

## **Paper**

# **Measuring the Quantity and Quality of Online Discussion Group Interaction**

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## **Abstract**

This paper aims to explain the thinking behind the development of a tool to measure online discussion group interaction. The output parameters (results factors) relating to both quantity and quality of interaction are explained. Quantity metrics are relatively simple to establish and relate to measuring the number and length of initiated and response postings by both learners and tutors. Measuring quality of interaction clearly moves the researcher into a more qualitative domain. Earlier research at the Open University in the UK (Salmon, 2000) established a 5-step model of online interaction. Using definitions related to the different stages, this model is applied to evaluate interaction quality. The evaluation establishes a level in a continuum from basic access, through socialization and information exchange, to knowledge construction and finally to autonomous development. A comparative case analysis is provided to illustrate the application of the tool. On the basis of this initial study, input parameters (enabling factors) are tentatively postulated. These include aspects related to: [1] learning design and assessment, [2] tutor management and skill, [3] learner e-literacy skills and [4] peer-related learning. This research provides a contribution in deriving an approach to the examination and interpretation of the factors that enable e-Learners to engage in this type of e-encounter. It provides information for educators about the design of Virtual Learning Environments and the e-Literacy issues for the learners that use them.

## **Key Words**

Online interaction, measuring interaction, interaction quality, group interaction.

## **1 Introduction**

The increased use of networked learning environments has encouraged debate about how the classroom can be simulated at a distance. Where the learning takes place online through the Internet, facilities such as online discussion groups, chat facilities and e-mail are key parts of the Virtual Learning Environment (VLE). This paper focuses on one type of e-encounter provided by a VLE – the asynchronous online discussion group. Although this is only one type of e-encounter, it is arguably one of the most important for the learner. As part of a wider project examining the facilitation of online discussion group interaction, the dilemma of how to measure group interaction was encountered. In order to examine and interpret the factors that

enable learners to engage in this type of e-encounter, it was considered necessary to measure the learning exchanges taking place. Output parameters (results factors) are derived to measure quantity and quality of interaction and input parameters (enabling factors) are tentatively postulated.

A number of pedagogies and philosophical approaches are quoted in e-learning literature (Govindasamy, 2001). Conole et al (2004), suggest that the wide range of educational thought and learning theories can be mapped to three broad approaches: behaviouralism, socio-culturalism and constructivism. Although Conole et al conclude that different learning theories may be applied to different activities in the VLE, most authors appear to see constructivism as the philosophical base for e-learning. The orientation is summed up by Rovai (2004):

*‘Constructivism is a philosophy of learning based on the premise that knowledge is constructed by the individual through his or her interactions with the environment. It has roots in the constructivist movement of cognitive psychology, which holds that individuals gradually build their own understanding of the world through experience, maturation, and interaction with the environment, to include other individuals. Thus, from the constructivist viewpoint, the learner is an active processor of information. This is in sharp contrast with behaviourism, for example, in which the learner is viewed as a passive recipient of information’* (Rovai, 2004: 2).

## **2 Literature Review**

### **2.1 Community of Learners Concept**

Perhaps due to the differences between an asynchronous discussion group and a face-to-face classroom situation, there has been much discussion in e-learning literature about the importance of social interaction in the learning process (Driver, 2002; Nicol et al, 2003; Vonderwell, 2002). Johnson et al (2002) uses the Tuckman (forming, storming, norming, performing) model to virtual teams and discovered emergent roles of shared leadership. Vonderwell (2002: 79) suggests that asynchronous communications ‘may minimise the richness of communication and impeded student learning’ citing the absence of social cues such as body language. On the other hand, many researchers suggest benefits for asynchronous communication such as shy students participating more freely (Vonderwell, 2002) or where anonymity ‘facilitates self-disclosure without taking risks’ (Oren et al, 2002: 2), whilst others note the importance of reflection time permitting more depth of discussion and critical thinking (Thomson, et al, 2003). Thomson’s use of inquiry-based learning is based on the premise that complex problems compel students to think about many issues and leads them to realise that there may be multiple solutions to problems.

Related to these social aspects of learning is the idea of a ‘community of learners’ (Johnson, 2001; Johnson et al, 2002; Rovai, 2001, 2002a, 2002b, 2002c, 2003a, 2003b, 2004). It is suggested that ‘there must be proper attention to community building in distance-education programs, because it is the sense of community that attracts and retains learners’ (Rovai, 2001: 109-110). A key concept related to “communities of practice” is that in a community the sum of knowledge is greater than the sum of individual participant knowledge. Related to constructivism, two

aspects of collaboration can be seen to be facilitated in such a community: peer interaction and expert-to-apprentice interaction (Johnson, 2001). In some circumstances, clearly peer interaction may also be an expert-to-apprentice or indeed, expert-to-expert interaction. Due to the importance of context, different learner experiences will inform and enhance the learning experience. Roberts (2002) emphasises the importance of the relationship between interaction and reflection and the importance of personal perspective and individual orientations to work and education. The underlying theoretical proposition in much of this thinking is that of ‘Transaction Distance’ (Moore, 1993 in Rovai (2002a) and in Tait (2003)). The basis of this theory is that the space between the learner and the structure of teaching must be mediated by dialogue, thus emphasising the importance of the online discussion.

