Strategies Employed By Participants In Virtual Learning Communities

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Abstract

This paper examines the learning behavior of online students in an asynchronous learning environment. We employ the theoretical lens of an online community of inquiry, to understand how students build an understanding of course concepts as part of an online community of learning. Findings are presented from a study of an online, graduate University course. Student behavior was analyzed to investigate the detailed learning strategies employed by various students. An e-learning framework was devised, that identifies various types of behavior, each of which is associated with the distinct needs of an online learning process. We conclude with the reflection that we may need many different types of course interactions for different types of learning role.

1. Introduction

Online learning in Universities is increasingly seen as an area of probable growth. Common perceptions are that online learning provides a way to (a) achieve greater economies of scale than traditional, face-to-face education delivery methods and (b) provide more open access for members of disadvantaged groups. However, if we are to provide students with an effective learning experience, we need to learn to design online learning environments in different ways than those associated with face-to-face classroom environments. Otherwise, online learning suffers from a paucity of experience, where students are expected to take responsibility for their own learning, but are given none of the social support system that makes this possible in a traditional classroom setting. Tait [43] argues that, if falling retention rates are to be reversed, we need to address issues of how students bond with the course and the institution, and how appropriate intervention to support the emotional needs of learners may be designed.

In order to understand how best to design and moderate online learning, we need a fundamental and deep understanding of the processes engaged in by members of online learning communities. First, we need to examine the validity of characterizing online learners according to models of learning types derived from conventional pedagogical models. Online learning may have similar aims to face-to-face learning but may be fundamentally different. The tools and structures embedded in online learning may have a material effect on the kinds of contributions made by learners and the various interactions between learners, teachers and learning material [13]. Second, we need to account for how online learners behave when confronted with different types of learning problems. The majority of analyses focus on well-bounded problems: there is little research on online learners faced with ill-structured or "wicked" problems. We know that problem-solving behavior for ill-structured problems is different than that employed for well-structured problem-solving [32, 39]. Everyday work is not nicely packaged and well-structured [22]. As the boundary between work and lifelong learning is becoming increasingly blurred, it behooves us to try and deal with the kind of open-ended problems that we typically face in real life.

2. Conceptual Background

2.1 Characterizing Online Learning

Recent studies emphasize that students must take control of their own learning, for a successful outcome, especially in an online environment [5, 48]. To be effective, online environments must permit students to construct and to test their knowledge, as they learn. Students must develop strategies to recognize what they understand and when they need more information [5]. However, students also need to develop strategies to assess sources of information and to direct their own learning as part of a community of learners [12, 25].

The dominant model now emerging for online learning models is collaborative and asynchronous [17]. Computer-mediated communication tools such as email ListServs and discussion boards are often used, but require a great deal of structuring and instructor interaction, to fit with pedagogical models that incorporate the richness of experiential learning and reflection needed for deep learning [20, 23, 36]. A popular structuring mechanism is to consider individual learning styles, such as those devised by Honey and Mumford [19], who characterise learners as Activists, Reflectors, Theorists and Pragmatists. However, it is unclear how consistent or static any individual's learning style is [40]. It is also not clear how a knowledge of individual learning styles can be translated into a useful pedagogical structure. In fact, there is evidence to show that learning style is driven more by the learning environment, than by an individual cognitive style [9, 16].

We would therefore argue that human learning is more complex than can be attributed to a simple classification of cognitive style. While individuals may lean towards a preference for one kind of contribution, this changes with the context of learning. Certainly, there is evidence that students' learning styles do not affect their performance in a web-based learning environment [26]. If anything, an individual's learning strategy may be socio-cultural phenomenon, arising from membership of a specific professional group or discipline, rather than a cognitive one [24, 41].

This position is supported by the work of Scardamalia and Bereiter [35], who argue that, by focusing on individual learning, educators have failed to understand the social structures and dynamics required for progressive knowledge-building. What is missing is a detailed understanding of how learners participate in a social, community of inquiry [25].

