability, or indeed cost of mobile (data) networks, and there was an implicit assumption that all group members would use a (smart) phone. The phones themselves are mentioned, however other hardware e.g. PCs and tablets are not. The implicit assumption here is that 'everybody' has access to this stable and easy-to-use equipment, it is beneath mention. Interestingly, although all student groups were provided with a group collaboration area featuring a discussion board, group communication tool and file exchange capabilities on the Virtual Learning Environment, they do not reflect on using this, and the VLE is not mentioned. The students appear to make no distinction between (social) media used for personal interactions, and that used for their studies e.g. they reported no internal conflict using Facebook groups and messaging to interact with group members. Despite the growth in Twitter as a communication medium, it is not mentioned in this data set. The lack of use of some technologies or tools is a key feature of the sites of silence in the data. Some it may be assumed are being used but are not mentioned (e.g. wifi, computers) and some it may be assumed are simply not being chosen to the used (Twitter, The VLE).

The lecturer is mentioned in passing as a source of information, e.g "This was immediately resolved as another member emailed our lecturer." (19). However there is no reflection on the significant amount of scaffolding and support given to students on the module e.g. the dedicated sessions on reflective writing and report writing; discussions on group roles and approaches to group working that take place in class.

Although students identify that face-to-face meetings are an essential feature of effective working, they do not reflect on where these meetings take place, or how suitable space is found; only on the timing of the meeting. This leads to the assumption that students are able to find suitable group working space, alluded to by the group who meet directly after the weekly class, presumably staying in the open access room in which the class is held. The library, or "Information Commons" either as a place to meet or a place to study is not mentioned, despite the centrality of this building to the undergraduate student experience. Serious conflicts seem absent from the student reflections. Disagreements and minor problems feature in the reflections, but full-scale group break-down seems to have been avoided by these two cohorts.

5.5 Temporal elements

Temporal aspects featured strongly in the reflective data; and this may reflect the time-limited aspect of all university assessed work. As mentioned above, the time it took to arrange meetings was a point of frustration. Furthermore group members being late for or not attending meeting was problematic and identified as poor time management. It is interesting that the even though communication technology is seen to be positive, access to it does not preclude less positive behaviours, i.e. although it is possible to text a group member at a point of need, it does not mean that person will respond instantly.

As would be expected from deeply reflective writing, students both looked to the future and the past. They wrote about the skills they had gained that they would then take into employment,

"*This opened my eye to similar situations I am likely to have at work*" (7) "*I have become a more confident person because I have been able to express my opinion in the group without them judging it as well as improving my presentation skills which are necessary in the working environment*." (21). In looking to the past students reflected on their past experiences of group work, and how this experience differed.

