E-learning for healthcare students: developing the communities of practice framework

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Aim. This paper presents research considering whether healthcare students were able to develop characteristics of communities of practice when engaged in an online module.

Background. Little is known about whether the communities of practice framework can be applied to online learning, with no previous consideration of its potential use within healthcare education.

Methods. Using a case study approach the research, completed in 2004, had two phases. A questionnaire was administered to a group of 109 healthcare students to gain information on which to base sampling for the subsequent phase. Phase 2 employed three strands of data collection: five students completed an online diary, the online interactions of seven students were captured on a discussion board and three students were interviewed. Data were analysed using a form of pattern matching.

Findings. Students were able to develop essential elements of communities of practice: mutual engagement, joint enterprise and shared repertoire, though this was not uniformly seen. Particular issues emerged for the online community, including enabling access to the online environment to support mutual engagement. The development of trust was also threatened by difficulties of presenting identities online. Joint enterprise was hampered by the online situation, although the virtual classroom proved essential for supporting endeavour. Not all students were committed to their groups. There was some evidence of group members developing shared repertoire, as routines of group working emerged. Professional understanding and computer skills were also enhanced.

Conclusion. The framework can be applied to supporting online learning internationally amongst students and has applicability to professional groups. Those intending to employ the framework should ensure that students can gain access to the community and have the computer skills to engage. Course design should be considered to ensure support for developing the essential components of communities of practice.

Keywords: case study research, communities of practice, e-learning, higher education

Introduction

The potential of e-learning to deliver flexible and innovative approaches in nurse education is recognized internationally (American Association of Colleges of Nursing 1999, World Health Organization 2001). United Kingdom (UK) policy drivers within higher education (National Committee of Inquiry into Higher Education 1997, Department for Educa-
This meant that mutual engagement was negotiating shared understanding of the action research and histories of the research partners created tensions in agreed deadlines being frequently missed. Shared repertoires seemed to impede the negotiation of joint enterprise, with when reliant on electronic communication. Dispersed work-research project group linked by electronic communication.

Somekh and Pearson (2000) used CoPs to analyse a European discussion group moderators in nurturing the online group. It highlighted the importance of webmasters and physically and virtually located community (Millen & Muller 2001). It showed the importance of webmasters and discussion group moderators in nurturing the online group. Shared repertoires and histories of the research partners created tensions in negotiating shared understanding of the action research approach used. This meant that mutual engagement was undermined, as negotiated meaning remained illusive.

In e-learning contexts, Rogers (2000) applied the framework to a small sample of 26 teachers and administrators participating in a 3-week workshop ‘Teachers of English as a Second or Other Language’. Analysing online dialogue, he identified the elements of community in his American study, but confirmed the need for further research. Chalk (2001) completed a case study in the UK involving three software engineering students, employing limited analysis of team documentation and responses to ‘hidden’ examination questions. The results suggested the online experiences constituted a CoP and that a virtual learning environment (VLE) could assist in the provision of such a community. Murray (2003) comments on the potential advantages to nurses forming virtual communities for exploring practice, information exchange and practice developments. This suggestion is referenced to an earlier PhD (Murray 2002) that has a focus with qualified nurses, rather than nursing students.

Debates surround the feasibility of learning in an online community (Kirkup 2002). Web-based learning has been viewed as failing to provide a meaningful community (Brown & Duguid 2002), with Dreyfus (2001) suggesting that learning requires a physical presence. Wegerif (1998), following research with 21 Open University students, proposed that successful learning online related to whether the student felt as an insider or an outsider, with importance being attached to feelings of belonging to a community.

Wenger’s (1998) presentation of identity developing through engagement in the community suggests an element of trust in the knowledge presented by the members (Kirkup 2002). This poses potential problems for an online CoP. The presentation of different personas or identities on the Web has been documented (Tomes 2001). Turkle (1997) suggests that Web users can adopt and present a range of identities, causing distress to those who trust the deceiver. With the potential for those engaging online to present a different persona, there is scope for falsely based identity development.

Shared repertoire (Wenger 1998) implies longevity of engagement, not always seen in online learning situations. It is felt that this may render the development of CoP unfeasible for short-term courses (Fowler & Mayes 1999).

