

Do Lurking Learners Contribute Less? – A Knowledge Co-construction Perspective

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ABSTRACT

Drawing upon the emergent idea that “the negotiation of meaning involves the interaction of participation and reification”, this study proposes an entirely different perspective on lurking. Collecting data from 82 group forums with a total of 490 members, we identify 46 lurking learners by comparing the online/postings ratio of each member within the group. Further classification of these lurkers provides an opportunity to highlight the neglected contribution of the types of lurkers who go online regularly but post only sporadically from the framework of knowledge co-construction. This paper concludes by challenging the common emphasis on the quantity of postings.

Keywords

Lurk, lurking, lurker, co-construction, participation, group learning, posting

INTRODUCTION

Discussion has been expected to be one of the most valuable activities in online learning communities. The effectiveness of discussion is therefore regarded as an important index to be evaluated. Counting the frequency of logins as well as the number of postings in the discussion forum is the primary measurement used in evaluating learning effectiveness. The term “lurking” has been used extensively to describe a reluctance to post, a phenomenon that put constraints upon interactivity of forums, in response to which strategies have been developed to have these lurkers de-lurked from silence.

Recently a growing body of research on lurking has introduced a new focus into the debates about whether or not lurkers are still engaged and actually learning, even when not actively involved in online discourse with other members [1]. Existing approaches to lurking tend to rely upon behaviorist and individualist assumptions, are dependent on counting the numbers of postings the participants contribute or are associated with cognitive science accounts of external representation. Despite the debate over the lack of benefit in lurking, the preponderance of literature takes an individual learning perspective in inspecting lurkers’ learning effectiveness. However, our focus here is not on lurking as a personal

experience of low-frequency presence. The concern of this paper is collective rather than individual learning. During the analysis process we came to realize that the current conceptualization of lurking was insufficient to describe the phenomena we observe if online learning is considered as a kind of social learning. Following social theories of learning, scientists such as Etienne Wenger [2] and Marlene Scardamalia [3], we are interested in the dualities of participation and reification as a framework for understanding the meaning of lurking from a knowledge co-construction perspective. In particular, most research focuses mainly on the learners as individuals with no regard for the collaborative environment in which the learners engage. Such studies focus on why they do not contribute and how they steal knowledge by observing silently in the forum. With this approach, learning activities appear limited to merely submitting individual assignments and receiving messages delivered by others. As a matter of fact, forums are essentially designed to be a place for collaborative knowledge co-construction. That is, it is the collective knowledge building in the forum that provides opportunities for learning. The key focus is therefore shifted from how many postings a person contributes to the forum to whether the sporadic postings contribute significantly or whether benefit is derived from the postings of others. By adopting a knowledge co-construction perspective on lurking behavior, we are better able to reveal the dynamics of forum learning than has usually been the case. The objectives of this study are: (1) to identify lurking learners through comparison of login to post relationships of group members; (2) to investigate the nature of lurkers’ postings by referring to the context of the development of the whole thread; and (3) to make sense of lurkers’ contributions in the context of knowledge co-construction. In other words, rather than perceiving lurking in groups from an individual learning perspective, this study attempts to scrutinize and reveal the nature of lurking in forums from a group learning perspective.

RELATED WORK

This section is organized as follows. First, there is a description of the variety of terms used by researchers to describe lurking, including a discussion of the conceptual definition as well as the operationalized definition. Then, the theoretical frameworks used by researchers are compared and contrasted to clarify the social aspect of lurking. Wenger’s participation and reification as well as

Scardamalia's democratizing knowledge were applied as the underpinning for analysis in the present study.

Empirical Consideration

Lurking has been gaining increasing attention from researchers of online learning and has been included as one type of participation [4]. Different terms are given to similar lurking phenomena. To date, lurking has been regarded as having ambiguous, both negative and positive valence [5]. On the one hand, much research claims that if there is no visible online interaction, little or no learning is likely to occur. The lurking participant is referred to with terms such as "passive recipient" [6, 7], "inactive or invisible online participant" [1], "witness learner" [8], "free-rider & bystander" [9], "hidden participant" [5], "observer" [10] or "quiet participant" [11], and the phenomenon of lurking as "vicarious learning" [12] and "limited student contribution" [13]. On the other hand, current insights into lurking related literature suggest that, although some participants are less visible than others, this is not necessarily an indication that the learning benefits are being compromised [14]. Terms used by those taking this perspective are: "active lurker" [15], "free-rider & lurker" [4], and "marginally positioned individual" [16]. Current studies seem to put emphasis largely upon *visible* learning behavior and the individual benefit derived from public resources. It is obvious that two things might therefore be neglected: First, the *invisible* aspect of the lurker's learning; and Second, the potential contribution of lurkers to online collaboration.