2.2 Student Behaviors In A Community of Inquiry

If we view online learning as taking place within a social setting, knowledge is not merely transmitted but is constructed, within a framework of community behavioral norms, genres and social expectations [22]. To each member of a learning community, other members represent "a distributed information resource enabling the construction and reconstruction his/her own cognition" [42]. The use of online media may impede the richness of information found in face-to-face settings, but human beings still act to place the information that they have into a social context, as they evaluate its usefulness. This may be more important in determining how they assimilate new information than the widely-debated information leanness of electronic media [28].

Figure 1 shows a model of a community of inquiry provided by Garrison et al. [13], who argue that an online learning community relies on three elements: cognitive presence, social presence and teaching presence.

Cognitive presence is the extent to which the participants in a community of inquiry are able to inquire into and construct meaning, through sustained communication [13]. There are two main components to cognitive presence: *Critical inquiry*, which involves behaviors that demonstrate creativity, problem-solving, intuition and insight, and *Practical inquiry*, which includes behaviors that reflect imagination and reflectivity leading back to experience and practice [14].
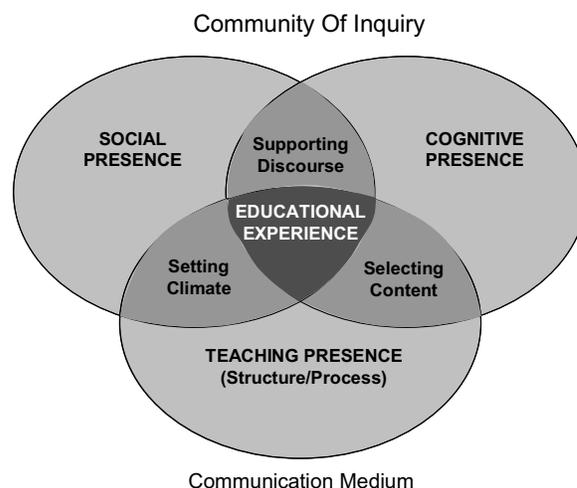

Community Of Inquiry

Communication Medium

Figure 1: Online Community of Inquiry (Garrison et al 2000)

Social presence is the ability of learners to project their identity and personal characteristics into the community of inquiry [13]. There are two main components that contribute towards social presence; *Affect* (the use of emoticons, humor and self-disclosure (and reciprocation), and *Acknowledgement* (recognition of other individuals' contribution to the community, such as evidence that the other is attending, addressing participants by name, acknowledging the contributions of others, or the use of inclusive pronouns in community discourse) [34].

Teaching presence involves two elements: (i) the design of the educational context and experience, and (ii) the facilitation, and direction of the educational processes [13]. Through including specific content and processes in the learning environment, the instructor may guide the learning experience in distinct ways. The instructor frames course concepts and also presents these in the context of other concepts, to produce a specific worldview. This is accomplished through the use of specific language and the design of a series of interactions. But students also engage in these behaviors and that is what of interest for the scope of this study. Students may make *Course-design* contributions, suggesting new or alternative structures or course content. They may also make contributions that provide *facilitation, and direction*, to guide the thought of others. For example, they may re-purpose or re-interpret course materials, or they may contribute personal insights and alternative views of concepts covered in the course [2].

Building a sense of community and fully utilizing the social-technical capital imbued in it are of key importance [30, 31]. As in any other community, members will not enjoy the maximum benefit if they feel themselves to be outsiders [45]. But while computer-mediated communication may make it easier to cooperate at a distance, it also makes it easier to be more selfish

than in face-to-face communications [21]. This is epitomized by the phenomenon of lurkers, who belong to communities but make no material contributions to them and merely leech from the contributions of others [29]. However, students who do not contribute to discussions may still be using the community effectively, as they engage in "vicarious learning" [4, 7]. By modeling how the world works, from the experiences and examples of others, students engage in passive learning that requires less engagement and risk than active participation. Passive learning is difficult to assess. However, an effective way of assessing the impact of various sources of information on passive learners is to capture the number of times these learners have read the messages posted by others [18].