The study

Aim

The aim of the study was to assess whether healthcare students were able to develop online CoPs. The overarching research question was: ‘How do the essential characteristics
of communities of practice develop in higher education online learning environments?

Design

Data were collected from a single case study through multiple methods (Yin 1994). A case can be determined as an individual, an event or an institution, constructed from naturally occurring situations (Hammersley & Gomm 2000). There are a number of reasons why a single case might be employed: to test or explore a theory, to record a unique event or to observe phenomenon not previously open to investigation (Yin 1994). This case included healthcare students studying an interprofessional module, so named as it is delivered to a range of healthcare professions; however, during the period of the research, it was being completed by nursing, radiography and radiotherapy students. The case was formed from students enrolled on the module, selected as it is delivered entirely online following an initial face-to-face introduction. It employs group working using Blackboard as the VLE, based on a constructivist learning approach that uses peer review and enquiry-based learning (Hughes et al. 2004). This case had specific boundaries related to enrolment on the module and provided a conveniently located sample of healthcare students.

The research had two phases of data collection, conducted in 2004 following a pilot study. A questionnaire elicited information employed in sampling students for Phase 2. This involved three strands of data collection. Discussion board interactions were accessed, online diaries completed and individual semistructured interviews conducted. This reflected the need for multiple methods of data collection within the single case study and employed techniques used by previous research teams exploring online learning (Foley & Schuck 1998, Tolmie & Boyle 2000). The approaches taken also allowed observation of online interactions at various points in time.

Participants

A total of 109 final year students were enrolled on the module (see Figure 1).

The sample was accessed through the initial questionnaire that allowed students to self-select themselves into Phase 2, thus reducing the potential for coercion. It was composed to support the selection criteria required, such as representing different age groups and males and females. Levels of confidence in computer use and previous online learning experience were used, rather than any assessment of specific ICT skills. The sample also included those accessing computers from different sites (see Table 1). The questionnaire reflected the key issues in the online learning literature (Akerlind & Treviit 1999, Hakkarainen et al. 2000, Richardson & French 2000, Kewell & Beeby 2003).

Phase 2 included 15 participants, as detailed in Table 1. Five students completed online diaries, seven were involved in the online discussion group and three were interviewed.

Data collection

Pilot study

Pilot work reviewed a previous discussion board and other data collection tools. One minor change to the wording of the title of the project resulted, substituting ‘pedagogy’ for ‘learning’.

Phase 1

All 109 students completed the questionnaire as part of timetabled sessions, securing a 100% response. This personal approach overcame many issues of poor return from unsolicited or postal surveys (Polit et al. 2001), but does raise issues about possible coercion, given the captive audience. The ethics committees approved this approach as students, although seen in one venue, consented to complete the questionnaire and were able to withdraw consent at any time without prejudice. Frequencies identified from the

![Figure 1 Healthcare education system from which participants were recruited.](image-url)
questionnaire responses were used to identify the sample for the second phase.

**Phase 2**

Five students completed an online diary, responding weekly to an emailed set of questions throughout the 6-week delivery period of the module. Completion rates were high, with only one student omitting to complete a diary in the final week.

Seven students were organized into one learning group within Blackboard, with facilitator and researcher access. The discussion board was visited daily throughout the 6 weeks, with student interactions totalling 327, relating to six discussion forums.

Three individual semistructured interviews were conducted at university sites. The interview started with an open question and was guided by a list of questions derived from the diary analysis. Students also rated their confidence in using computers on a scale of one (not confident) to ten (very confident). The interview discussions were tape recorded to facilitate transcription and analysis.

**Rigour**

Yin (1994) suggests quality may be maintained in case study research through employing criteria that support internal, external and construct validities and reliability. These have been commonly used to establish the quality of empirical research. Yin (1994) argues that, as case study can be seen as a form of empirical research, it is appropriate to apply such criteria in judging its rigour. Achievement of the criteria is enhanced through a number of strategies used in this research design.