Conventionally, much of the research on lurking in an asynchronous online forum equates "contribution" with "posting messages" and makes the assumption that visible postings are the only evidence of learning. For example, they consider such online forums as a place where there is no loss of data as the discussion forum allows records of an individual's written messages to be kept in the virtual space [13]. Studies based on this line of inquiry not only neglect everything but visible postings, but also equate posting with learning. They consider a sizeable number of participant postings to be a necessary condition for a discussion to be regarded as promoting learning [17]. Although most of the research relies on the quantity of postings as a measure of participation, several papers have acknowledged the limitations of this approach and have called for better measures of online participation (e.g., [18]).

Theoretical Consideration

In seeking a theoretical underpinning for the measurement of lurking learning, most research has been based on the individual. Frameworks that have been borrowed from are Heider's balance theory [16], Bandura's vicarious learning [19], Wenger's negotiability [18], Bourdieu's cultural capital theory [5], Maslow's hierarchical needs theory [20], Walther's social information processing theory [10] and

Dewey's observation [1]. With the exception of Wenger's social theory of learning, the rest of these frameworks refer to individual learning.

The dominant influence of mainstream cognitive theories may be responsible for the fact that lurking is generally viewed as an individual learning activity. Many researchers from a Piaget or Vygotsky's tradition consider CSCL environments to be a space for individual learning such as the exchange of personal opinions and the delivery of codified knowledge, rather than a stage for collaborative knowledge building. Lakkala [21] proposed two mechanisms that lead to having the ideas of knowledge building and collaborative learning interpreted from an individual-oriented perspective. Piaget's socio-cognitive conflict [22] provides a traditional framework for interpreting the process of a shared understanding as individual gains taking place in individual minds, rather than a product of co-construction. In addition, Vygotsky's idea of the zone of proximal development [23] interprets collaboration as a facilitator of individual cognitive development and a result of individual endeavor, rather than a matter of participation in a social process of knowledge construction.

In response to the theoretical mismatch that exists in previous research on lurking, the present study proposes two sets of theoretical frameworks to facilitate the interpretation of lurking phenomena: E. Wenger's duality of participation and reification, and M. Scardamalia's democratizing knowledge.

The work of Wenger provides a more adequate basis for understanding the social aspect of lurking. Wenger argues that negotiation of meaning involves the interaction of two constituent processes, participation and reification (p.52). He views participation and reification as a fundamental duality; as two dimensions that interact, interplay, and imply each other. Reification is therefore potentially a hurdle as well as a help to learning (p.264). Thus, additional work is required to make sense of the reification. By the same token, reified objects such as postings in a forum do not represent the whole picture of a lurker's online participation. Researchers also need to examine and consider the *social participation* of learners in order to make better sense of their online learning.

On the other hand, the work of Marlene Scardamalia [3] proposes the concept of democratizing knowledge as a turning point for understanding lurkers. Scardamalia argues that all participants are legitimate contributors to the shared goals of the community; that all take pride in knowledge advances achieved by the group. The diversity and divisional differences represented in any organization do not lead to separations along knowledge have/have-not or innovator/non-innovator lines. From a community knowledge point of view, contributions to a group/community should not be judged by the number of postings submitted. Rather, diversity and variety of

contributions accomplish the knowledge-building activity collectively.

Methodological Consideration

These studies have also highlighted a number of methodological weaknesses in the traditional understanding of the collective aspect of lurkers' learning.

First, in the majority of research, lurkers have been defined as contributing nothing at all. Those lurkers who have been examined are the ones who never took an active role in online forums [1], posted no online messages at all [14], or observed a setting but did not contribute in any noticeable way [24]. Little research defined lurking behavior in terms of the number of postings from a relative viewpoint [18]. That is, as long as the number of postings by any participant is greater than zero, they have not been categorized as lurkers and have thus been excluded from lurking studies. Therefore different levels or types of lurking have seldom been noticed.

