

A Comparison of Participation Patterns in Selected Formal, Non-formal, and Informal Online Learning Environments

Comparaison des modes de participation dans des environnements formels, non formels et informels d'apprentissage en ligne

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Abstract

Does learner participation vary depending on the learning context? Are there characteristic features of participation evident in formal, non-formal, and informal online learning environments?

Six online learning environments were chosen as epitomes of formal, non-formal, and informal learning contexts and compared. Transcripts of online discussions were analyzed and compared employing Transcript Analysis Tools for measures of density, intensity, and reciprocity of participation (Fahy, Crawford, & Ally, 2001), and mean reply depth (Wiley, n.d.). This paper provides an initial description and comparison of participation patterns in a formal, non-formal, and informal learning environment, and discusses the significance of differences observed.

Résumé

La participation des apprenants varie-t-elle en fonction du contexte d'apprentissage? Existe-t-il des caractéristiques de participation spécifiques aux environnements formels, non formels et informels d'apprentissage en ligne?

Six environnements d'apprentissage en ligne ont été sélectionnés pour illustrer les contextes formels, non formels et informels d'apprentissage et ont été comparés. Les transcriptions des discussions en ligne ont été analysées et comparées à l'aide des Transcript Analysis Tools pour mesurer la densité, l'intensité et la réciprocité de la participation (Fahy, Crawford, et Ally, 2001), ainsi que la profondeur moyenne de réponse (John Wiley & Sons, nd). Cet article décrit et compare les modes de participation dans un environnement formel, non formel et informel d'apprentissage, et discute la portée des différences observées.

Introduction

The literature examining learning in online environments is extensive, but it is primarily focused on formal learning environments in higher education (see Anderson, 2003; Brooke & Oliver, 2006; Garrison, Anderson, & Archer, 2003; Luppacini, 2007; Murphy & Coleman, 2004) and on research of online discussions (Daniel, 2011; Jeong, Lee, & Kim, 2012; Rourke & Anderson, 2004). Formal environments typically require learners to engage each other online in specific, externally defined ways, whereas non-formal environments impose fewer controls on learner activities, and informal environments impose even fewer still. The nearly exclusive attention to formal settings limits our understanding of how learners make use of other types of contexts in self-directed learning. One of the most significant challenges in educational technology is to understand how learners participate in non-formal and informal learning networks to construct their own learning spaces.

By *formal*, we refer to educational contexts usually characterized by learners in classes being taught by teachers who deliver comprehensive, multi-year curricula, which is institutionally bound to a graduated system of certification (Coombs, 1985). In sharp contrast, *informal* education is often characterized as unorganized, unsystematic, and regularly serendipitous (Selman, Cooke, Selman, & Dampier, 1998). This type of learning is the lifelong process of learning by which people acquire and accumulate knowledge skills, attitudes and insights gathered from a lifetime of experiences. For the purposes of this research, we focus on a third category of education, *non-formal* learning, that straddles these two seemingly polar learning contexts. Selman, et.al. (1998) identify non-formal learning as that which

comprises all other organized, systematic educational activity which is carried out in society, whether offered by educational institutions or any other agency. It is aimed at facilitating selected types of learning on the part of particular sub-groups of the population. (p. 26)

For example, non-formal education may include such activities as professional development interest groups or community education initiatives. These alternative, group learning, contexts are usually characterized by participants who share expertise and knowledge, and may or may not include a content expert.

In informal and non-formal learning environments, learners need to exercise various degrees of self-directedness in their approaches to their learning. Some authors have characterized the self-directed learner as learning alone, whether under the tutelage of an instructor or agency, or completely independent of such structures (Selman, Cooke, Selman, & Dampier, 1998; Tough, 1971). However, we expand the notion of independence to include being independent of the structural contexts of education; any particular learner or group of learners may manifest elements of self-directedness in their learning whether it be within a formal, non-formal, or informal learning environments.