5.6 The Social Worlds/Arenas map

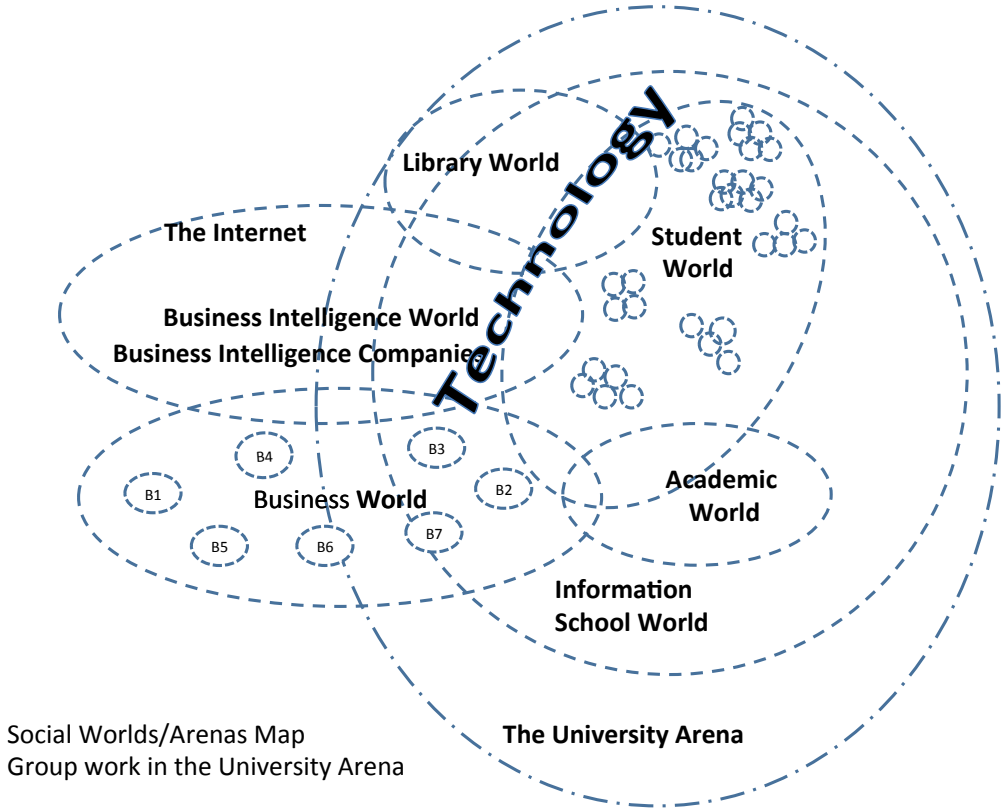

Figure 3: The Social Worlds/Arenas map

In the Arenas map we can see the multiple and worlds occupied by the students and understand this particular group project as a way for students to interact with the business world. Students enjoyed working with and for their business partner clients:

> "After every decision made, we sent our meeting feedback to client to improve, then preparing new improved topic for next meeting. Keeping communication with client, it is essential part to improve and correct project direction." (9)

The intersection of the academic world and the business world is facilitated not only through the actual project, but also through the reflective assignment where students are encouraged to think to the future and reflect on the skills they have gained for their future careers. Technology is a prominent overarching theme in this map, evidenced through the numerous references made to electronic communication technology e.g. Facebook (38 mentions); Whatsapp (21 mentions) and email (40 mentions). Students wrote analytical reflections on the value of communication technologies and how they would use them in the future:

> In order to try and resolve this issue I suggested that we should create a group on Facebook. I did this because I believed that this would act as a message board for the group on which we could all openly share our views and opinions. This proved to be a very effective method of communication as everything would be written down and referred back to if needed. In the future I would now suggest this communication approach at the outset as I believe it proved to be very beneficial and effective. (3)

6 Discussion

In the support session that students attended that covered reflective writing they were encouraged to write deep reflections that looked both forward and back based on the models of reflection developed by [Author]. Some of the deeply reflective writing did exactly this and it was possible to see how students could relate their group learning at University to their future careers as recommended in the literature [2],[4]. Wharton [16] suggests that students may not fully explore negative aspects of group work in their reflective writing and present a non-critical account. However while others in some groups are singled out for criticism, there is significant critical self-reflection in this data set where students not only identify where their own behaviour could be improved, but also where the group practices could be improved. There is

reflection on where the successes of the group lay, particularly in how effective communication was achieved, however this is far from simply presenting a positive account of the group work.

Situational Analysis invites the researcher to consider the non-human actants that have agency, that "matter" in the situation being investigated. In this data it was evident that the tools that students use and the particular software applications that students use are important actants in the situation of group work. In common with the findings of [40] and [43] students used their phones to connect with each other and engage in team work in multiple locations, with the expectation that communication would be rapid and that responses would be quick. However these students still value face-to-face communication, and when team members do not attend meetings or are late this is problematic, which is consistent with the findings of Hassanien [30] who also reported on the difficulty that students have in arranging these important meetings. Technology therefore can enable the reduction in the "debilitating" factors of time, space and pace [59 p. 56] but not seemingly eradicate it.