Second, lurking differs from attrition, in that it is characterized by "persisting in staying" according to the Merriam-Webster dictionary. Without simultaneously taking the two elements, frequency of posting and frequency of login, into consideration, the picture of lurking is less complete. Third, since very few postings have been available to study lurking, few attempts have been made to ascertain the nature of lurker's postings and to determine the relationship between lurkers' postings and those of the forum members. Taken together, dissatisfaction with individual interpretations of lurking, a social behavior, has led the present study to re-investigate lurking based on a social learning framework as well as a knowledge co-construction perspective.

In summary, rather than focusing upon the intention of individual participants who never post, in this paper, we take a different perspective. Lurking learners are defined as participants whose ratio of posts to logins is relatively low in comparison with that of other members of the group. We further classify their behavior as a different type of lurking and investigate the dynamics between lurkers and their forum colleagues in order to understand how they participate and involve themselves in online knowledge co-construction. By investigating the nature of the visible postings of these lurking learners, we trace their invisible social participation. One specific group will be analyzed to provide a potential alternative explanation with which to reconsider the meaning of lurking phenomena beyond the conventional superficial measurements.

METHODS

The Context

Four hundred and ninety voluntary high school participants attended a 6-week inquiry learning program in an inquiry-based learning environment called Learning Atmospheric sciences via the InterNet (Lain). Participants who chose the same topic from a list of five topics were sorted into a set of groups with 5-7 individuals per group.

Basically, the 82 groups worked independently with each group having its own forum for group members to discuss and complete weekly tasks. Since this was a voluntary activity, members with different levels of participation had to work things out. This resulted in an authentic situation within which to investigate lurking behavior in the context of group learning.

The Participants

Of the 490 participants, 72 never posted nor logged in and were excluded from this study. The mean of group participant counts was 5.1. The average frequency of online instances was 55.3 per person and the standard deviation was 46.6. The average frequency of postings was 81.2 and the standard deviation was 101.6. It is clear that there was a large amount of variation between groups as well as among individuals. We also noticed that the post/online ratio was greater than one, which means that participants tended to contribute more than one posting whenever they logged in.

Data Collection and Analysis

In this section, we introduce how we identify the specific proportion of participants whose online participation was consistent and sustained but whose postings were meager. We then classify the lurkers into three types by comparing their postings and online frequency with that of the total community. The nature of the individual postings was sorted by referring to the adjacent postings. Finally, one example was given to explore the dynamics between Type II lurkers and their group members.

Identifying the Lurkers

The purpose of this study was to identify group members who were relatively silent in terms of the ratio of postings to logins. The frequency of participants' postings as well as the frequency of participants' online presence were tallied and analyzed. Using the group as the unit of analysis, we calculated the ratio of postings to logins per participant and per group. Participants with a Z score ratio below one SD (standard deviation) of the group Z score ratio were identified as lurkers.

Classifying the Type of Lurkers

The basic characteristics of these identified lurkers were displayed in relation to those of the community as a whole in terms of the frequency of online presence and the frequency of postings. Owing to individual group disparities, some of those identified as lurkers with their groups appear not to be as silent as we normally thought and thus need to be classified and further analyzed. Taking such a community perspective, we are interested in differentiating the engagement level of lurkers between a variety of groups. That is, the frequency of postings and logins of a list of lurkers generated from each specific group situation were compared with the mean postings and mean login frequency of the community in order to adjust the distinct differences among groups' Z ratios. To be specific,

- a. Type I involves the lurkers whose frequency of postings and online presence were both above the mean of the community.
- b. Type II involves the lurkers whose frequency of online presence was above the mean but the frequency of postings was below the mean of the community.
- c. Type III involves the lurkers whose frequency of postings and online presence were both below the mean of the community.

Exploring the Nature of the Postings of the Lurkers

Content analysis of the postings of the lurkers was performed as follows in order to understand the nature of the postings of the lurkers in terms of their interaction with group members. The postings were sorted into four categories [25] : i) Social Talk about affective and supporting aspects, ii) Coordination about scientific procedures and collaboration, iii) Information Sharing about on-task topics, and iv) Critical Comments about others’ on-task postings. After the initial sorting of the postings by two researchers, the definition of the four categories were negotiated and revised, and the interrater reliability reached to 0.99.