Methods

Six distinct environments were selected for analysis, including two formal, two non-formal, and two informal groups. We attempted to select typical groups, not representative groups, and our selections were deliberate but based on convenience, which we considered reasonable for a

preliminary and exploratory study. The formal environments included an online graduate level course that met for 26 weeks from September to April, and another that met for six weeks during an accelerated term, and that included prescribed online discussions weekly. The non-formal environments were run as classes that ran for 13 weeks, and participation in the online conversations was encouraged but entirely voluntary. Our ethics permission does not permit us to reveal the names of the informal sites we reviewed, but they were selected according to specific criteria:

- Active conversations were conducted for no fewer than 13 weeks
- Participation was open to anyone;
- Conversations were held in public;
- Participation was voluntary;
- Topics of conversation were created by participants;
- Participants were free to come and go.

In every case, the selected informal environments were typical of discussion boards focused on a theme or broad topic, and that invited sustained conversations. They did not include effervescent social media such as Twitter, Facebook, or Tumblr.

In every case, transcripts from the online discussion boards were analyzed. Because the informal environments we selected included many more threads of conversation than we needed for analysis, we randomly selected 25 conversations by generating a table of random numbers (1 to 100) and drawing the first 25 numbers associated with the most recent 100 conversation threads in each environment. We coded conversations in the transcripts at the unit of message level, and employed negotiated coding among coders (Garrison, Cleveland-Innes, Koole, & Kappelman, 2006), but the content analysis was used only to edify observations we made from the participation interactions we observed.

Fahy, Crawford and Ally (2001) proposed several useful measures of describing interaction that they called collectively the Transcript Analysis Tool (TAT), based on a model proposed earlier by Zhu (1996). The TAT includes methods of measuring density, intensity and persistence of interactions in transcripts of online discussions. We drew on their recommendations and elaborated some of them to analyze interactions in our data, particularly transcripts of asynchronous discussions.

Density

Fahy, Crawford and Ally's (2001) definition of density is "the ratio of the actual number of connections observed, to the total potential number of possible connections" (Density section, para.1). It is calculated by using the following formula: $Density = 2a/N(N-1)$, where "a" is the number of observed interactions between participants, and "N" is the total number of participants. Density is a measure of how connected individuals are to others in a group, and the idea is that a higher degree of connection is a positive indicator of community. Fahy, Crawford and Ally (2001) caution that the measure of density is sensitive to the size of the network, so larger groups will likely exhibit lower density ratios than will smaller groups.

Reciprocity

A particularly important TAT measure for the purpose of understanding community is "S-R ratio," a formula to measure the parity of communication among participants. We referred to this as a measure of "reciprocity," and we felt that truly engaged groups who form communities will exhibit high degrees of reciprocity.

For this analysis we only included interactions that were not directed to the group, but only those directed to individuals. So, for example, a general question tossed out to a group would not be counted, but a reply to the originator of a message would be counted. In every case, regardless of topic, the communication was directed to a particular person, instead of to the group or to nobody in particular.

As an initial step in the analysis, we charted the number of messages sent and received among participants in the group. The S/R ratio (sent to received messages) is an indication of the reciprocity of messaging within the group. Ratios approaching 1.0 indicate a high degree of reciprocity. Ratios considerably higher or lower than 1.0 indicate disparity in the communication. High numbers indicate that the individual was communicating to others, but not receiving as many communications in return. A low number indicates that a higher number of messages were received than were sent in response. We speculate that a healthy, vibrant community exhibits a high amount of reciprocity among members of the group.

Intensity

Fahy, Crawford and Ally (2001) recommended measures of intensity to determine whether participants were authentically engaged with each other, not merely carrying out their responsibilities in a course. They argue that it is a useful measure of involvement because it involves measures of persistence and dedication to being connected to others in the group. This measure has more meaning for analyzing interaction in formal settings, as the total number of participants is known, and a baseline of expected postings can be set with intensity being defined as the amount of "extra" discussion happens in the group.

For example, one measure of intensity is "levels of participation," or the degree to which the number of postings observed in a group exceeds the number of required postings. So for example, if a group of students is required to make a total of 200 postings as part of the course requirements, and the group actually makes 600 posts, it would yield a participation ratio of 3.0. While this is a useful measure, the number of superfluous and thoughtless replies to postings inflates it. Also, it does not fit well in informal environments where there are no required postings. For purposes of comparing environments, we took the position that we would anticipate each participant to make 2 posts in each discussion as a base line, and anything above that number would contribute to the measure of intensity. This was not entirely arbitrary, given that this was the expectation set out in the formal environments.