Students in these cohorts seemed very comfortable with using a wide range of software applications and technologies in their group work, in contrast to these students who took part in Hogarth's [4] study. The reflections of the students in this study mirror more the findings of [[Author]], which although a small scale study, found a similar flexibility and adaptability in students around their use of technology to support group working. The choice of which software or application to use seemed to be openly discussed within the group, and is more a process of negotiation grounded in the needs identified of the particular tasks or group members in this particular context.

> "We set up an online Facebook group in order to keep in contact and create an information sharing mechanism. Some group members claimed to use Facebook less than others so whenever information was shared, it was encouraged for each individual to forward the message to the rest of the group via Sheffield email. (19)

The VLE as a site of silence in the data corresponds to the findings of [46] who commented that students prefer to use applications that are "Free and easy to use" (p.109). This behavior is consistent with Cristiansen's (1997) theory of disruptive innovation where disruptive technologies (i.e. social media) are adopted because of qualitative differences to do with ease of use and cost from established "sustaining technologies" (i.e. the VLE). In Flavin's [46] study The VLE was not found to be easy to use and did not have a critical mass of users that encouraged engagement with it, and it can be inferred that the same is true for these Business Intelligence students.

In seeking a theoretical underpinning for the VLE as a site of silence and the preference of students for populist and popular communication applications in our data, we turn to Illich's theory of convivial tools [47]. Convivial tools are defined as those that can be easily used by anybody and that can be adapted to multiple uses, they are not controlled by the establishment. Students seeking tools to facilitate group working and communication find that the tools provided by the university are not convivial as they are controlled by the establishment (i.e. the university) and are bounded by the university environment: The VLE (Blackboard) is a proprietary tool and is unlikely to be one that can be used by students once they leave university. It can be inferred that students reject the (radical) monopoly of one communication tool and instead seek to negotiate shared group tools that fit particular group needs in a flexible and fluid way..

> We stayed in contact via a number of different mediums with our primary vehicle of communication being through a mobile messaging application known as WhatsApp. Despite being able to keep in constant contact regardless of location, this was not my preferred method of contact as it was not the most reliable form of communication. For sharing documents between each other and occasionally assigning work, we relied upon our Google Mail accounts, as each of us was able to access this from both a computer and our phones if required. (18)

Illich [47] defines radical monopoly as existing "where a major tool rules out natural competence. Radical monopoly imposes compulsory consumption and thereby restricts personal autonomy. It constitutes a special kind of social control because it is enforced by means of the imposed consumption of a standard product that only large institutions can provide" (63). Instead students move fluidly between university provided tools that still have resonance in the 'outside' world (e.g. Google docs and email), and tools that are more truly convivial. Students reflect on the use of a range of free services such as Whatsapp and university email system to support group work, and although the is a material cost to the use of some services via smart phones this is not reflected upon, although cost has been identified as an influence on student's use of mobile phones [10].

The use of mobile phones for learning is undeniably student led [41]. Students seek to be "efficient and effective" these two words were used many times (efficient 16 times; effective 51 times) in their reflections, and it is interesting that [41] also use these two words in reporting students' engagement with mobile learning. We assert that students make practical and pragmatic choices about the tools they use in their pursuit of "efficient and effective" learning that enables them to achieve their learning goals and achieve success in a convivial manner. The challenge for educators is in responding to this with our pedagogical approach and learning design that can cope with the blurred lines between formal and informal learning, social media, and establishment-led Virtual Learning Environments, and allow students to explore the tools that are openly available to them without constraints.

"Time" as in time management, conflicting timetables and timeliness of communication were also identified by [63] in their study of virtual teams.