## 2.2 Measuring Online Interaction.

Two main approaches can be seen in research related to measuring online interaction. The first relates to the use of *Learner Feedback* (Driver, 2002; Offir, 2003; Rovai, 2002a, 2002b, 2002c) and the second is based on *Content Analysis* (Anderson, 2003; Blignaut and Trollip, 2003; Brace-Govan, 2003; Fahy, 2003; Masters, 2004; Pena-Shaff and Nicholls, 2004).

Using the *Learner Feedback* approach, Rovai (2002) establishes a ‘classroom community scale’ based on factor analysis of student perceptions, whilst Driver (2002) found a strong relationship between perceptions of the amount of interaction and learner satisfaction. There is also a wider literature on the evaluation of e-learning programmes (McGorry, 2003; Rovai, 2003; Strother, 2002) much of which relates to interaction.

The second approach, based on *Content Analysis*, is perhaps more revealing. In a preface to a special edition on collaborative learning, Puntambekar and Lucklin (2003) review the approaches from previous literature. Three main approaches emerge from this review and other literature: quantitative approaches - thread length, number of postings (Masters and Oberprieler, 2004); interaction patters (Pena-Shaff and Nicholls, 2004); and quality of interaction (Brace-Govan, 2003; Blignaut and Trollip, 2003).

Quantitative approaches to measuring the amount of online interaction are well known, relatively straightforward and are often calculated by online discussion group software. Whereas the complexity of interaction patterns is interesting and the message maps constructed are of value (Pena-Shaff and Nicholls, 2004), it is the classification of the quality of interaction rather than the destination and linkage that appears to be the most fruitful area for investigation.

The Fahy (2003) Transcript Analysis Tool (TAT) provides an example of an explicit classification of online interaction (See Table 1).

| Category                      | Definition                                              |
|-------------------------------|---------------------------------------------------------|
| 1A Vertical Questions         | Assume a correct answer exists and can be found         |
| 1B Horizontal Questions       | Invite negotiation on a plausible answer                |
| 2A Non-referential statements | Make no reference to others' comments or views          |
| 2B Referential Statements     | Make direct or indirect reference to others' statements |

|    |                            |                                                                                                                                |
|----|----------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 3  | Reflections                | Usually guarded personal thoughts, judgements, opinions or experiences                                                         |
| 4  | Scaffolding and Engaging   | Intended to initiate, continue, encourage or acknowledge interaction, and to 'warm' or personalize the interaction environment |
| 5A | Quotations and Paraphrases | From sources within or outside the conference                                                                                  |
| 5B | Citations                  | Attributions of quoted or paraphrased material                                                                                 |

Table 1: Transcript Analysis Tool (Source: Fahy, 2003)

In comparison, Blignault and Trollip (2003) propose a taxonomy which relates to instructor postings: administrative, affective, other, corrective, informative, Socratic. Brace-Govan (2003) establishes a 'Moderators' Assessment Matrix' based on three variables: Conference Progression (based on the Salmon (2000) model); Group Formation (based on the Tuckman Model, previously discussed); and Debate Development (based on Gunawardena et al, 1997 in Blignault and Trollip, 2003).

The benefit of the Salmon (2000) model is that it is based on action research, using Content Analysis and focus groups from online discussion groups at the Open University (UK). The model has 5 stages (see Table 2).

| <i>Stage</i>              | <i>Learner Evidence</i>                                   | <i>Online Tutor Role</i>                                                 |
|---------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|
| 1: access and motivation  | accessed discussion forum and posted their first message  | solve access problems and encourage participation                        |
| 2: online socialisation   | introduced themselves and 'share a little of themselves'  | create an atmosphere of mutual respect and defuse differences of opinion |
| 3: information exchange   | exchanges flow related to course content                  | organising productive discussion                                         |
| 4: knowledge construction | formulation of ideas through discussion and collaboration | build and sustain the group learning process                             |
| 5: development            | Responsible for own learning and its construction         | supporting and responding as required                                    |

Table 2: Model of teaching and learning through online discussion groups (Source: adapted from Salmon, 2000)

The model has also been tested and amended through 'reflection' conferences and exit questionnaires in an ongoing online tutor (Salmon uses the term e-moderator) training programme at the Open University (OU).