In the present study, multiple methods of data collection and involvement of the participants in reviewing data interpretations supported construct validity. This also enhanced internal validity, ensuring students’ experiences captured in diary and interview data were a reflection of their views. There are a number of debates surrounding the generalizability of case study research, particularly when a single case is employed (Gomm et al. 2000). Eminent researchers in the field present arguments to support naturalistic generalization (Stake 2000) and intuitive generalization (Lincoln & Guba 2000). Both suggest that readers of the research will consider the generalization through recognition and transfer. This requires a full description of the case and the presence of clear boundaries, seen here through the detailed presentation of the case that is focused on one module. Providing a comprehensive research protocol of the procedures undertaken throughout the research will support reliability, allowing replication of the case study journey. A research diary was maintained throughout the study, recording a decision trail and case study protocol. This was audited by the external supervision team and subsequently used to support the presentation of the research journey.

**Ethical considerations**

The study was approved by university and faculty ethics committees. The proposal addressed issues of unequal status
in the researcher–respondent positions (Griffiths 1998) by limiting the possible effects of researcher power. This included ensuring no involvement in the delivery or assessment of the module and not having any other role in the students’ academic life. Information sheets were provided and students completed written consent forms prior to entering each phase of the project. These emphasized voluntary participation and that students could withdraw at any time without penalty. To support the maintenance of confidentiality, a number of steps were taken in data collection, storage and presentation. Discussion board data were stored under codes allocated to each participant that identified their programme of study but not their name. These were held in online files accessible only to the researcher. This approach was also taken with online diary data; these were emailed to a specific and password-protected account and stored under allocated numerical codes for each student. Pseudonyms were allocated to the three interviewees. Data presented were anonymized.

Data analysis

Yin (1994) discusses an approach to pattern matching, where the researcher matches data obtained against a predicted set identified from an existing theory. All data were analysed using a form of pattern matching, employing categories as suggested by Miles and Huberman (1994). A matrix of categories identified in Wenger’s framework (1998) was developed and evidence from the case study was placed into the appropriate categories.

The interpretations of the online diaries and interview transcripts were emailed to the participants, with a supporting letter asking them for any specific feedback on the interpretations. They were asked to consider whether these represented their diary accounts and interview discussions. The students’ responses accepted the interpretations offered without change, thus validating the analysis.

Findings

Mutual engagement

Enabling engagement

Students established early contact, introducing themselves and trying to interpret the assessment guidelines. This socializing is important within models of online teaching and learning (Salmon 2000), and is essential to community working. Despite this, social exchange was stilted at times. Delays in asynchronous (not real time) communication were problematic when the group needed to make decisions. The virtual classroom enabled more ‘instant’ communication at these times, as seen by Hughes et al. (2004). The discussion board data reflected the benefits of working in e-based groups. Learners were able to engage with other professional groups across geographically disparate sites, an opportunity denied in previous face-to-face modules.

Enabling engagement in the virtual community raised access issues peculiar to the online setting. These included problems accessing a computer with an Internet connection, difficulties for students lacking computer skills, technical issues and problems with admission to the learning environment. Access issues identified early in the discussions suggested that students felt this might affect on their ability to interact online. Difficulties with access and ICT skills in relation to online discussions and e-based learning are acknowledged in the existing international literature (Milstead & Nelson 1998, Andrusyszyn et al. 1999, Geibert 2000, Gillis et al. 2000, Moule 2002, Hong et al. 2003). The importance of enabling engagement within CoPs is about more than enabling discussion online, but engagement is necessary for the relationship development needed for the functioning of the community. It is also important to support the shaping of individual identities as a product of negotiated experience and community membership (Wenger 1998).

A participant reported:

Personally I haven’t got a computer at home. I have to come in to Uni to access my mail. I already feel left out. At the pace we are going I think I will have to come in at least three times a week. (BSc Adult Nursing)

A number of globally based studies have also identified the difficulties for students engaging in online learning when access to a home computer is denied. Canadian researchers (Kozlowski 2002), evaluating a limited sample of seven nurses, commented on the convenience of using e-delivery. Reports also suggests that flexibility and convenience of use, often espoused in online learning (Andrusyszyn et al. 1999, Geibert 2000, Conole et al. 2002, Atack 2003), was limited by the nurses’ lack of access to home computers. Computer-based delivery has been seen as more convenient by nursing students studying in Tasmania, where 18 of the 25 had access to home computers (Martyr 1998). The importance of home access was the subject of research in Wales involving one cohort of learners (Geershuis et al. 2002). The flexibility of laptop use was valued by the nursing students involved (Krayer et al. 2003).