The reported desire for physical meetings begs the question "where do students meet with each other for learning activities?". The design of traditional university spaces into "formal" learning environments (e.g. classrooms, libraries), and "informal" social spaces (e.g. cafes, student lounges) has long been identified as needing to change in response to pedagogies becoming

more learner-centred and focused on active and collaborative learning [64]. The concept of an "Information Commons", a technology rich multi-use mixed learning environment that contains study resources (including books), and physical space to support collaborative working is one way in which universities have sought to provide for the needs of the so called millenial learner [65]. Muti-use buildings such as these blur the boundaries between formal and informal learning spaces. The University of Sheffield opened its Information Commons library building in 2007, and the identification of space for group meetings as a site of silence in these reflections may well be because this building, and other newly designed spaces that support social learning, are meeting the needs of students working in groups for face-to-face meetings and have become just part of an accepted and expected learning environment.

7. Conclusion

The data used in this study came from a small sample of undergraduate students studying in the information disciplinary context and their use of technology to support their group working may be influenced by this. The framework provided by Situational Analysis helped provide a structure to the data analysis that revealed interesting and diverse perspectives on the data. In this paper we attempt to answer the research questions:

- What do students think "matters" in this situation of assessed group work?
- What elements and activities are identified as contributing to group success or failure?

The focus on the actants in the situation facilitated by the SA framework allowed a detailed discussion of the technologies that students reflected on using. We argue that convivial tools are elements that matter in this situation of assessed group work. The choice of tools for group communication contributes to the success of the group as each group attempts to negotiate a shared understanding of which tools will work best for them. There are many other factors that impact on groups, but our results show that successful groups should have this explicit discussion about which communication tools are the most appropriate for that group in their particular situation. The identification of the sites of silence gave rise to reflections on the

ubiquity of wireless networks and availability of suitable space for meetings. These students are studying information and technology related subjects and may therefore be more comfortable with using technology-based tools to support their collaborative working than others students. Nevertheless there is a steady rise in browsing and data access through mobile platforms in our "Smart phone society" [66]. The lack of use of the VLE as a site of group activity should be a cause for concern, particularly as this and many other institutions have invested so heavily in platforms such as Blackboard. The analysis gives rise to the following points of advice for the application of collaborative inquiry in Higher Education

The difficulty experienced in arranging face-to-face meeting with group members who have different teaching timetables and a range of other responsibilities and commitments should be a cause for concern for educators using assessed group work. More needs to be done to support students in this activity either at institutional level (e.g. with the provision of an integrated calendar/email/timetable tool; or at the individual student (group) level with advice on scheduling tools (e.g. Doodle poll) that can help students with arranging meetings. Simply addressing this issue and opening up communication in groups about arranging meetings would be a support strategy easily implemented. Similarly students should be encouraged to discuss methods and means of communication in the initial stages of group work and should be encouraged to find a method/technology that works for them, rather then be recommended any particular methods (e.g. university email) This approach would support students in selecting convivial tools. Groups should also discuss the tasks that individual members are expected to perform and should attempt to ensure parity of workload. Face-to-face meetings and interactions are still important for group work, and technology is vital in arranging these opportunities for collaboration and in producing and sharing meeting output.

Reflective writing has been criticised as a method of assessment due to a view that students simply write what they expect the lecturer to want to read and don't present a critical view of group work.[16],[21] However, as [52] found, the range and depth of the reflections in this data

set is not consistent with this viewpoint, particularly as students have been deeply reflective about how they approached solving problems in their group. However through this analysis it can be shown that reflective writing is helpful for making sure students can see beyond the immediate context of their group work which they may find problematic, and look at the end result in terms of marketable skills for employers and their own personal development.

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Bibliography

1. Volet S, Mansfield C. Group work at university: significance of personal goals in the regulation strategies of students with positive and negative appraisals. High Educ Res Dev [Internet]. 2006;25(4):341–56. Available from: http://www.tandfonline.com/doi/abs/10.1080/07294360600947301

2. Race P. The Lecturer's Toolkit : A Practical Guide to Assessment, Learning and Teaching. 3rd ed. London: Kogan Page; 2007.

3. Livingstone D, Lynch K. Group Project Work and Student-centred Active Learning: two different experiences. Stud High Educ [Internet]. 2000;25(3):325–45. Available from: http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=3887604&site=ehost-live

4. Hogarth A. Introducing a collaborative technology strategy for higher educatuon students: Recommendations and the way forward. Educ Tnformation Technol. 2008;13:259–73.