Another measure of intensity recommended by Fahy, Crawford and Ally (2001) is persistence, or the level to which participants pursue topics. A measure of persistence is intuitively appealing, as it addresses how deep are the discussions we have observed in formal, non-formal, and informal environments. Even if there are fewer participants in one environment than another, are there differences in how persistent the conversations, and how replies ladder inward as individuals

follow a thread of conversation deeper? In order to get at these questions, we turned to a measure of mean reply depth (MRD) proposed by Wiley (undated) in a working draft of a paper he prepared on the topic several years ago.

Wiley’s approach proposes that replies in threaded conversations indicate that discussions are happening, and that levels of replies (reply depth) are positively correlated with the depth of discussion. Wiley proposed a formula that assigns increasing value to each level of reply in a conversation that can be used to calculate a mean reply depth for any thread in a conversation.

$$d_{crude} = \frac{\sum_{i=1}^n r_i}{n}$$

In this formula, d_{crude} is an uncorrected measure of mean reply depth (MRD). In the formula, r is the reply depth of the i^{th} message, and n is the total number of messages in the group. Each level of reply is given a value depending on its depth, with top level messages valued at 0, first level replies given a value of 1, second level replies given a value of 2, and so on.

In order to correct for the confusion that can obtain from comparing conversations that have top level messages and no replies with conversations that have the same total value but with more active participation, Wiley proposed an adjusted MRD formula that accounts for top level messages that have no replies (b), and corrects for them.

$$d = d_{crude} \times ((n-b)/n)$$

The MRD measure does have weaknesses that Wiley carefully notes. The MRD is a measure of activity, not quality of conversation. Each reply counts equally, whether it is a simple greeting or a deep critique. Also, participants in discussion groups do not always reply in correct thread positions; they sometimes reply higher or lower in the thread structure than intended. But with these cautions in mind, the MRD does provide a more robust and meaningful measure of the depth of activity and so provides a better indication of the intensity of a conversation. Also, the weaknesses can be mitigated by qualitative analysis of the original data.

Following recommendations from Wiley (n.d.) we suggested the d values can be categorized as:

- < 0.3 = monologue, moribund
- 0.3 – 1.2 = simple question and answer; chatting
- > 1.2 = multilogue, discussion

Results

As a preamble to considering our results, we acknowledge that learners participate in online learning environments for a host of reasons, responding to personal desires or needs and external requirements or pressures. Before offering a few generalizations about audience differences in

the settings we observed, it is important to recognize that any environment includes individuals who are pursuing their own learning agendas, and any attempt to generalize will be filled with exceptions and flaws. Nevertheless, it seems reasonable to speculate that membership in formal learning communities is significantly influenced by program requirements and course designs, as well as by personal and professional compulsions. If a course is required as part of a credential, learners may have a deep interest in the broader area of study, but not necessarily the course under study. The challenge of building a strong sense of community in groups such as these is peculiar to their populations.

We speculated that generally speaking, formal groups differ significantly from non-formal and informal learning environments, where participation is based on affinity rather than requirement or fiat. Online informal learning communities usually depend on the participation of relatively autonomous, independent individuals. In some non-formal and most informal online communities participants can engage or disengage from the group easily and without personal consequence, and they can sometimes participate in the community without revealing who they are to the other participants.

Overview of Participation in Selected Environments

First, we will summarize what we found when we compared participation in six selected environments—two each that were formal, non-formal, and informal according to our criteria. Table 1 summarizes the key observations. We then turn our attention to a closer look at mean reply depth within groups as an indication of the persistence and depth of the conversations.

Table 1: Summary of Participation Analyses Comparing Formal, Non-formal, and Informal Groups.