*Stage 1: access and motivation*, identifies that the participants have accessed and are able to use the online discussion forum and have posted their first messages. The online tutor's role at this stage is to solve any access problems and to encourage and motivate participants to spend time and effort in the discussion group. *Stage 2: online socialisation*, identifies participants as having introduced themselves and the stage is over when participants 'share a little of themselves' online. At this stage the online tutor is attempting to create an atmosphere of mutual respect and where 'productive and constructive exchanges of views' can take place and also to defuse any differences of opinion that would be counter-productive to this. *Stage 3: information exchange*, the exchanges start to flow more freely and are now focused on the content of the course, thus there is student-content, student-tutor and student-student interaction taking place. At this stage online tutors are providing a guiding and organising role, such as opening and closing off discussion themes and arranging for discussions to be synthesised in a summary. *Stage 4: knowledge construction*,

participants can be identified as formulating ideas and understanding and developing ideas through discussion and collaboration. At this stage the students are starting to take more responsibility for their own learning and the online tutor's role is now to build and sustain the group. *Stage 5: development*, there is evidence that participants become responsible for their own learning, with experienced participants guiding the less experienced and participants establishing their own agenda for exploring and learning. At this final stage, both tutors and students are using a constructivist approach to exploring their own thinking and knowledge-building process.

### **2.3 Enabling Factors for Effective Online Interaction**

Anderson (2003) develops an 'Equivalency Theorem' based on experience and feedback on online programmes and the educational literature debate. The theorem suggests 'that "deep and meaningful" learning is possible as long as one of the main forms of interaction is at a high level: student-teacher; student-student; student-content'. The particular importance of student-student interaction is highlighted as the basis for collaborative approaches to learning (Cummings, 2002; Driver, 2002). Based on experience and the literature, four enabling factors are postulated as being possible input parameters to online interaction:

- [1] learning design and assessment;
- [2] tutor management and skill;
- [3] learner e-literacy;
- and [4] peer-related learning.

The importance of assessment as a means of facilitating collaborative learning in general and online discussion group activity in particular is highlighted by Macdonald (2001 and 2003) who emphasises 'not only must the assessment be appropriate to the subject content of the course, it also must have an important role in supporting course pedagogy' (Macdonald, 2003: 378-379). Referring to the Salmon (2000) Model, Macdonald notes that at all stages in the development of competence in online collaboration, there may be the need for these to be reflected in the design of the assessment. Using this stages approach, marks are awarded in the early stages for simply including a transcript of a message, whilst at later stages, transcripts of contribution to a debate are required, together with related contributions of fellow students. The ability of the threaded discussion forum to provide a record of discussion is helpful to the student in easily assembling this evidence. The integration of online collaborative activities was regarded as a central part of the course philosophy, with later summative assessment being based on earlier collaborative discussion, but related to individual research and endeavour. The fact that the activities were an essential part of the requirements for assessment was appreciated by students as it guaranteed the involvement of all students. Macdonald (2003) also explained that there are a variety of ways in which individual contributions can be assessed. For example, students may contribute in terms of group moderation or alternatively in locating sources of information. This concurs with Vonderwell (2003) who provides an example of a points system where points are awarded for contribution, but also judges are appointed to evaluate contributions and they are also awarded a points value for this activity.

Related to assessment are the aspects of learning design. Lamy and Hassan (2003) note that distance learners cannot be easily persuaded to undertake interactive reflective work if the task presentation is not explicit in the expected requirements. The writers go on to note that task design only pays a small part in the promotion of reflective habits and that there must also be a learning design that permits 'space' for learners to be responsible for the management of their tasks.

With regard to tutor management and skill, Tanner and Jones (2002) emphasise the importance of 'scaffolding' for encouraging reflection in action. This relates in turn to the ideas of e-literacy where 'scaffolding' is proposed by Walton and Archer (2004) as a basis for web literacy (a critical approach to the use of web sources) and critical literacy (provision of evaluation criteria, search tasks to helpful resources and shared collaborative resources such as class bibliographies). Related to the ideas of transactional distance (previously discussed), research by Baker (2004) indicates that the more instructors incorporate relationally supportive language, the more students will benefit from the online learning experience. Social interaction between learners and instructors occurs when instructors adopt strategies to promote interpersonal encouragement or social integration (Jung et al, 2002). Finally, the importance of timely responses from online tutors is an important practical factor (Clark, 2001).

### **3 Methodology**

#### **3.1 Analysis Approach**

On balance it was decided that the Salmon (2000) Model, together with established definitions for the stages provided a suitable tool for measuring quality of interaction, whilst linking with traditional measures for quantitative evaluation. It was also decided to use the Content Analysis approach rather than the Feedback Method which had been explored in previous studies (Nisbet, 2003). A Case Research orientation was adopted due to the explorative nature of the study. This permitted the analysis of different potential enabling factors in context. Quantitative evaluation related to descriptive statistics measuring the quantity of online interaction. Qualitative evaluation is made of the cases using the case comparative methodology.