An Example: Making Sense of the Intentional Lurker

One lurker in Type II was selected for analysis because the Type II characteristics were the most pedagogically critical.

Waters and Gasson’s [26] approach, the classification of the primary learner-role behaviors, was adopted to examine the contribution of the participant’s behavior in an online group forum. Discourse analysis was further applied to analyze a long thread in this group so as to explore the potential influence of the sporadic postings of this lurker on the dynamics of the group in knowledge co-construction.

RESULTS AND DISCUSSIONS

The results are presented in two parts. First, the types of lurkers and the nature of their postings were categorized. In the second part, a microanalysis of a long thread of a C2 group was applied to explore the role of the lurker in this group. A knowledge co-construction perspective was introduced to reconsider the meaning of lurking beyond the tallying of quantitative aspects of participation.

The Types and Nature of Individual Postings

Of the 82 registered participants, 46 lurkers from 44 groups were identified. As mentioned before, these lurkers were identified by their low ratio of postings to logins. That is, based on the engagement levels of the whole group, only those members with a ratio below one SD were considered to be lurking in their group forum. Thus viewed, the quantitative aspects of lurkers’ participation varied significantly and merited further classification.

Table 1. *The Distribution of the Nature of Postings of Three Types of Lurkers*

Lurker	Number	Post(Mean)	Online(Mean)	ST(%)	CR(%)	IS(%)	CC(%)
Type I	3	89.67	89.33	20	24	42	14
Type II	6	30.67	72.33	21	34	32	13
Type III	37	8.70	20.27	20	42	34	4

Note. ST=Social Talk; CR=Coordination; IS=Information Sharing; CC=Critical Comments

Table 2. *The Profile of 6 Type II Lurkers*

Group	ID	Posting	Online	Ratio
d_2	kawai	40	64	0.63
a_16	es1225246	37	88	0.42
b_4	kelia	36	76	0.47
e_11	twyoyo71	29	68	0.43
a_18	70332	25	68	0.37
c_2	snowlove	17	70	0.24
Mean of the community		81	55	1.47

The distribution of the types of lurkers is reported in Table 1. First, there are 3 lurkers of Type I, 6 of Type II and 37 of Type III. Since these lurkers were identified by comparing the roughly 5 members within each group, different levels of participation within a group determine who might be considered to be lurking. We purposely used the mean of

the frequency of online and postings of the 82 groups as indices to search for particularly unusual participative behavior. In line with this inquiry, we are not concerned with either Type I nor Type III because participants in these two categories either contributed as many postings as ordinary participants or as few as the type of lurkers we are already familiar with. In particular, Type I lurkers contributed posting counts above the average for the whole community, yet they were identified as lurkers simply because the rest of the group members were so exceedingly active that those of Type I were reduced statistically to lurker status. In contrast, 28 out of 37 lurkers in Type III contributed fewer than 10 postings during the six-week inquiry team work. Their levels of participation in general were far below the average. On the other hand, lurkers of Type II (Table 2) are the ones who had above average login frequencies but unusually low posting frequency, which is the focus of this study.

Second, the result of the nature of lurkers' postings in Table 1 seemed to reveal interesting patterns. All types of lurkers had roughly the same proportions of Social Talk. In terms of Coordination, the type of lurkers with fewer contributions posted more in this category. It seems that coordination is an easier kind of contribution for them to provide. All types of lurkers made efforts in Information Sharing, which involved searching for potential useful information from websites or authoritative sources and then shared them with the group. This is a safer way to join the group forum. Most importantly, we noticed that while Type III lurkers did not dare to provide their Critical Comments to the group, the distribution of Type II Critical Comments was similar to that of Type I.

Due to the extremely engaged team members they were surrounded by, Type I lurkers could be treated temporarily as a pseudo-lurking participant. To be more accurate, those Type I participants defined as lurkers could reasonably be considered as normal participants. It is then most interesting to discover how Type II lurkers involved themselves as much in deep-level knowledge construction as did Type I lurkers.

In summary, rather than identify the lurkers' online activities in an isolated fashion, a micro-analysis of Type II lurkers was performed to explore how they interacted with team members and what they posted in order to determine how they benefited from or contributed to the group.

Intentional Lurker's Profile

The members of group C2 were selected as the target of our microanalysis. The C2 group consisted of 6 members whose postings totaled 389 and whose online presence frequency totaled 526 (Table 3). According to our definition of lurkers in a group, the ratios of each member were compared and calculated and Snowlove was identified as the only lurker. The main topic of the C2 group discussion was "Fog".