	Informal 1	Informal 2	Non-formal 1	Non-formal 2	Formal 1	Formal 2
Total Messages	785	320	97	175	1041	764
# Discussions	25	21	12	6	7	19
# Participants	506	82	12	8	18	8
# Messages/ Participant	1.55	3.90	8.08	21.88	57.8	95.5
Messages/ Discussion	31.40	15.24	8.08	29.17	148.71	40.21
Density	Cliques	Cliques	0.47	.40	1.0	0.78
Intensity	.03 but variable	.09 but variable	0.34	1.82	4.1	2.51
Reciprocity	Low	Low	0.92 (sd=.94)	1.74 (sd=4.77)	1.10 (sd=.42)	0.96 (sd=.37)
Grand MRD	0.71	1.16	0.60	0.70	1.76	1.40

The first thing that jumped out at us was the difference in the number of messages and discussions. The number of discussions was prescribed for the most part in the non-formal and

formal groups. While participants were permitted to start their own conversations, they seldom did. So, in these groups, the number of discussions was defined externally, at least mostly. By contrast, the members of the informal groups initiated all of their own discussions. We were forced to develop sampling criteria for the informal groups, because the number of discussions numbered in the hundreds or thousands, and we wanted to examine the groups in ways that were roughly equivalent. So the raw number of messages and discussions is accurate for the formal and non-formal groups, but are a small percentage of the actual number in informal groups.

The actual number of messages was considerably fewer in the non-formal group, with higher message counts observed in informal and formal environments. But interestingly, when the number of participants was taken into consideration, we observed that there were dramatically fewer messages per participant in the informal group, with the number higher in non-formal and bursting in formal environments. Without question, this was related to the compulsory nature of participation in the formal groups, and probably the expectation of participation in the non-formal groups.

Taking a closer look at the interaction patterns, we drew on Fahy, Crawford and Ally's (2001) TAT indicators of intensity, density and reciprocity. Again, because the informal environments did not have a membership that could be tracked reliably, we adjusted our methods of observation, but in every case tried to inform our understanding of the feature under investigation. We suggest that as a result we can draw some interesting speculations from our observations, but we do not make any claims about the reliability of comparisons with the informal groups. We were able to employ comparative measures between formal and non-formal groups, but the unstable membership in the informal environment would not permit us to use the same assumptions when we applied the TAT measures. As Reeves (2011) would probably observe, we were trying to achieve a balance between rigor and relevance, with a preference for relevance.

Given these cautions, we found dramatic differences among the three environments. We defined intensity as the ratio of the number of postings that exceed expectations to the number of expected postings. In the formal group, this was counted as the ratio of postings that exceeded the requirements in the class (two per discussion topic). In order to keep the comparisons parallel, we set the same level of expectation as the baseline in the non-formal and the informal groups. In this case, we saw that the intensity of discussions in the formal group was considerably larger than in the non-formal group, and in fact, the non-formal group fell well below minimal expectations in one case (formal intensity = 4.1 and 2.51; non-formal intensity = .34 and 1.82). The informal group, on the other hand, repeatedly demonstrated high intensity on several discussion threads, and almost no intensity on some, and yielding composite intensity ratios of .03 and .09. Interestingly, the comparison of intensity in all of the groups demonstrated dramatic differences within environment types. While we do not want to over-interpret this finding, it might suggest that the designs of the experiences and the topics under consideration may have contributed to the intensity exhibited by participants. But overall, the grand measure of intensity was higher in formal and non-formal groups than in the informal groups we observed in this case. Again, we cannot draw conclusions from the observation, but it allows us to generate some interesting hypotheses.

A measure of density is a ratio of the number of actual connections to the number of potential connections among participants. Density asks whether all possible connections among

participants are being made; in other words, does everyone in the network connect with everyone else? We found that a greater number of people in the formal environment connected with fellow participants than in the non-formal environment (formal density = 1.00; .78; non-formal density = .47; .40), but this was at least partly an artifact of the measure of intensity. Fewer people were engaged in the first place, so fewer connected with each other. While not surprising, it is another indication that the community bonds in the non-formal group were weaker than in the formal group. Once again, the informal group was curious. Because people came and went in the group more casually, it was difficult to track density in the same way. But we did find that density was lower in informal environments. In discussion threads in the informal environment, there was clustering around the person who began the conversation, but fewer connections among individuals responding. Conversations were largely bi-directional, not multi-directional.