An effective learning environment must therefore operate in three distinct ways. It must provide the opportunity for social interactions and constructive discourse [13, 22, 36]. It must provide students with the information and content required for them to understand course concepts, both through engaging with course processes and vicariously [7, 13]. Finally, it must provide instructional structures and processes to guide the student learning [13].

2.3 Research Questions

If we are to understand how to provide the conditions under which students may direct their own learning as part of a community of learners [12, 25], we need to understand learning behavior within a social environment. Thus, our research questions reflect this objective, using the specific lens of a community of inquiry. We therefore derived the following research questions, to guide our study:
1. Are there specific behaviors that represent participation in a *community* of inquiry?
2. Do individuals display dominantly one type of behavior, or does this vary?
3. Are there specific individuals who have more influence in the community than others?
4. Do people appear to learn from each other and are there different behaviors that reflect different modes of learning as a member of a community?

3. Research Method

To answer these questions, we performed an exploratory study that examined the online discourse for an online graduate Information Systems degree course at a North American University. We performed an analysis of 1063 messages posted to the course discussion board by 23 students enrolled on a Management of Information Systems course. Students were required to post messages to the course (this was worth 10% of their course grade), but community interactions were not made an explicit part

of the reward system. The course required students to prepare individual bi-weekly assignments and to participate in weekly discussion forums on associated (but not directly-related) topics, using commercial discussion board software (Blackboard). The forum topics were set by the faculty member who designed the course and also acted as the main course instructor, moderating the online discussion. The software allowed for the capture of basic statistics such as how frequently students viewed messages and visited the discussion board. This study examines data from the discussion board taken from the all ten weeks of the course, including the initial "please post something about yourself" topic. The course material was deliberately open-ended as befits a graduate level course; students were not expected to reach a final conclusion on a particular topic but were expected to display critical thinking skills. Each week, three questions were posted, to which students were expected to respond. Topics ranged from the conceptual (e.g. "What role does IT play in organizational success") to the practical ("Is there any such thing as a turnkey system?"). Most students had prior industry experience and the majority were working in IS-related jobs.

Data from individual discourse in discussion board postings were coded qualitatively [8, 38], using a thematic comparison to discern differences between individual contributions. A content analysis was carried out on the student discourse for the first 3 weeks of teaching and the pre-teaching introductory forum. We posited a framework based on Garrison et al.'s [13] 3 types of interaction required for effective learning (Teaching, Social and Cognitive). However we expanded this framework to discriminate between different types of contribution. For example, some types of message appeared to be posted for the purpose of interaction with the instructor, some for the purpose of interaction with other students, and some messages displayed no intention of being interactive. Through an analysis of the content of student discourse we were able to recognize a number of contribution roles that individual students played in the discourse. These roles were validated in discussion and co-coding comparisons between the two authors and refined during several passes through the discourse, during which the coders used a sample set of statements to be sure they agreed on role-definitions and assignments. We categorized a set of distinct behaviors, based upon our reading of the literature, discussed above, and on patterns that we discovered in the data. The results from this analysis are presented below.

4. Findings

4.1 Patterns of Access

Each week a variable number of open-ended questions were posted by the instructor. There were a total of 951

responses to the questions. Total responses per week varied from a low of 43 (week 8) to a high of 162 (Week 2). There was a weak negative correlation of -0.68 between the number of questions posed (between 1 and 4) and the number of responses per question. The first two weeks were the most active weeks in terms of postings (157 and 162) after which postings settled into a more sedate pattern, if we remove the first two weeks (as a settling in period) there is a negative correlation of -0.80 between the number of questions posed and the number of responses per question. It is difficult to make too many inferences with such a small sample but for this class and the specific material presented there seems to be a sweet spot at between 1 and 3 questions where the most student participation occurs.