5. John-Steiner V, Mahn H. Sociocultural Approaches to Learning and Development-A

Vygotskian Framework. Educ Psychol. 1996;31(3/4):191–206.

6. Doel M, Sawdon C. The essential groupworker: teaching and learning creative group work. London: Jessica Kingsley publishers; 1999. 278 p.

7. Johnson DW, Johnson RT, Smith K. The state of cooperative learning in postsecondary and professional settings. Educ Psychol Rev. 2007;19:15–29.

8. Palmer S, Hall W. An evaluation of a project-based learning initiative in engineering education. Eur J Eng Educ. 2011;36(4):37–41.

9. de Freitas S, Conole G. The influence of pervasive and integrative tools on learners' experiences and expectations of study. In: Rethinking Learning for a digital age: How learners are shaping their own experiencesearning for a digital agl. Abingdon: Routledge; 2010.

10. Benfield G, De Laat M. Collaborative knowledge building. In: Rethinking Learning for a digital age: How learners are shaping their own experiences. Abingdon: Routledge; 2010. p. 223.

11. Facer K, Selwyn N. Social networking: key messages from the research. In: Rethinking Learning for a digital age: How learners are shaping their own experiences [Internet]. Abingdon: Routledge; 2010. Available from: http://hdl.handle.net/2173/92253

12. Clarke AE. Situational Analysis: London: Sage; 2005.

13. den Outer B, Handley K, Price M. Situational analysis and mapping for use in education research: a reflexive methodology? Stud High Educ. 2012;(October 2014):1–18.

14. Clarke A. Situational Analysis: Grounded Theory After the Postmodern Turn. Symb Interact [Internet]. 2003;4(4):83–144. Available from: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Doing+Situational+Maps+and+Analysis#0\nhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Doing+situational+maps+and+analysis#0

15. Clarke AE, Friese C. Grounded Theorising using situational analysis. In: Bryant A,

Charmaz K, editors. The SAGE handbook of grounded theory. London: SAGE; 2007.

16. Wharton S. Presenting a united front : assessed reflective writing on a group experience. Reflective Pract Int Multidiscip Perspect. 2012;(July 2014):37–41.

17. Boud D. Avoiding the traps: seeking good practice in the use of self assessment and reflection in professional courses. Soc Work Educ [Internet]. 1999 Jun [cited 2014 Oct 24];18(2):121–32. Available from: http://www.tandfonline.com/doi/abs/10.1080/02615479911220131

18. Greenall J, Sen B a. Reflective practice in the library and information sector. J Librariansh Inf Sci [Internet]. 2014;1–14. Available from: http://lis.sagepub.com/cgi/doi/10.1177/0961000614551450

19. Sen BA. Reflective Writing: a management skill. Libr Manag. 2010;31(1/2):79–93.

20. Sen B, Ford N. Developing reflective practice in LIS education: The SEA-change model of reflection. Educ Inf. 2009;27(4):181–95.

21. Moon JA. A handbook of reflective and experiential learning: Theory and practice. Abingdon: RoutledgeFalmer; 2004.

22. Rai L. Social Work Education : The Owning (up to) Reflective Writing in Social Work Education. Soc Work Educ Int J. 2006;(July 2014):37–41.

23. Nevalainen MK, Mantyranta T, Pitkala KH. Facing uncertainty as a medical student-A qualitative study of their reflective learning diaries and writings on specific themes during the first clinical year. Patient Educ Couns. 2010;78(2):218–23.