A number of students coped with technical issues, as illustrated in their diary accounts with one BSc (Child) student suggesting that ‘Radiographers have been unable to access Blackboard for a number of days.’
The manifestation of technical problems and concerns with technical skills in online learning are not unfamiliar and are reported internationally. Gillis et al. (2000), when recording female nurses’ experiences of using multimedia technologies in the United States of America (USA), recalled problems with the email system and Internet use. Cooper and McConnell (2000), researching in Scotland, found that network issues caused access difficulties. In addition to experiencing technical problems, there were concerns about computer skills, as noted by one Diploma in Adult Nursing student: ‘Me and computers do not mix, having written this for the second time because it crashed on me!’

A number of studies have alluded to difficulties with the development of students’ technological skills (Andrusyszyn et al. 1999, Geibert 2000). Canadian research with Registered Nurses recorded that the 11 females not only experienced problems, but also were reluctant to use the technical help provided, fearing they would be unable to execute the advice offered (Atack 2003).

Defining and maintaining identities

Communities are composed of individuals with unique identities. Their contributions to the community will influence other members and be based on their backgrounds and interests. In the present study, professional identities were presented online, with students reporting that they had learned about other professions and their ways of working. There were, however, some tensions around this. The absence of visual clues in the community led to assumptions being drawn about the cultural and gender identity of individuals, as noted in previous research (Barrett & Lally 1999). The discussion group learners were unaware that two members were African. Gender identity seemed to be hidden in some groups, and students referred to presenting themselves differently when learning online:

At the start of a classroom experience I would have been quieter. With this, I felt I had to go on at the start and say, ‘Hello, this is me!’ and get on with it. (BSc Child Nursing student)

A number of authors have expressed concerns that online environments create opportunities for individuals to present alternative personas (Turkle 1997, Tomes 2001, Kirkup 2002). This can be particularly difficult for females, who report feeling harassed in chat rooms (Herring 1994) and continue to have problems of confidence and competence, despite suggestions that technology access and literacy may be improving for women (McSporran & Young 2001, Gunn et al. 2002). In a situation where the authenticity of presentations is unclear, the development of trust will be affected. This is important to identity development, which draws on knowledge shared amongst the group (Kirkup 2002).

Forming relationships

It is anticipated that sharing practice will help forge mutual relations within the group. Research with physician students in the USA (Kamin et al. 2001) found that web-based groups reported difficulties relating to each other. Indeed, data collected from this case included some examples of supportive and personable data. However, it was apparent that one BSc Radiography student preferred to strengthen links within his existing professional group, not investing in his online community: ‘the majority of the information I am getting is obtained from fellow students, not my IP group.’

Developing group leadership proved difficult for some, whereas members of the discussion group had a clear leader whose organization of the group was appreciated. This was perhaps a reflection of the group composition. Most students already knew at least one other member of the group before starting the online module, a factor seen as beneficial to group working by Andrews and Schwarz (2002). Studying 114 business students in Australia, they reported the benefits of online group working where team members with prior knowledge of each other achieved a higher performance.

Joint enterprise

Negotiating endeavour

Endeavour is negotiated within the community although, as the students were completing a module with learning outcomes and assessment criteria, their enterprise was to some extent predetermined. Data revealed examples of negotiation, including the development of a critiquing framework and assessment approach. It was also clear that groups used the virtual classroom for much of the negotiating activity, as recalled by a BSc Radiotherapy student: ‘They used the virtual classroom to discuss the guidelines. It was clear it was going to need a lot of negotiation.’