Reciprocity among participants is a measure of the ratio between the number of messages received by individuals to the number sent. In other words, did people realize balanced conversations in the group, which would be represented by a ratio of 1.0 if individuals received and sent the same number of messages. In this case, we found that the mean reciprocity of participants in formal and non-formal environments was high and similar with one exception (formal reciprocity = 1.10; .96; non-formal reciprocity = .92; 1.74). The mean reciprocity of the groups masked considerable differences. We found that the standard deviation for the formal group was comparatively low (s.d. = .42; .37) indicating that reciprocity did not vary across individuals in the formal group as much as it did for individuals in the non-formal group (s.d. = .94; 4.77). There was one outlier in the non-formal group who skewed the measure of reciprocity and also accounted for the unusually high standard deviation. When this person’s data were removed from the analysis, the reciprocity was .89 with a standard deviation of 1.4. Once again, the informal group demonstrated a considerable amount of variance, with very low reciprocity for the group, but this was expected, given the voluntary, occasional and casual nature of interaction in this environment. Yet as a casual anecdotal observation, we noticed people were considerate of each other in the group; when somebody posted a comment, the person who posted the original topic was often attentive and responsive. We saw incidents of good manners, if not community.

Mean Reply Depth

Initially, we compared the Grand Mean Reply Depth for each environment, which was calculated as the average MRD for all of the conversations in the group (see Table 2).

Table 2: Comparison of Grand MRD for All Groups

	Informal	Non-formal	Formal
Group 1	.71	.60	1.76
Group 2	1.16	.70	1.40

The Grand MRD revealed that non-formal groups exhibited the lowest Grand MRD, with informal groups somewhat higher, and formal groups considerably higher than the others. But

the grand MRD for informal groups varied considerably, which suggests that the environments did not behave consistently. Clearly, the Grand MRD masked other factors that were at work.

When we compared MRD patterns in formal, non-formal and informal settings over time, considerable differences and patterns emerged. Figure one offers a comparison of the MRD for discussions held over time for formal and non-formal groups, and 25 randomly selected discussion topics from the most recent 100 for the informal groups.