Over a ten week period there were 25,937 visits made to the discussion board by students, individual patterns ranged from 331 to 2179 visits, there was a positive correlation between frequency of board visit and final course score (0 – 50) of 0.94. For the same period there were 951 non-instructor posts to the discussion board (a range of between 1 and 154), the correlation between student postings and final course score was 0.95, however student contributions formed part of the grading criteria so this cannot be surprising. The correlation between student discussion board access and discussion board postings was 0.69.

4.2 Student Roles In The Community Of Inquiry

Profiles of individual learners were built up on a further analysis of the discourse. The initial method of categorizing contributions examined each individual posting to the discussion board for content on each of the three learning dimensions identified by Garrison et al. [13]: (Teaching, Social and Cognitive). But it was discovered that, within each dimension a posting could potentially contribute in different ways. As many messages displayed evidence of multiple types of behavior, for example social networking or cognitive analysis of course content, it proved most useful to analyze the combinations of behaviors that students displayed, as there did appear to be a key set of combinations that occurred. These combinations of behavior were rarely combined in the same message and so we employed role definitions to summarize the complexity of community interactions engaged in by students.

We identified eight primary roles played by students, during this analysis. In the examples that follow, we provide example messages from students acting in each role, to give examples of the different ways in which students in these roles interrelate. Names, where given, are pseudonyms.

Initiator

An analogy for this type of behavior is that of a social "spider": someone who sits at the center of a web of social connections. The core behaviors associated with this role are social: sending out multiple messages that are often unrelated to the work in hand, to set up and to maintain a social network of people who would recognize the student as someone accessible, with whom to interact. The Initiator appears to look for points of connection such as affiliations, occupations or hobbies. Where no obvious connection exists someone in this role may simply comment on another participant's background and ask general questions. This is not necessarily a purely selfish action as this frequently acts to draw participants out into the community.

Hi, xxxx. If your contributions to the XYZ class discussions are any indication, I think you'll be giving the class a few things to think about, as well. Good to see you back!

An Initiator often starts a debate by providing an initial understanding of the problem or a possible/partial solution, an initiator may also express a framework for a solution:

Most critical things to consider in planning for IS? Here are a few, as I'm sure most people have plenty enough to read by now:; - Is there an enthusiastic key stakeholder at the right level to fund the project? Or, is there an unavoidable business need (e.g. changes/updates for ABC) that drives the project?

Contributor

This role can be likened to that of a "journeyman". A student in the Contributor role tends to project their identity through their messages and to add their view on the existing debate, but does not change the nature of the debate. Students in this role appear to be fulfilling their contractual (grade-earning) obligation to contribute, but do so in a minimalist way. They may give examples from their own experience, but these are brief and more often they just quote examples from course readings to support their position. Even their socializing is not designed to elicit interactions:

Hi! My name is xx. I live near yy and work in zz. Currently I am a user interface designer for a web application for a mortgage insurance / financial services firm. I think this is my 8th class in the program. I Look forward to working with you!

A simple contributor will add to one argument or another, they may frequently do this by using examples from personal; experience, contributors may also explicate positions.

I do agree that there are portions of IT which have already been commoditized. Several of these have been mentioned in other postings and in Carr's article (storage, networks etc). In fact, in Champy's

rebuttal he concludes that "IT will eventually become a commodity..."

Facilitator

A facilitator acts like a conceptual "middleman". The facilitator acknowledges and draws out further debate on a question, and gets things moving by throwing out community-oriented questions, such as "how would this happen?", or "I disagree with XXX but what do you think?". They often resolve external or logistical problems for other students, moderate discussions, warn the community when a debate is wandering off topic, and actively acknowledge other students' contributions.

Sounds like your work in the ABC, might provide you some insights into this class. Do you think so?

A Facilitator will often acknowledge good ideas from participants and discuss how these can be used.

Fred, I like your definition of a commodity. I think that the Microsoft suite of applications, the operating system, Word, Excel, Powerpoint, Outlook, have become the commodity standards in the industry, for the most part.