#### **3.2 Case Research**

Four Cases were examined based on Modules all with identical credit ratings at Masters Level. For the purposes of definition, a module is a taught subject on a programme and a cohort refers to a specific group of students within a programme. The module cases all operated over a 15 week semester period, but the final 3 weeks of semester were not included in the investigation, as this period was normally devoted to preparation and submission of assessments. The modules were selected from courses tutored by staff that were interested and understood the purpose of interactive discussions and collaborative learning. The cases thus represent better practice rather than poor practice in online education. The analysis of interaction was limited to examination of online threaded discussion fora. It is accepted that there was other interaction taking place via e-mail or telephone that was not considered within the study. Discussion fora were downloaded and printed off. The postings were coded according to whether they were Tutor Initiated (TI), Tutor Responses (TR), Student

Initiated (SI) or Student Responses (SR). A word count was taken and the postings were coded using the Salmon (2000) Stages Model.

### **3.3 Interpretation of the Model**

If students had managed to make their first posting on the discussion forum, they had already reached Stage 1 of the Salmon Model. However, it was soon realised that this is only the first of a number of access hurdles that online students face. Thus the interpretation of Stage 1 Access was expanded to include all types of access problems. These included difficulty in downloading or accessing materials or resources, difficulty in accessing the online library and other problems such as compatibility of student computers or software. Stage 1 and Stage 2 postings were relatively simple to code and identify. The difficulties lay in Stages 3 through to 5. The model does not distinguish between the transfer of learning information compared to course information. This is perhaps drawback as a proportion of postings coded as Stage 3 related to some extent to administrative rather than learning information. Postings were coded Stage 4 Knowledge Building if the material contained significant critical analysis and promoted discussion and reflection within the group. Stage 5 Development was identified when learners started to make their own constructions and became more autonomous.

## **4 Case Research Findings**

### **4.1 Case A: Comparison of the same Module in Different Cohorts**

In Case A the tool was used to compare the same module in 2 different cohorts (i.e. the same module and same tutor, but different students). This module was at a late stage in the programme and you would expect that learners would have overcome access problems and that is generally the case. This was a small cohort of 8 students and there was not a high degree of interaction of any type. Most of the interaction related to Stage 3 information exchange, although there was a small amount of Stage 4 knowledge building (see Fig 1). On cohort 7 the tutor (T) was significantly more active than in cohort 9, but in this instance this has not led to a significantly better volume or quality of interaction. Weekly topic discussions were designed within the course and threads were set up for these, but there were no introductory guidelines or suggestions provided in the discussion threads.