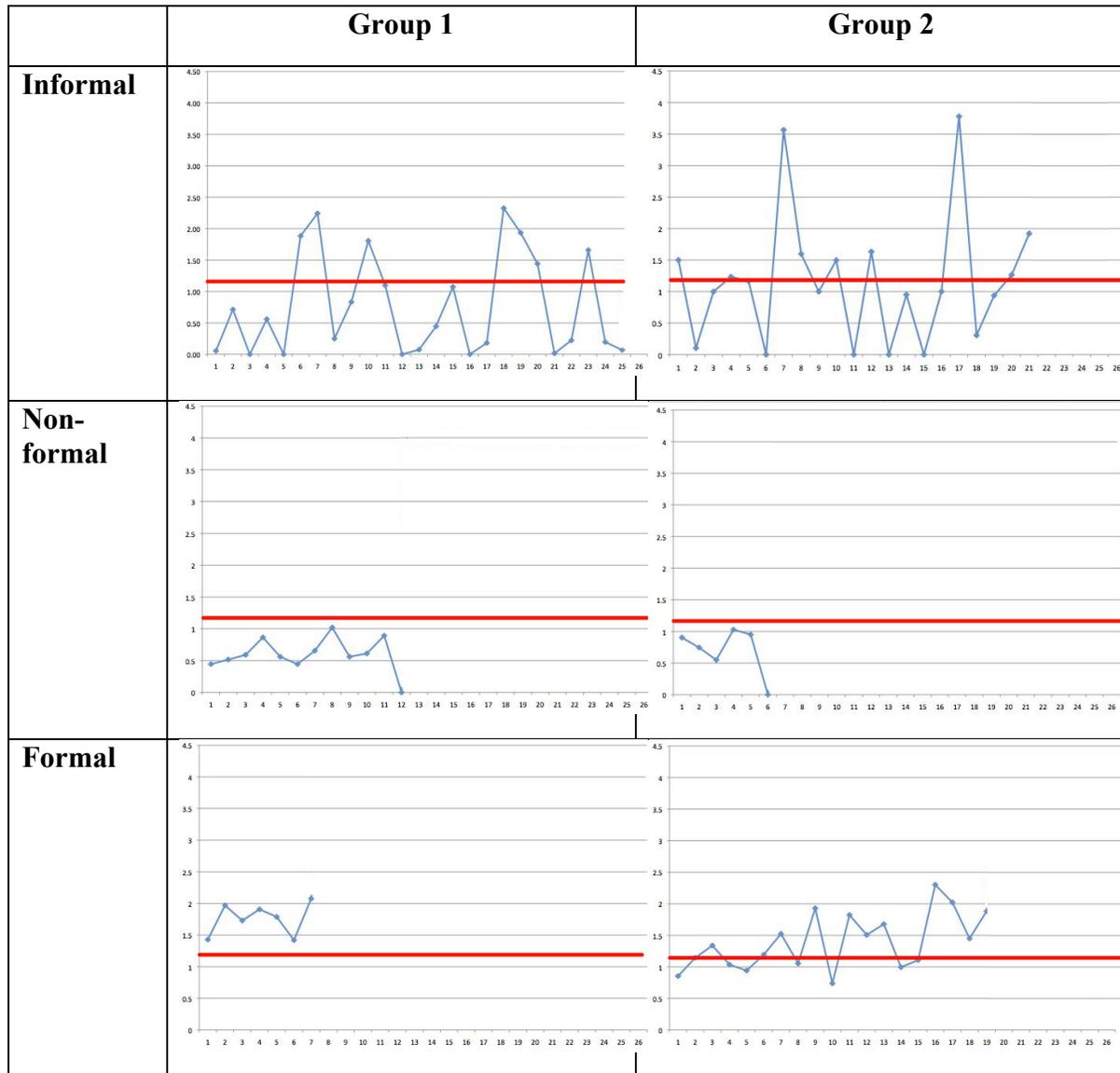


Figure 1: Comparison of MRD over time in informal, non-formal, and formal groups (bold line indicates Wiley’s (n.d.) interpretation of when the MRD level reaches multilogue or discussion).

In formal environments, participation was initially high, and while conversations fluctuated, they generally grew over time as participants moved beyond assigned postings and added their own contributions voluntarily, and the MRD reflected this pattern. In almost every discussion, the

MRD exceeded Wiley’s (n.d.) threshold to be considered a discussion. As an aside, these observations were made of two selected environments. One other formal environment we observed followed a similar pattern as these, but returned a lower MRD overall, seldom exceeding the threshold for discussion (see figure 2). We think this indicates that there is a continuum of depth of conversation that can happen in any environment, and we speculate that formal environments may be particularly vulnerable to differences. Because formal environments require a minimal amount of discussion, it is possible that unobserved factors in the context of the class (e.g., content, general affect, instructor presence) may serve to encourage or discourage deeper levels of commitment and conversation.

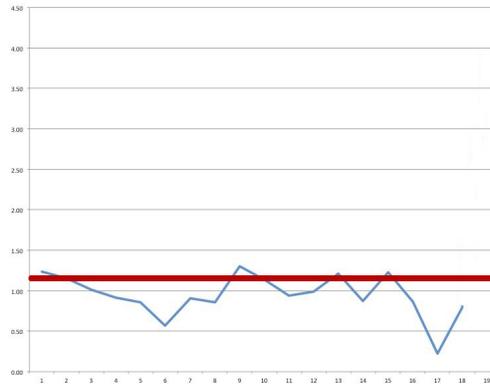


Figure 2: MRD graph of a formal environment with lower participation and depth.

In the non-formal environment we observed, participants were encouraged but not required to participate. In these cases, initial participation rates were not as high as in formal environments, as a few participants chose not to post to the discussion board. In addition, we repeatedly observed that participation fell off steeply and quickly as the course neared its end, and this was mirrored by the MRD pattern. The MRD hovered at the level of chat, and never exceeded the threshold to be considered a discussion.