A Facilitator may also expand other's examples, by providing further insights along the same lines:

That's a good example. Company-X puts some similar intelligence around its customers' behaviors as well. I occasionally get emails advertising new books that would be interest to someone who's bought "such and such" in the past. ... I too have bought things as a result of these marketing methods.

Knowledge-elicitor

A peer-knowledge-elicitor – a "seeker" – is someone who consistently seeks information from their peers about what to do and why. They frequently ask for advice or explication about the current task.

Can somebody please clarify for me what diagram we have to create the one that is on slide 22 or 28 or both? I just wanted to make sure that any of those two is OK. Thanks

Vicarious-acknowledger

A vicarious acknowledger ("me-too") demonstrates a recognition that someone else's contribution influenced their perspective (positive or negative).

I completely agree that any communication to high level management (especially the CEO!) needs to be very clear and succinct. I am a bit concerned that a single spaced two-page memo can be brief or succinct.

Complicator

A complicator is a "reframer": someone who redefines an initial position (initial question or someone else's response) or suggests alternative perspectives. A Complicator points out inconsistencies in arguments, provides alternatives or alternative approaches, shows complications that arise form an approach and may reframe questions:

That is not an easy question. It depends the business model and the impacts of IT on such models. If IT is restricted to general support then IT doesn't matter. If IT could change from the back office support to reshape the entire business then IT does matter.

Closer

A "Closer" is a synthesizer – someone who pulls together a final or coherent answer to the question. A Closer often acts to bring a debate to a conclusion. Closers reconcile differences and combine threads of arguments.

Does IT really matter anymore?
Just ask WalMart, UPS, Amazon, Ebay or even Xerox and Apple if it really matters. All of these companies are continually attempting to innovate current technology to develop an edge over their competitors. Even though Apple & Xerox are currently minor players in their fields, as long as innovation continues to drive IT forward, they could be at the top of their class 10 years from now.; In my opinion, IT, science and medicine will never become commodities. All three will continually progress forward and will always truly matter.

Passive-Learner

The passive learner is a "freeloader", making minimal contributions and providing little or no projection of self into community. A freeloader makes no notable contributions. Freeloaders (called lurkers in some contexts) may learn vicariously or may bring learning from the online community into the real world. However, in terms of community participation, there is little evidence of their presence or their learning.

4.3 Patterns of Contribution

Table 1 summarizes the percentage of postings that fulfilled each role, by student, over the total period of the course. We allowed each posting to contribute only once to each role, this was felt to be important as each message appeared to fulfill a primary objective on the part of the student and this prevented the more verbose students biasing the analysis.

Apart from the first set of postings, in which students introduced themselves, we found that the great majority of student postings were made in the "Contributor" role. This is to be expected: as part of a student's grade depended on the quality of their contributions, they naturally add their view to the existing debate, but did not substantially change the nature of the debate. This type of behavior incurs a lower cognitive cost than more synthetic

discussions [1]. Facilitator was the second most frequent role adopted, which demonstrates clearly that students saw participation in a community as a critical part of their online presence.

Table 1: Percentage of Postings In Each Role, By Student

	Init	Comp	Con	Fac	PKE	V-A	Cl
1	0	0	83	0	0	0	17
2	0	3	77	7	3	10	0
3	0	7	43	32	4	4	11
4	0	14	64	14	2	3	3
5	0	9	52	29	0	5	5
6	0	8	50	30	2	2	8
7	0	18	55	18	0	0	9
8	0	7	64	7	14	0	7
9	0	0	33	44	11	0	11
10	0	0	100	0	0	0	0
11	0	11	25	50	11	0	4
12	0	11	47	30	6	2	4
13	0	6	52	32	6	0	3
14	0	0	82	6	3	3	6
15	0	5	60	25	0	0	10
16	0	18	82	0	0	0	0
17	0	5	51	32	3	5	5
18	0	0	87	4	0	4	4
19	0	5	67	24	0	5	0
20	0	10	50	40	0	0	0
21	13	4	24	51	4	2	1
22	0	11	78	4	0	0	7
23	4	0	67	24	2	2	2
Ave	*0.7*	*6.6*	*60.6*	*21.9*	*3.1*	*2.0*	*5.1*

5. Discussion and Synthesis

5.1 Student Behaviors and Communities of Inquiry

The first research question asked:

Q1: Are there specific behaviors that represent participation in a *community* of inquiry?