24. Moate J, Sullivan P. The moral journey of learning a pedagogy: a qualitative exploration of student–teachers' formal and informal writing of dialogic pedagogy. Pedagog Cult Soc [Internet]. 2015;23(April 2015):1–23. Available from: http://www.tandfonline.com/doi/full/10.1080/14681366.2014.994666

25. Braun UK, Gill AC, Teal CR, Morrison LJ. The utility of reflective writing after a palliative care experience: can we assess medical students' professionalism? J Palliat

Med [Internet]. 2013;16(11):1342–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23937062

26. Mayne L. Reflective writing as a tool for assessing teamwork in bioscience: Insights into student performance and understanding of teamwork. Biochem Mol Biol Educ. 2012;40(4):234–40.

27. Clarke N. Emotional intelligence and learning in teams. J Work Learn [Internet]. 2010 [cited 2014 Jul 14];22(3):125–45. Available from: http://www.emeraldinsight.com/10.1108/13665621011028594

28. Belbin RM. Management teams: why they succeed or fail. 3rd ed. Butterworth-Heinelen; 2010.

29. Egolf DE, Chester SL. Forming Storming Norming Performing: Successful communication in groups and teams. 3rd ed. Bloomington: iUniverse; 2013.

30. Hassanien A. Student Experience of Group Work and Group Assessment in Higher Education. J Teach Travel Tour. 2006;6(1):17–39.

31. Pang E, Tong C, Wong A. Key determinants of student satisfaction when undertaing group work. Am J Bus Educ [Internet]. 2011;4(10):93–104. Available from: http://baywood.metapress.com/index/B2V7R91M6WXRKCCR.pdf

32. Fearon C, McLaughlin H, Eng TY. Using student group work in higher education to emulate professional communities of practice. Educ + Train [Internet]. 2012 [cited 2014 Jul 31];54(2/3):114–25. Available from: http://www.emeraldinsight.com/10.1108/00400911211210233

33. Thomas D, Seely Brown J. A new culture of learning: cultivating the imagination for a world of constant change. CreateSpace Independent Publishing Platform; 2011.

34. Livingstone D, Lynch K. Group project work and student-centred active learning: two different experiences. 2002;(September 2014):37–41. Available from: http://dx.doi.org/doi:10.1080/03098260220144748

35. Ali A, Murphy HC, Nadkarni S. Hospitality students' perceptions of digital tools for learning and sustainable development. J Hosp Leis Sport Tour Educ [Internet]. Elsevier; 2014;15:1–10. Available from: http://dx.doi.org/10.1016/j.jhlste.2014.02.001

36. Lightfoot JM. A comparative analysis of e-mail and face-to-face communication in an educational environment. Internet High Educ. 2006;9:217–27.

37. Kennedy GE, Judd TS, Churchward A, Gray K. First year students ' experiences with technology : Are they really digital natives ? 2008;24(1):108–22.

38. Middleditch P, Moindrot W. Using technology to enhance the student experience in large cohort settings: evidence from a journey of innovation at the University of Manchester. J Perspect Appl Acad Pract. 2015;3(2):58–71.

39. Khan MMH, Chiang JCL. Using mobile devices & social media in supporting engineering education. 2014 IEEE Glob Eng Educ Conf [Internet]. 2014;(April):1077–81. Available from: http://www.scopus.com/inward/record.url?eid=2-s2.0-84903444922&partnerID=tZOtx3y1

40. Nortcliffe A, Middleton A. The innovative use of personal smart devices by students to support their learning [Internet]. Cutting-edge Technologies in Higher Education. 2013. 175-208 p. Available from: http://dx.doi.org/10.1108/S2044-9968(2013)000006D009

41. Gikas J, Grant MM. Internet and Higher Education Mobile computing devices in higher education : Student perspectives on learning with cellphones , smartphones & social media. Internet High Educ [Internet]. Elsevier Inc.; 2013;19:18–26. Available from: http://dx.doi.org/10.1016/j.iheduc.2013.06.002

42. Lauricella S, Kay R. Exploring the use of text and instant messaging in higher education classrooms. Res Learn Technol. 2013;21(1063519):1–17.

43. Robinson S, Stubberud HA. Communication preferences among University stduents. Acad Educ Leadersh J. 2012;16(2):105–14.