Table 3. *The Profile of Snowlove's Group Members*

ID	Posting	Online	Z-Ratio
010124	150	182	0.57
milkbottle	123	119	0.52
cathyjudy	53	94	0.43
icebox	34	60	0.84
snowlove	28	70	0.24
beer	1	1	1.00
Total	389	526	

Since we were interested in how lurkers took part in the process of knowledge co-construction, a longer thread, the

Table 4. *The Classification of Primary Learner-Role Behaviors*

Level	Form of Behavior	Milkbottle	Cathyjudy	010124	Snowlove
I. Partici-pation	Passive-learner				
	Knowledge-elicitor	173	1	3	
	Contributor			13	*
II. Involvement	Vicarious-acknowledger	1	1	1	

15th, was chosen to be the sample thread. The 15th thread consisted of 69 postings by the 4 members during the second week. Icebox and Beer had not participated in this thread. The long thread provides us a better opportunity to discover the progress and the dynamic interaction in the C2 group discussion.

Waters and Gasson's [26] approach was adopted to examine the contribution of the participant's behavior in the online forum. In contrast with most of the studies using the "single posting" as the unit of analysis, Waters and Gasson's classification was accomplished by the following three steps: 1) identifying the contribution of each posting through comparing the relationship of prior postings to the current one in order to recognize the level and the contribution of the posting, and 2) tallying the total of each classification of posting of each group member, and 3) selecting the highest frequency as the most fitting classification with which to define the participation level of each group member. The eight learner-role behaviors are: *Passive-learner, Knowledge-elicitor, Contributor, Vicarious-acknowledger, Closer, Facilitator, Initiator, and Complicator*. The classification further provided a framework for three levels of involvement: participation, involvement, and social engagement.

For the purpose of exploring group knowledge co-construction, Waters and Gasson's approach was able to examine how each posting functioned in relation to the postings of other members and accomplished collective knowledge building. In this way, despite the sporadic reified objects (postings), it was still possible to capture the subtle participation of the lurker's to some extent.

Each member's learner-role behavior and participation level is reported in Table 4. Most of the members fell into the *III. social engagement* level. Milkbottle and Cathyjudy were classified as the *Facilitators* and the only lurker, Snowlove, as the *Complicator*.

The three postings were the only ones that Snowlove contributed in this thread and all of them were categorized as the most advanced level in terms of role-player. According to Waters and Gasson, the definition of a *complicator* is as follows:

"A complicator is a participant who forces the community to reflect on assumptions and who suggests alternative interpretations. The complicator points out inconsistencies in arguments and may reframe questions in an original way. A student in the complicator role behavior communicates a perspective that redefines an initial position (an initial question or someone else's response) or suggests alternative perspectives to a proposed point of view and shows complications that arise from an approach."

The result of the classification of each member is indicated with *.

The level of Snowlove’s engagement was classified as social engagement, which is defined by Waters and Gasson as:

Active commitment to the social facilitation and direction of the community learning process.

Table 3 shows that, except for Beer, Snowlove was the least active contributor in terms of the quantity of postings. When examined from a knowledge co-construction point of view, however, Snowlove dramatically played a decisive role.

Lurking in Group Knowledge Co-construction

This episode showed that the *Complicator’s* opinion was suddenly raised after 44 postings by other team-members had been interchanged. Noticeably, the powerful and challenging posting content (#45-47) demonstrated that the lurker, Snowlove, was not a bystander or free-rider at all.

Engagement, including inviting and accepting the ideas of others, is important in the process of knowledge co-construction. The concept of “wind” as the main hypothesis (#43) was started back in #18, and went through 25 postings (#18~43), eventually to be accepted and integrated in the group hypothesis for the group member who had engaged more over a long period of time. But, the *Complicator*, Snowlove, who always remained silent in the group, broke her silence and submitted 3 postings (#45~47) at this stage to address the problem of the concept of “wind” as the main hypothesis and one that was in her opinion justified, specifically “advection fog is not restricted by wind speed, but the advection of warm and wet air.....”.