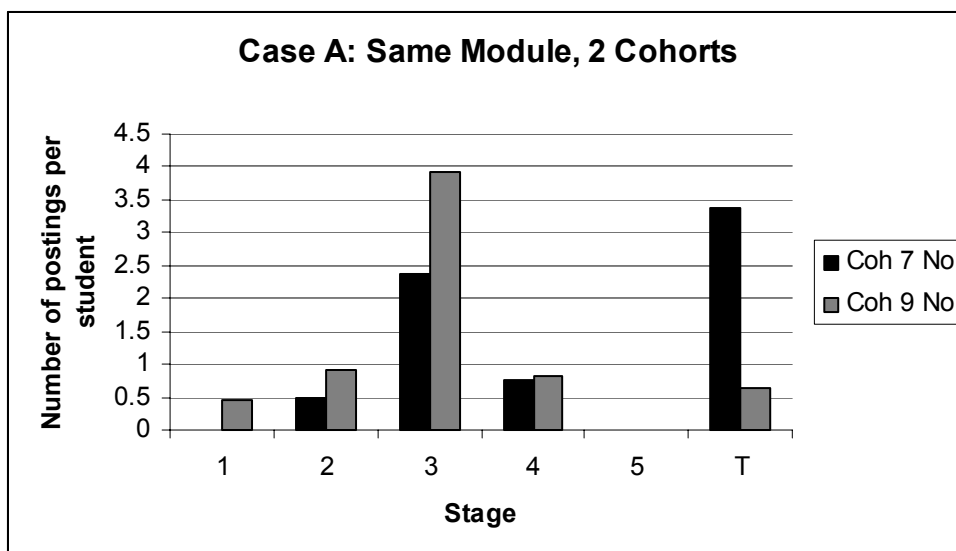


Fig 1: same module in two different student cohorts

#### 4.2 Case B: Comparison of Modules at early and Later Stages of a Programme

In Case B the tool was used to compare two different modules within the same programme and same cohort. The first module was the very first module to be studied on the programme, whilst the second module was studied in year two of the part-time course. When the number of postings is examined (see Figure 2), there appears to be a similarity between the two modules. Interestingly there continues to be a small number of students experiencing access difficulties, even at the late stage of the course. In this case, Tutor Initiated (TI) postings were distinguished from Tutor Response (TR) postings. From this it can be seen that the tutor was highly pro-active with the discussion groups. The discussions had clear deadlines and were closed off and feedback provided by the tutor at the end. Initiated postings included introductions to discussions, information about useful resources and encouragement about collaborative learning. Stage 2 Socialisation was relatively similar between the two modules which initially may be a surprise as you would have expected the students to be well known to each other by year 2 of the course. However, on examination of the socialisation much of it is between the students and the tutor. This is the first time that they have met up since the first module on the course and they are renewing acquaintance.

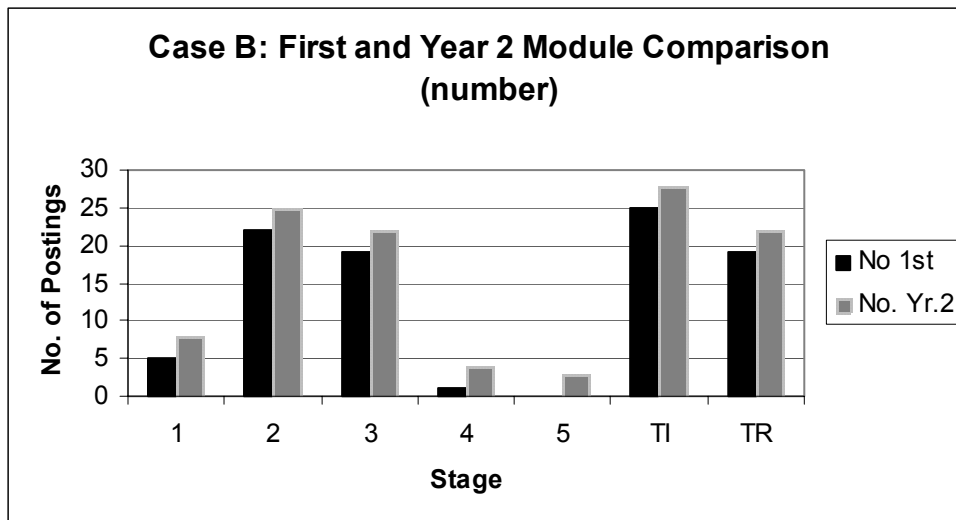


Fig 2: number of postings between different modules on same cohort

When the word length of the postings is examined, the situation is a little more encouraging. In all cases the later module exhibits more content and a significant difference in the volume of the Stage 4 Knowledge Building. It can be deduced also that the tutor is not merely acknowledging responses with a few remarks but has responses on average between 50 and 100 words per student and when initiated postings are examined the input by the tutor is even more prolific.

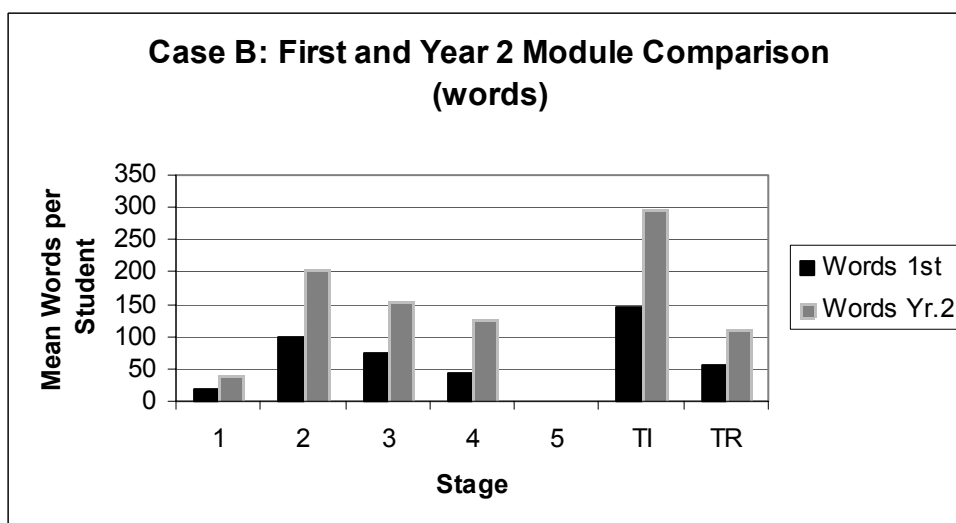


Fig 3: word count of postings between different modules on same cohort

#### 4.3 Cases C and D: Longitudinal Studies

In Cases C and D the tool was used to examine longitudinally the progress of online discussions throughout the 12 weeks of discussion. In this instance, the module is the first to be studied on the programme and it was a large cohort of 67 students. For purposes of simplification, the module was segmented into four quarters of 3 weeks each, (Q1 to Q4 in Fig 4).