In the informal environment, where participation was entirely voluntary, a completely different pattern emerged, one that can be described as effervescent. Participation rose and fell over time, apparently according to the amount of interest generated on a particular topic. Some topics drew audiences; others remained relatively quiet. But as a result, it was apparent that participation patterns were mediated by the personal interest of participants in topics, rather than by fiat (as in the formal learning environment) or by duty (as in the non-formal environment). Once again, the MRD pattern followed the participation pattern. Approximately one-third of the conversations could be classified as discussions, while most were categorized as chat or moribund. A review of the topics that drew higher rates of participation revealed that they might be provocative, humorous, profound, or personal, but in every case they invited conversation. So in the case of our informal learning environment, participation seemed to be less about nurturing the group, and more about nourishing the group – offering the audience something that drew them into a conversation. And the audience judged what was worthwhile and what was not. This observation is supported by the participants’ conversations. One person decided to participate in a discussion only after they found a topic that was highly relevant to them as demonstrated in the following quote from the participant: “... I found out about this site a few days back, checked out a handful

of articles and then rooted around the forums a bit. I found this topic and it hits close to home, so I thought I'd join.”

In every learning environment we observed, except in non-formal environments, there were bursts of engagement in online discussions where participation was high and deeply engaged. This caused our research team to coin the label “principle of intensity” to describe what we thought was at the heart of the spikes of participation we observed. We speculated that intensity might be motivated by a number of catalysts in learning environments: social advocacy, joyful learning, emotional connections to ideas, and even associations with someone who is important or provocative. But in online learning, content also seemed to be an essential ingredient for intensity that was present, regardless of the catalyst. In other words, the interactions were about something significant that was shared by the group, a feature that has been labeled “object-centered sociality” elsewhere (Zengeström, 2005).

When individual learning is about something meaningful to members of the group, intensity can ignite, and it can appear in both synchronous and asynchronous discussions. The mean number of replies to posts in one of the formal environments was 3.45 with a standard deviation of 2.61. Whereas, a burst of engagement that was identified in this group had a 16 replies to a single post. Of those 16 posts, 9 included personal stories that related to the topic and every post included language that indicated personal interest. Language that was identified as indicating personal relevance include “I agree with ...,” “Sometimes I wonder whether...,” or “... I've long said that...” Similar language was identified in other bursts of engagement, which lead to the conclusion that the interactions centered on topics significant and shared by the group.

We also speculate that the design and implementation of the learning environment is also complicit in the patterns of participation we observed. The measures of intensity in the formal environments, while limited in their explanatory value, were considerably higher than the measures of intensity in the informal and formal environments. Individuals, when required to participate, engaged in a higher amount of additional and extra-curricular conversation. When initial engagement was only recommended or left completely to the discretion of participants, there was little in the way of engagement beyond modest expectations. This begs the question of whether forced participation contributes to the development of more casual kinds of connections among participants.

It also appears that the design of discussions in learning environments may influence the depth of the discussion that takes place. This is intuitively pleasing. If instructional leaders offer well-designed topics for conversation in formal environments where expectations for participation are high, then conversations may be deeper and more persistent. The average number of replies for new discussions in the non-formal environment was 3.57 with a standard deviation of 3.89. Whereas, if just discussions that start with a well-designed questions are analyzed, the mean reply rates increase to 7.33 with a standard deviation of 3.11. Well-designed questions are defined as multi-level questions that ask open-ended questions that explore several related aspects of the overall topic. Often these questions encourage the student to relate their answer to their experiences. An example of a well-designed question includes: “What aspects of teaching come naturally to you? Which feel less natural? What did you learn about teaching from your best teacher? Is this something that you could emulate, or would this be inauthentic? ... How do you communicate enthusiasm to your students?” This question is in contrast to questions defined as less structured, which include more rhetorical components such as: “I'm curious—did you feel

like you were trying to drink from a fire hose? Was there just too much to take in, or were the take-away handouts enough to help you remember what we had discussed in class?” This type of question could be answered in a short comment. Less structured questions do not challenge the student to consider multiple perspectives. Although all discussions that included a question have higher reply rates, the well-structured questions have even higher reply rates. For example, the well-structured question presented above had twelve replies, whereas the less structured question had four replies.