However, given that Snowlove had not posted anything previously in this long thread, group members gave it an unfriendly reception, in contrast to that which they gave the Contributor, 010124. We could see a decrease in postings

and a silent and conflicted atmosphere when Snowlove attempted to raise a point counter to the direction of current group discussion. The *Faciliator*, Cathyjudy, tried to counter Snowlove’s opinion by using 010124’s previous opinion (#48). The *Faciliator*, Milkbottle, kept summarizing group members’ opinions but excluded Snowlove’s proposal from the “the summarization of hypotheses postings” and did not respond to Snowlove. At this point, Snowlove’s posting was ignored by the group members.

We recognized one specific bid to negotiate interactively between the *facilitator* and the *Contributor*: the *Contributor* 010124 justified the *Complicator*, Snowlove’s, posting to help build a bridge between their conflicting opinions. It appeared that nobody cared for Snowlove’s argument (#45-47), but 010124 did pay sufficient attention to it. Instead of using personal internal resources to judge the opinions of other group members, 010124 sought an external resource to evaluate Snowlove’s claim. 010124 took Snowlove’s opinion and looked for authoritative references to check it, then copied and pasted seven authoritative references (#51, 52, 55, 57~60) to justify Snowlove’s opinion as right. In this way, 01024’s posting eventually evoked negotiation within group. The group members renewed discussion and consideration of the value of Snowlove’s claim. Milkbottle also sought out an external resource to justify Snowlove’s posting (#53) and then, convinced of its validity, supported Snowlove’s argument. Snowlove’s argument became legitimate knowledge for the group members. The *Facilitators*, Cathyjudy and Milkbottle, adopted the *Complicator*, Snowlove’s, opinion to make an adjustment to the direction of group discussion (#62~68). We could see that the vindication of this view revived the progress of group discussion which then went forward again toward knowledge co-construction.

No.	ID	Content
40	010124	Fog takes place at night easier than during the day
41	Milkbottle	010124! Give the reasons for your hypothesis or you will not be able to convince anyone.
42	Milkbottle	Rain in Spring is too light to be felt. Is it a kind of drizzle?
43	010124	Wind at high altitude is stronger than at lower altitude, so I proposed the first hypothesis. Wind over the sea is stronger than over the land, so I proposed the second one. The reason of the third one is that wind is always stronger during the day than at night.

45	Snowlove	This is used data..... I thought radiation fog took place on land mostly and the weather must be less windy. ...
46		advection fog is not restricted by wind speed, but the advection of warm and wet air.....
47		Maybe other teams study radiation fog and advection fog, so can we start from another point of view, like looking for some materials of other kinds of fog, then discussing?
48	Cathyjudy	According to #15-42. According to 010124, can we summarize all into a hypothesis? The occurrence of fog is related to wind, because of only one key point that 010124 mentioned is wind.....
49~50	Milkbottle	The conditions of formation of fog: 1. low temperature, 2 high humidity, 3. less wind, and condensation nuclei.
51, 52, 55, 57~60	010124	frontal fog, fog, fog, Upslope fog, Spring fog in early morning is a sign of clear sky. Summer fog in early morning, Heavy rain in the afternoon (All of the contents forwarded from the website were omitted due to limited space)
53	Milkbottle	Frontal fog, fog.
62	Cathyjudy	The main hypothesis. When the cold and warm air contact each other, fogs take place where there is a large temperature difference, more humid warm air, and more condensation nuclei. I specially point out the humidity of warm air...
65	Milkbottle	The main hypothesis. In nature, cold air is below warm air when cold and warm air contact each other. A big temperature difference means the difference between the temperature of cold air and warm air. Given more temperature difference, suitable wind speed, higher humidity and more nuclei in the air, then fog forms easily.
67		The main hypothesis. Humidity of warm air
68	Cathyjudy	The explanation for the main variable. The main variable is not just humidity, but the humidity of warm air. If the humidity of warm air is not high enough and the saturated water vapor pressure becomes lower, it does not reach saturation.

The lurker who was regarded as demonstrating very little contribution played a critical role, given the support of the industrious members (i.e., 010124) in the knowledge co-construction process. It is less difficult for lurkers to contribute a posting than it is to find the right turn-taking timing to do it. It is even more difficult for them to foresee how their postings might receive serious evaluation, as was the case here.

The picture of the lurker in the present study was one of withdrawn reticence. Through a microanalysis on the dynamics of one online group, we discovered that the lurker, Snowlove, was classified as a *Complicator* and was affiliated with the deepest *Social engagement* level.