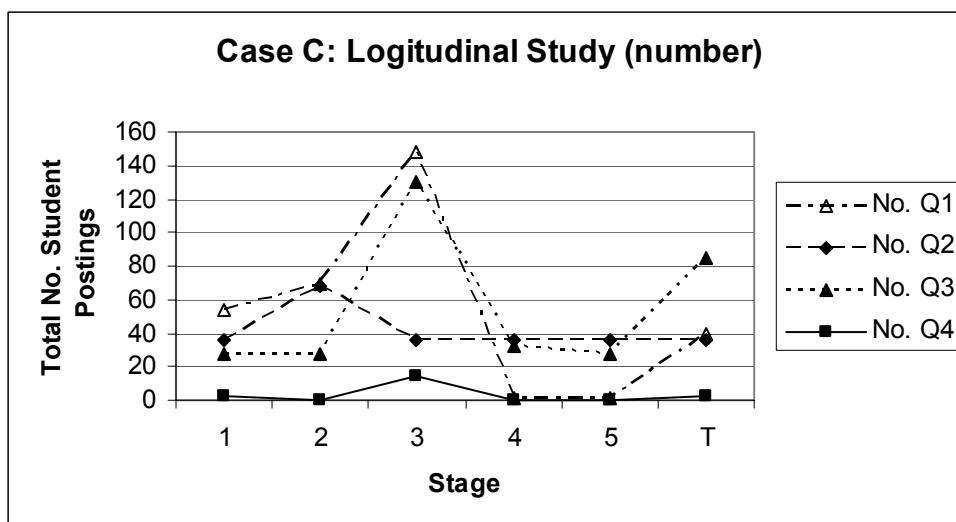


Fig 4: longitudinal study of the number of postings (Case C)

Quarter 1 has the largest number of Stage 1 and 2 postings as would be expected at the start of a course. Stage 2 Socialisation was also high in Q2 and on examination this appeared to reflect slow starting of a number of students on this, the first module of their programme. There was high amount of Stage 3 Information Exchange in Q1 and Q3. In Q1 this involved a large amount of interchange between students and tutor when they were selecting their assignment, whilst in Q3 this was due to similar interchanges about another assignment. These were student-tutor interactions rather than student-student interactions. There was an amount of Stage 4 and even Stage 5 interaction in Q2 and Q3, but it was at a relatively low volume in comparison to the size of cohort. On further examination, it appeared that a core of around 10 students were involved in this. Each week in the programme, there was a separate discussion activity and in all cases the tutor had posted a thread and in most cases the tutor had also posted some introductory guidance. There was no compulsion to undertake the online discussions and it was possible to detect a degree of ambivalence from the tutor about the need for online discussion.

Case D was also the first module on a programme, but on this occasion it was a very small cohort of only 6 students. There were no Stage 1 Access postings in this case and socialisation was limited to Q1 (see Fig 5). In both Cases C and D an initial socialisation activity thread had been set up by the tutor. In Case C this was a simple invitation to introduce yourself, whilst in Case D, a simple open format questionnaire was used to provide more structured and detailed information. This is reflected in the word length of these averaging around 800 words per student. This appeared to be a relatively non-threatening way to get students to access the discussion and to make a significant and thought-out contribution. By Q2 students were peaking on Stage 3 Information Exchange and by Q3 and Q4, were undertaking a significant amount of postings that profiled with Stage 4 Knowledge Building.

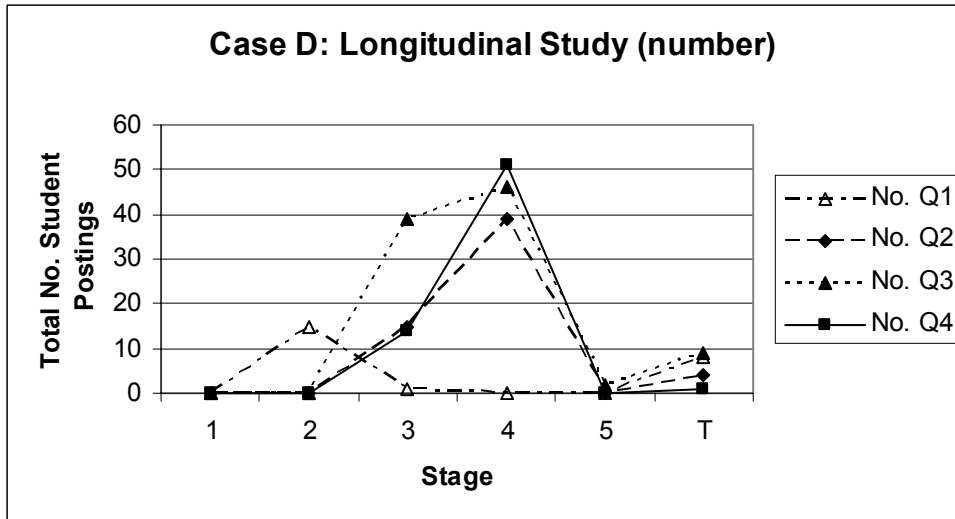


Fig 5: longitudinal study of number of postings (Case D)