A number of things emerge from this analysis. The first is that there are specific *roles* that students adopt, to promote and interact with the community of inquiry. ***Each role represents a consistent pattern of behavior***

that appears to indicate an awareness of the student in relationship to a wider community of inquiry. These are summarized in Table 2, where they are related to the main types of behavior displayed for each role, according to the categories suggested by Garrison et al. [13]: social, cognitive, or teaching. Individual students do not appear to conform to a single role, although the dominant role varies among students.

Table 2: Student Roles in A Community of Inquiry

Role	Analogy	Main Behavior Types [13]
Initiator	Spider	Social
Facilitator	Middleman	Social, Teaching
Contributor	Journeyman	Social, Cognitive
Knowledge-eliciter	Seeker	Social, Cognitive
Vicarious-acknowledger	Me-too	Social, Cognitive
Complicator	Reframer	Teaching, Cognitive
Closer	Synthesizer	Social, Teaching, Cognitive
Passive-Learner	Freeloader	Cognitive

The role of "Closer" (the person who draws together and summarizes diverse argument or discourse threads) is relatively infrequent (5% of contributions). Given the open-ended nature of student discussions, this is hardly surprising, as synthesizing such a complex set of ideas requires a great deal of understanding – understanding which is emergent, in a community of inquiry. What emerges is a pattern where the majority of contributions are initiations or adding to an existing position but where there is also a noticeable number of contributions which could be characterized as refining the debate and giving it momentum (Complicator and Facilitator).

The Complicator role, who reframed or "complicated" the debate on a topic, was found to be infrequent (7% of contributions). This role may stimulate cognitive breakdowns [47] in other students' tacit knowledge and the reflection-in-action that leads to new knowledge internalization [37]. This is arguably the hardest role to achieve. If we wish students to achieve deep learning, we need to support such breakdowns through the encouragement of collaborative inquiry. The instructor often plays this role explicitly, but our study has demonstrated that the views of other students also have this effect.

Each role appears to demonstrate a specific combination of the behavior types identified by Garrison et al. [13], in their community behavior. However, there were finer shades of this behavior displayed than could be explained by assignment to simple combinations of these behaviors. For example, a combination of primarily Social and Cognitive behaviors were observed in posting

by Contributors, Knowledge-Elicitors, and Vicarious-acknowledgers. Yet postings from students in each of these role-pattern were quite distinctive from each other. We would therefore argue that Garrison et al.'s [13] types are insufficient to explain online community of inquiry behavior – we need to expand these types to distinguish .

5.2 Consistency in Roles and Behavior

Q2: **Do individuals display dominantly one type of behavior, or does this vary?**

In different weeks, the same student could display different patterns of posting behavior (profiles) in terms of the dominant role that they played within the community. Patterns of posting behavior change from week to week, as we can see from Figure 2. ***So students do not appear to adopt a single mode of behavior, but to adapt it to the contingencies of the current learning task.*** This evidence may refute theories that argue that students adopt personality-based learning-styles.

Weeks 7 & 9 were characterized by relative jumps in the prevalence of contributor messages as opposed to facilitator messages. We have a possible explanation for this. In Week 7 students were as obsessed by offshore outsourcing challenges. In Week 9 students were presented with tie-up questions requiring synthesis across course – students were focusing on completing assignments, as a higher priority (resubmitting and understanding final assignment requirements). Students appear to exhibit: different behaviors when members of the community are not heedfully interrelating or actively building a collective view [46], but are focusing on external (to the community) problems or individual priorities. It was noticeable, for example, in week 7 that students focused on their own experiences and concerns about offshore outsourcing, as they obviously felt that this was a problem too big for the community to resolve in any substantive way. This reduced the number of "interactive" postings significantly, as each student voiced individual concerns.