Previous research with 96 nursing students in the USA, comparing classroom and web-based delivery, found that the immediacy of interaction in the classroom was important (Ryan et al. 1999). Given the importance of negotiation, it is interesting that not all groups in the present study were able to fully engage in this. Interview data suggested that they were able to meet the module outcomes without engaging with their groups. It is difficult to know whether technical issues adversely affected the engagement experienced. Alternatively, a lack of computing skills or trust amongst members, which can be an important factor in online group success (Wegerif 1998, Murphy et al. 2000), could have
affected engagement. Research also suggests that individuals can be reluctant to engage in online groups (Brown 2001). The present findings may also reflect problems seen in other dispersed groups working online, as reported by Somekh and Pearson (2000), where group members missed deadlines as they failed to consciously remember responsibilities to remote partners.

**Disagreement**

Not all members of the community will necessarily agree on endeavour, with joint negotiation needed to move forward. Data identified that disagreements occurred amongst the group members, with a suggestion that students may be more inclined to disagree in such environments. Such findings corroborate with those of Rogers (2000) and Chalk (2001): I think that people talk more openly online. If group members disagreed with a proposed guideline it was easy to say so, as we weren’t face-to-face. (BSc Adult Nursing student)

**Mutual accountability**

Mutual accountability relates to taking a responsible approach towards fellow group members. Here, there was a contrast in the data. The discussion board revealed evidence to support mutual accountability. The group negotiated ground rules, members posted work on time and provided timely feedback. Additionally, despite the difficulties three members had in accessing the Internet, all regularly contributed to discussions and group working. There was diary evidence that students were giving advice and sharing resources with fellow group members. Data also revealed a number of concerns. Some students, including one Diploma in Mental Health Nursing student, reported that group members were not logging on to the discussion boards: ‘as I mentioned earlier, there only seem to be myself and two others who are pulling our weight’.

The students believed that online group learning could foster a lack of parity in effort, with some perhaps learning from the group without making a significant contribution, being online ‘lurkers’. The reason for such behaviours can only be postulated and may be related to a lack of skill, trust and relationship development in the groups. It could be compounded by a lack of technical skills. Indeed, Andrews and Schwarz (2002) found that team relationships and understanding of technology had an impact on performance. A further explanation may relate to the time taken to engage in online learning. A number of students referred to having difficulty investing the time required. The expression of feeling ‘time poor’ has been raised in previous research (Gillis et al. 2000, Conole et al. 2002, Steele et al. 2002), seen especially where students were devoting more time to learning how to use the technology, which may well have been the case for some in the present study.

**Shared repertoire**

**Shared understanding**

A number of students had learnt from others in their group, although for some the experience had been a lonely one. Students can prefer autonomous working. This can particularly be the case if collaborative elements are not focused on the assessment or are not seen as relevant (Ragoonden & Bordeleau 2000). Students can also prefer face-to-face learning, as seen in research with 12 Master’s degree students who avoided the online environment in studies by Tolmie and Boyle (2000) and a study by Monteith and Smith (2001) evaluating VLE support. Although the group discussions and working was linked to the ongoing and final submissions of course assignments, it seems that there was scope for individuals to complete assessments with minimal negotiation and joint working.

**New meaning**

The negotiation of new meaning is dynamic within the community, with new ideas being created from common interpretations. New meanings were developed, particularly in relation to professional practice, as noted by a Diploma in Adult Nursing student: ‘I’ve learned more about the other professions…and how they can help me in my role.’ Research reviewing students learning online has found them capable of deep learning (Rosie 2000), and a review of group learning in the UK found members to be influenced by other group members (Gunawardene et al. 1997).

Interview and diary data revealed learning of critical review and computing skills, with previously recorded confidence scores increasing. The achievement of computer skills as a direct result of online learning is also reported in the literature (Gillis et al. 2000, Atack 2003) and is echoed here.

**Discussion**

Students working in a virtual community needed to overcome access issues not normally present in physically located environments. Access to computers and the Internet affected the experience of some. A lack of computer skills had an impact on a number of students, affecting engagement. Ensuring access to all components of the learning environ-
ment was an additional requirement. Technical issues with access to Blackboard affected the student’s ability to join in online discussions. Additionally, the asynchronous (not real time) modes of communication proved problematic when groups were trying to negotiate. At these points the synchronous (real time) chat afforded by the virtual classroom supported decision-making.