When word count is examined there is a strong correlation between word count and number of postings (see Fig 6). There is clear evidence of Knowledge Building with detailed and critical collaborative exchanges taking place.

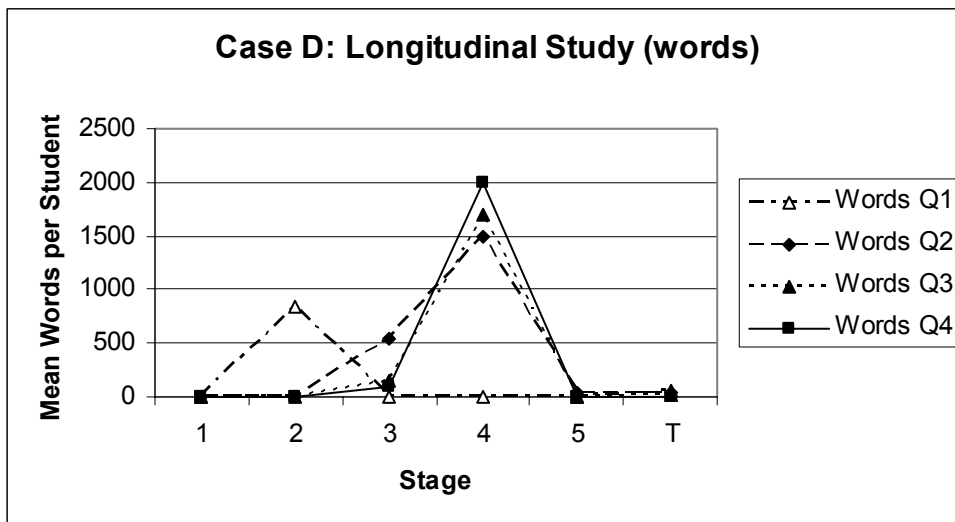


Fig 6: longitudinal study of the word count of postings (Case D)

In common with Case C, Case D had discussion threads set up by the tutor. However, there were only three main discussions which related to the three main themes on the course in comparison with over 12 discussion themes in Case C. The discussions had clear deadlines for completion and students were required to provide a chairman to organise the discussion and a summariser to provide a summary at the end. In addition, tutors provided some feedback following the discussion. Importantly, part of the student's assessed output for the module related to their contribution to the discussion group and thus the link with assessment was clear.

It could be said that the approach to Case D was much more prescriptive than in Case C. There were very few student initiated discussion threads in Case D whilst in Case

C there was a considerable amount of discussion activity initiated by the students. On the other hand there was some evidence from student comments that the consequent complexity of the discussion threads in Case C were difficult to follow. This may have been compounded by the size of the cohort. In Case C by Q4 discussion activity had virtually ceased with all students concentrating on their coursework assessment. In Case D the individual assessment was built from the earlier collaborative discussion and thus the discussion interaction was core to the learning. It is not to say that the same level of learning did not take place in Case C, but it did not take place in great measure collaboratively within the online discussions.

With regard to tutor input, it is interesting to note that in Case D the number of tutor postings was relatively low and the word count even lower. By encouraging the students to chair and summarise the discussions themselves, the need for tutor intervention appeared to be reduced.

## **5 Discussion**

This study has endeavoured to design a tool to measure online discussion group interaction. This Discussion Group Interaction Tool (DiGIT) has been applied in a number of different cases scenarios to indicate how it can be used to evaluate the quantity and quality of discussion group interaction. It has been applied to evaluate growth (or otherwise) of interaction longitudinally within a module, between the same module in different cohorts and between modules at different stages in the progression of students within a programme. Although the output parameters are relatively clear, the evaluation procedure is time-consuming and would not be appropriate for general programme evaluation. However, if students could be made aware of the model it may be possible for them to peer review and self-assess their own contribution. Perhaps this could even be input each by the student as part of the posting and extracted automatically as part of the software program.