From the types derived by Garrison et al. [13] one would expect to see a consistent pattern of contribution types according to "learning type". Two findings contradict this assumption. Firstly *most* participants in the discourse adopted a number of different roles in their contributions to the discussion board. While it is true that in any given week an individual usually leant more towards one kind of contribution or another it was unusual to find individuals who solely operated within one of these categories and *these patterns changed from week to week*. Individuals who one week would be engaging in intricate debate would the next week be throwing out initial thoughts and avoiding discussion and would be back to debate the following week. This finding requires more

analysis across multiple samples, before any conclusions can be drawn. It may be that individuals simply do what they feel is necessary at a given time, it may be that individual debates require more or less interaction or there may be other factors.

5.3 Individual Influence On Community Learning

Q3: **Are there specific individuals who have more influence in the community than others?**

There appears to be no relationship between the number of contributions made by individuals and the number of times each student's messages were read. A person posting more or less is no more or less likely to have their posts read. There was one person whose contributions were more frequently read than any others (subject number 11) this person also had the highest overall class grade though none of the cohort could have predicted this. ***We infer that students are capable of identifying valuable contributors within a short period of time after the course starts and will actively seek out their contributions to any debate.*** This particular student exhibited a strong facilitation role. They made more facilitation-role postings than any other student, except for subject 21, who posted made over twice as many contributions as subject 11 (including over twice as many facilitation-role postings), but whose postings were much less likely to be read (28% less frequently). This student was identified as the single most significant initiator (spider): they posted almost all (85%) of this type of message. This student posted twice as many contributions as any other student. But the number of accesses per message by other students was below average. It appears that other students assigned less importance to this
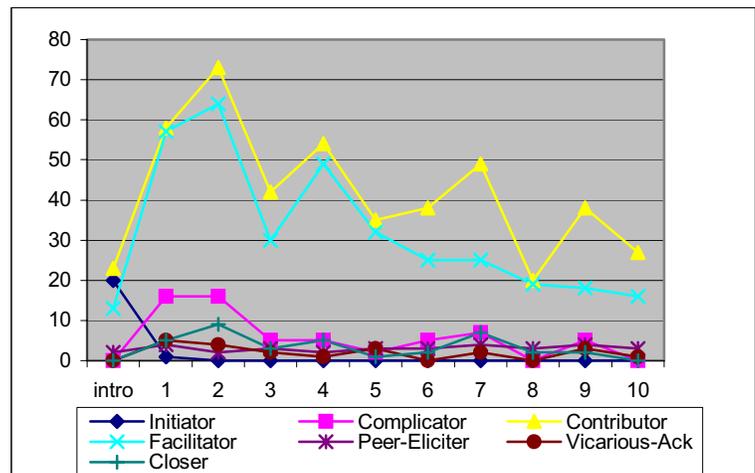

Figure 2: Number of Contribution-Types By Week
(Note that Passive Learning role is not reflected in contributions)

person's contributions with experience. This student achieved a good grade, but needed to rework their assignments much more than any other student.

In terms of students accessing others' postings, facilitations (students steering the contributions of others in a certain direction) and peer knowledge elicitations (students asking each other for information) were read *significantly* more frequently than other message types (23 and 24 reads per message) (F=64.574,n=951). Students' ability to identify valuable or knowledgeable peer contributions appears to be an important part of peer learning; this area deserves further investigation.