There was potential for gender and culture differences to remain illusive, apparent as discussion board members had not appreciated the cultural diversity within their group. Students confirmed that they presented themselves differently online, suggesting there was scope to present a different persona. There was evidence of individuals failing to engage in community endeavour, possibly ‘lurking’ and learning from others without contributing.

Development was hampered by the brief existence of the community. However, the engagement supported the development of computer skills amongst many and enhanced their understanding of other professional groups.

The following augmented theoretical framework (see Figure 2) is proposed for use in online environments. This includes a number of facets to support the application of the framework to online learning contexts.

To support mutual engagement, issues of computer and Internet availability to enable online learning access need addressing. The development of computer skills necessary to engage in the community requires consideration, as does the need for technical support. Joint enterprise embraces the development of trust and the support of identity presentation as added facets. These support members of the community in negotiating and maintaining endeavour. Longevity of online communities is required to enhance the development of shared repertoire.

The proposed model represents the three main components of CoP (Wenger 1998) arranged in a structure that adapts the original presentation. The additional facets are attached using interrupted lines to depict the possibility of the community continuing to exist in physical environments. The structure also offers scope for the online facets to support physically located contexts. For example, the development of trust, whilst identified as important to online communities, is also likely to impact on physically located communities.

Group membership affected the development of trust amongst members. Andrews and Schwarz (2002) have reported the benefits of identifying group members with prior knowledge of each other. Although it may not be possible to replicate this in groupings, it should be given consideration. Should a group be composed of unfamiliar members, early introductions that might include an exploration of professional histories and values might aid identity sharing.

Engagement in the community supports the key dimensions of mutual engagement, joint enterprise and shared repertoire. Approaches recommended to support this include the use of an assessment-driven focus that couples outcomes to online activities. This could be augmented to include assessment that allows students to reflect on their learning and identity development, as suggested by Rogers (2000). Course longevity is also worthy of consideration, as personal investment might be positively affected if the community were maintained for a greater period of time.

Figure 2 Augmented theoretical framework (adapted from Wenger 1998).
Community computers and software, technical support and computer skills are crucial to support engagement online. Access to computers, the Internet and components of the VLE require consideration. Technical support should be available in a format that encourages use, given the suggestion that learners are reluctant to obtain help (Atack 2003). Facilitators will need to ensure students have the necessary computer skills to enable engagement. Community membership might also reflect a composition where members in the group with a greater repertoire of skills support less confident or able computer users.

Study limitations
The interpretations presented reflect the data from one case study site and the experiences of a select student group. Although the short period of engagement was thought to have adversely affected the development of shared repertoire, as suggested by Fowler and Mayes (1999), difficulties encountered in data collection must also be recognized. Identifying elements of shared practice proved problematic. Discussion board data lacked the richness that might be observed in a physically located community, with evidence of routines, ways of working and shared language being limited to text presentation.

Conclusion
Engaging students in an online CoP has the potential to support the development of professional identity and can be employed in distant or work-based learning contexts, both nationally and internationally based. Thus, there is scope to include members of the healthcare professions and students in other higher education fields with a similar professional theory/practice relationship, such as education and social work. Those intending to apply the framework as developed for online learning will need to ensure that a number of issues are considered.

A number of recommendations about the use of CoPs for online learning communities both nationally and internationally based can be made as a result of this research. The CoP provides a framework that can be employed to support communities of learners engaged in forming relationships and developing individual professional identities across geographical boundaries. There is scope to employ this approach to develop a shared understanding of professional practice and create relationships between members that can work to the benefit of the community and those it serves. Such communities need not be limited to learners, but groups of professionals can engage to explore professional practice issues and ultimately contribute to practice development. Those wishing to embrace CoP for online use should consider the following:

- Access to the learning environment should be ensured through the development of necessary computer skills amongst users and the provision of technical support.
- The composition of groups can affect performance and group familiarity should be considered or socialization processes included.
- Online learning should be designed to facilitate socializing activities that allow exploration of individual histories and values.
- Linking group activities that necessitate the involvement of members to assessment processes or practice development can improve engagement, as can course longevity.

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