The interpretation of the input parameters (enabling factors) is more difficult as the cause and effect to be interpreted from these results is more problematical. It is tentatively postulated that enabling factors relate to four aspects: [1] learning design and assessment; [2] tutor management and skill; [3] learner e-literacy and [4] peer-related learning. The most prescriptive learning design and specific link between discussion group interaction and assessment was in Case D and this related to a strong design that encouraged peer-related learning. In turn this appeared to reduce the requirements for tutor input. In Case C where assessment was more individualised, this appeared to lead to student-tutor dialogue rather than student-student interaction. In addition, at certain stages of the module discussion activities were abandoned for questions about the assignment and towards the latter weeks of the module discussion activity had largely ceased. On the other hand, there were a greater number of student initiated postings and a higher level on ongoing socialisation throughout the module. In Case C, learner-e-literacy problems with access and the use of the media appeared to be greater than in other courses and perhaps had some impact on the growth of students to a higher level on the stages model. In Case B, there was evidence of the most pro-active tutoring taking place, but this did not appear in itself to lead to a high level of discussion group interaction.

## 6 Conclusions

This paper has evaluated the use of a tool to measure the quantity and quality of online discussion group interaction in educational programmes. The output parameters (Results Factors) are relatively clear, but the quality evaluation procedure is time-consuming. It is considered possible that students could be made aware of the model, permitting them to peer review and self-assess. It may also be possible for this self-assessment to be input by each student and extracted automatically as part of Discussion Forum software capability.

The input parameters (Enabling Factors) are more problematic to interpret for cause and effect. Prescriptive learning design with specific link to assessment appeared to encourage both discussion quantity and quality. Alternatively, in those circumstances where assessment is not related to collaborative discussion, learners may abandon online discussion to focus on individualised work. Where the discussion thread is less prescriptive there may be more student initiated postings – but in large student groups this can lead to complexity and possibly confusion. Finally, where activities are more individualised, this leads to student-tutor rather than student-student interaction

There were some interesting conclusions related to Tutor Management and Skill. There were indications that Pro-active tutoring in itself may not lead to a high level of discussion group interaction, but that other mechanisms were also required. One of these is the importance of Peer-related Learning: where effective student leadership of discussions is organised and encouraged there is an improved quantity and quality of online interaction and also the tutor's intervention role may be reduced.

With regard to Learner e-literacy, it was found that access problems extended to a range of different levels of access difficulties as new and more complex resources are utilised throughout a programme. There was also an indication that large cohorts may have greater e-literacy problems with regard to access and use of media.

Although this study has been very much exploratory and to some extent experimental, it is suggested that the Discussion Group Interaction Tool (DiGIT) has made some contribution to measuring online discussion group interaction. Summary conclusions are provided in Appendix A.

## 7 Limitations and Further Research

There are a number of limitations to this study. Different programmes will have different learning objectives with regard to the importance of discussion as a knowledge-building mechanism. For example, Case C was more focused on individual endeavour. The difference in cohort size is also an intervening factor that requires further investigation. The use of a purposive sample where tutors were interested and understood the purpose of interactive discussions has also to be taken into account when considering how this exploratory study could be generalised. Further research is required to validate the use of the Discussion Group Interaction Tool (DiGIT) in a larger number of cases and educational environments. In addition, it would be useful to undertake further collaborative research with other institutions involved in online learning to further examine the enabling factors. This might permit

the construction of a Best Practice Template to guide educationalists on the design and management of this type of e-encounter.

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## Appendix A. Summary Conclusions

- The Discussion Group Interaction Tool (DiGIT) has the potential to evaluate the quantity and quality of online discussion group interaction
- **Results Factors**
- Output parameters (Results Factors) are relatively clear, but the evaluation procedure is time-consuming
- If students could be made aware of the model it may be possible for them to peer review and self-assess
- Perhaps this self-assessment could be input by each student and extracted automatically as part of the Discussion Forum software capability
- **Enabling Factors (Learning Design and Assessment)**
- Input parameters (Enabling Factors) are more problematic to interpret cause and effect
- Prescriptive learning design with specific link to assessment appeared to encourage discussion quantity and quality
- Where assessment is not related to collaborative discussion, learners may abandon online discussion to focus on individualised work.
- Where the discussion thread is less prescriptive there may be more student initiated postings – but in large student groups this can lead to complexity and possibly confusion
- Where activities are more individualised, this leads to student-tutor rather than student-student interaction
- **Enabling Factors (Tutor Management and Skill/Peer-related Learning)**
- Where effective student leadership of discussions is organised and encouraged, the tutor's intervention role may be reduced
- Pro-active tutoring in itself may not lead to a high level of discussion group interaction
- **Enabling Factors (Learner e-literacy)**
- Access stage extends to a range of different levels of access difficulties as new and more complex resources are utilised throughout a programme
- Large cohorts may have greater e-literacy problems with regard to access and use of media

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