5.4 The Role of Vicarious Learning

Q4: **Do people appear to learn from each other and are there different behaviors that reflect different modes of learning as a member of a community?**

Vicarious learning has used to describe a mode of learning where students do not actively participate in course debate and discourse, but construct their view of the subject from the discourse of the instructor and other students. It is argued that this form of passive learning, or "lurking" is a critical part of educational participation [4, 7, 18]. ***The most significant finding would appear to be the relationship between*** <u>***reading***</u> ***discussion board posts and course grade; this would appear to give tentative support to the vicarious learner construct.*** There was a significant correlation (0.94) between the frequency of read accesses and the student's course grade.

But we argue that the role of vicarious learning is more complex than merely assigning this behavior to passive learning. Kolb's [20] argues that individual learning involves a cycling between formulating abstract models of the world and comparing these to concrete exemplars. In this process, students move from inductive to deductive and back to inductive reasoning, as they relate course materials to their own experience. We know from studies of human psychology in systems design that, when individuals do not possess sufficient experience to provide them with solutions to a novel problem, they derive partial solutions from their own experience or that of friends and colleagues, fitting these to the problem at hand [3, 15]. If they do not find a suitable fit from the partial solutions available to them, they reframe the problem, often leading to inappropriate solutions [27, 44]. As this behavior is so widely reported in studies of software problem-solving, it is reasonable to extrapolate that it applies to educational problem-solving behavior. The students who read others' contributions more frequently scored higher grades on the course, regardless of their own contributions. We would therefore conclude that ***vicarious learning is not passive. It involves an act of construction that utilizes the discourse of other***

(active) participants, to reframe the vicarious learner's own perspective of the subject matter.

Thus, vicarious and shared learning become as important as individual learning, in assimilating novel concepts. An implicit understanding of this would explain the widespread "community" behavior observed in this study. Understanding who-knows-what is a critical survival skill in distributed learning contexts [6, 10]. In an asynchronous learning environment, students are not exposed to such easily-accessible supplements to their own experience (i.e. friends and colleagues), as they are in face-to-face work and learning environments. Students therefore devise social networking, inquiry and communication strategies to supplement their own experience. This area of research also deserves further attention, as the use of online and distributed learning approaches increases.

6. Conclusions

Probably of most importance is the emergence of a learning-role framework for analyzing student contributions. The most salient point about this is that simplistic models of behavior-types, or learning styles do not serve to explain the behavior observed. Numerous theories of learning and practitioners posit simplistic characterizations of human learning styles [11, 20, 33]. We believe that our main contribution is to suggest that these characterizations are less helpful in the context of online learning than looking at the nature of individual contributions. In an exploratory study of online learning behavior, we found that students appear to adopt a variety of learning roles. Each role represents a consistent pattern of behavior that that reflect an awareness of their participation in a wider community of inquiry. Students do not appear to adopt a single mode of behavior, or role consistently, but adapt their behavior to the contingencies of the current learning task. However, some students appear to adopt dominant roles in the community more frequently than other students.

The second contribution of this study is to demonstrate the complex nature of vicarious learning and the way in which this is reflected in students community behavior. It would appear that students are capable of identifying valuable contributors within a short period of time after the course starts and will actively seek out their contributions to any debate. The frequency with which students accessed others' arguments significantly affected their course grade. Other studies appear to view this "lurking" behavior as passive [4, 7, 18]. We would argue that vicarious learning involves an act of construction that utilizes the discourse of other (active) participants, to reframe the vicarious learner's own perspective of the subject matter. Future analyses will examine differences between experienced and naïve online students, to

understand how community experience contributes to behavior and learning outcomes.

This is a first attempt at a framework. The study was exploratory in nature and the sample size (23 students) was relatively small, so our conclusions are at best tentative. Our categorization scheme is clearly open to debate; we hope to refine it through further studies. What we feel is most important is the uncovering of the multidimensional and dynamic nature of student learning behaviors. It may be that patterns of interaction are related to the complexity and novelty of the problem, or to the form of knowledge with which the student is confronted. This analysis was performed on a set of questions that were relatively complex and open-ended, representing realistic organizational problems. The majority of existing studies appear to be predicated on well-bounded problem-solving, which may explain why we observed a more complex pattern of behavior, in this study.

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