Conclusion and Recommendations

This is a preliminary study, so we do not want to propose firm conclusions or make strong recommendations for practitioners, whether instructional designers or online teachers. However, if these findings can be replicated, we can draw some conclusions worth considering when designing online learning environments or conducting online instruction. Online learning environments should attend to emotional connections. Emotional connections can be made in a variety of useful ways, such as promoting a social advocacy agenda in a class, intentionally introducing opportunities for learners to share the happy moments in their academic growth, having instructors share stories of times they were moved emotionally by their subject areas, or inviting guest instructors who are well-known or controversial. Particularly when an instructor is working in a formal environment, where instructors are organizing deliberate conversations around prescribed topics, it appears to be important to leave room for—or even invite—casual, personal, and learner-directed conversations.

But it is reasonable from this study to conclude that content is pre-eminent. Even emotional connections should emphasize linkages with content. In any learning environment, attending to content that is meaningful to learners will increase the likelihood of participation, and more importantly, meaningful conversation. In informal environments the responsibility for determining what is meaningful is the responsibility of the participants, and they may need to experiment to find content that attracts conversation. In other contexts, the instructors have a responsibility to find content that resonates with the groups being taught. While this may sound like an easy task, it is no doubt fraught with uncertainty. In some cases, it might be helpful to draw up a list of possible discussion topics and ask students to rank them according to interest.

In reference to non-formal environments, we have been able to find little evidence that organized online discussions are viable. If an emotional commitment to the group or the content is built, it may be possible to generate lively discussions, but in our own observations we have yet to see it happen. Instructional designers would be well advised to build required participation into non-formal environments, at least until a habit or convention of online conversation can be lodged. This observation and conclusion may be temporal, as the non-formal groups observed were comprised of adults in higher education, many of whom were not experienced with online discussions. As people become more familiar with this mode of communication, perhaps participants will be more likely to use it in non-formal learning environments. However, from what we have seen to date, there is little or no reason to recommend that instructional designers or instructors employ discussion boards in non-formal learning environments.

The study of participation patterns is also valuable for pointing to additional investigations of the conversations. In addition to studying these patterns, our research team has been coding transcripts of the discussions to extract themes in the conversations we can map against

participation to understand the meaning of the interactions we have observed. Findings from those analyses will be reported in subsequent papers. We are also interested in learning more about the effect of the design of environments on participation, and particularly the quality of participation in those environments, a line of investigation complementary to that of Jeong (2012), and Jeong, Lee, and Kim (2011).

We also suggest that other aspects of conversations deserve attention. One area that interests us is how individuals initiate and elicit participation from others. In other words, what kinds of interactions invite discussion? This paper was based exclusively on asynchronous discussions on discussion boards where much of the discussion is in response to a posed question or idea. Synchronous conversations in chats, videoconferences, messaging systems and the like also offer unique ways to look at how groups form and learn together. Of course, much of that kind of conversation is challenging to code and analyze.

We suggest that conversation analysis may be a useful tool for conducting analyses of the dynamics of conversation, and especially helping us understand what kinds of communication attracts participation from others. Using conversation analysis, some of the things that could be examined include:

- adjacent pairs - the use of a phrase that elicits a known response (e.g., How you doing? Fine);
- tag questions - a statement that is turned into a question to elicit a response (e.g., Nice day, isn't it?); and,
- back channel cues – a signal that the listener is interested and wants the speaker to continue (e.g., smiling emoticon).

The absence or presence of these kinds of indicators would signal if people are working to nurture a conversation or discouraging it.

As tantalizing as these reported preliminary findings may be, they only scratch the surface of what might actually be happening when individuals participate in intentional learning activities in online learning environments. We realize that the meaning of these patterns is embedded in the conversations themselves—in their content, tone, and in the intentions of participants. But studying patterns of participation give rise to useful speculations about how online educators can build environments that will stimulate conversation and may ignite learning.

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