44. Greenhow C, Lewin C. Social media and education: reconceptualizing the boundaries of

formal and informal learning. Learn Media Technol [Internet]. 2015;9884(January):1–25. Available from: http://www.tandfonline.com/doi/abs/10.1080/17439884.2015.1064954#.Va4lM98SzR0

45. Lampe C, Wohn DY, Vitak J, Ellison NB, Wash R. Student use of Facebook for organizing collaborative classroom activities. Int J Comput Collab Learn. 2011;6:329–47.

46. Flavin M. Disruptive technologies in higher education. Res Learn Technol. 2012;5(Supplement: ALT-C 2012 Conference Proceedings):102–11.

47. Illich I. Tools for Conviviality [Internet]. 2007. Available from: http://www.preservenet.com/theory/Illich/IllichTools.html

48. Barnett R. Higher education: a critical business. Society for Research into Higher Education; 1997.

49. Spronken-smith R, Walker R, Batchelor J, O'Steen B, Angelo T. Enablers and constraints to the use of inquiry-based learning in undergraduate education. Teach High Educ. 2011;16(1):15–28.

50. Creme P. Should student learning journals be assessed? Assess Eval High Educ. 2005;30(3):287–96.

51. Ross J. Performing the reflective self: audience awareness in high-stakes reflection. Stud High Educ. 2012;5079(June 2015):1–14.

52. Fetherston a. B, Kelly RHS. Conflict Resolution and Transformative Pedagogy: A Grounded Theory Research Project on Learning in Higher Education. 2007;5(3):262–85. Available from: http://hdl.handle.net/10454/3450

53. Bryant A, Charmaz K. Grounded Theory in Historical Perspective: An Epistemological Account. In: Bryant A, Charmaz K, editors. The SAGE handbook of grounded theory. London; 2007.

54. Corbin J, A. Strauss. Basics of qualitative research: Techniques and procedures for

developing grounded theory. 4th ed. Thousand Oaks: SAGE; 2015.

55. Ford N. Introduction to information behaviour. London: Facet; 2015.

56. Perez MS, Cannella GS. Situational Analysis as an Avenue for Critical Qualitative Research: Mapping Post-Katrina New Orleans. Qual Inq [Internet]. 2013;19:505–17. Available from: http://qix.sagepub.com/cgi/doi/10.1177/1077800413489514

57. Sen BA, Spring H. Mapping the information-coping trajectory of young people with long term illness: An evidence based approach. Vol. 69, Journal of Documentation. 2013. 638-666 p.

58. den Outer B, Handley K, Price M. Situational analysis and mapping for use in education research: a reflexive methodology? Stud High Educ. 2012;(July 2015):1–18.

59. Mckinney PA. Reflection for learning : understanding the value of reflective writing for information literacy development. J Inf Lit. 2012;6(2):110–30.

60. Sen BA, McKinney P. The SEA - change model in Information Literacy : Assessing information literacy development with reflective writing. Nord J Inf Lit High Educ. 2014;6(1):6–22.

61. Dey I. Grounding categories. In: Bryant A, Charmaz K, editors. The SAGE handbook of grounded theory. SAGE; 2007. p. 166–91.

62. Mlitwa NB. Technology for teaching and learning in higher education contexts : Activity theory and actor network theory analytical perspectives. Int J Educ Dev using Commun Technol. 2007;3(4):54–70.

63. Gapp R, Fisher R. Undergraduate management students' perceptions of what makes a successful virtual group. Educ + Train. 2012;54(2/3):167–79.

64. Jamieson P. Designing more effective on-campus teaching and learning spaces: a role for academic developers. Int J Acad Dev. 2003;8(1-2):119–33.

65. Lippincott J. Information Commons: Meeting Millennials' Needs. J Libr Adm [Internet].

2010;50(1):27–37. Available from:

http://www.tandfonline.com/doi/abs/10.1080/01930820903422156

66. Ofcom. The communications market 2015 [Internet]. 2015. Available from:

http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr15/