Although the sporadic postings made it difficult for lurkers to become recognized and trusted by their teammates, the invisible engagement and participation can not be ignored and neglected. Were we to assume that lurkers made little contribution due to the paucity of *reified objects* in this episode, we might misinterpret their absence as a lack of *participation*. When Snowlove finally positioned herself as a critic, we suddenly realize that she had spent an extensive

amount of pondering time, engaging with group members in a silent way. Her critical comments were as important as those of the active members. Participation and reification, coined by Wenger [2], are a duality fundamental to the negotiation of meaning. It is necessary to analyze the online learning situation in terms of this duality and to redress the imbalance. The relations between the tacit and explicit are to be renegotiated in order to draw a more complete picture of the lurker's learning.

The results of the microanalysis have also challenged the individual-oriented framework view of lurker's online learning in previous studies. The conventional approach in general pursues a more even level of contribution and an independent, self-regulated participation in lurking literature. Viewed from that individual framework perspective, the free-rider and the bystander are considered to be negative factors. However, from a knowledge co-construction perspective, it is not how much they posted, but what they posted, and how it influenced knowledge advancement [27] that matters. Divisional differences do not necessarily lead to rifts along knowledge

give or take lines. Instead, knowledge co-construction is a collective enterprise with complementary contributions from diversified members.

CONCLUSIONS

Many important aspects of asynchronous online discussion as it relates to learner contribution remain understudied. Lurking, as treated in this paper, is indeed one of those aspects. Learning may take place through reified objects that we can measure, but also through invisible participation that we ignore. Because previous studies paid little attention to the invisible aspects of participation, the meaning of lurking has generally remained predetermined. The lurker's "limited" contribution is therefore yet to be analyzed. Using a confluence of methods and taking a highly contextualized approach to analyzing the messages posted by lurkers, we discovered that a number of lurkers are highly contributive to knowledge co-construction in our study—Snowlove is simply one example of them.

Some new light can be shed upon the lurker's contribution when taking a social theory of learning perspective. Firstly, an alternative definition of lurker needs to be developed. In the past, it was found that lurking research was dominated by low-level conceptions of online contribution, which relied merely on frequency counts as the measure of lurking participation. Lurking, in the present study, was examined by identifying unusual frequency ratios of online frequency to number of postings and considering the intentional learners with meaningful lurking behaviors. In particular, lurking was not found and identified only in a large community where interlocutors were unacquainted with each other, but also recognized as occurring in a small group where team-members had relatively close connections. By investigating online participation rather than online access, the results of the present study highlight specifically the nuances and dynamics of intentional learners with lurking behavior in small group forums rather than those of lurkers in large community forums whose postings were exiguous or nonexistent.

Secondly, lurking can not be viewed as individual passive participation as defined and interpreted in previous research. Posting messages here did not function as an isolated individual assignment submission activity as treated in previous studies. Rather, this study interprets lurking behavior in the context of collective learning. The term "lurkers" conventionally connotes a sense of gaining extra advantage and those who engage in it are considered free-riders in most of the previous studies. As a member of the group, however, one might benefit from or contribute to the group in a variety of ways. This study denies the taken-for-granted assumption that counting the number of postings accurately reflects the value of the individual participant. Thirteen percent of postings of Type II lurkers were identified as Critical Comments, a figure similar to that of Type I lurkers. That is, Type II lurkers reflect a considerable investment of time spent with group members' postings and are able to make comments on

them. In terms of the proportion of postings in the most challenging category, Critical Comment, Type II lurkers contributed as much as did the ordinary group members.

Thirdly, contrary to what is typically cited in the literature (i.e., [4]), we examined the nature of those limited lurker postings and discovered a significant contribution to the progress of group knowledge advancement. This study applies a different coding system to categorizing the level of inter-subjectivity of the postings. The unit of analysis is not the "single posting" but the relationship of the current posting to earlier turns or even to later turns. In this way, our approach represents a knowledge co-construction point of view and reshapes the role of intentional lurkers. For example, in this case Snowlove was found to be as sophisticated as a *Complicator* rather than as a passive recipient or witness learner. Instead of focusing on the level of involvement at the-individual-posting level, the give-and-take capability of members in a group was further emphasized. Although Snowlove contributed the least number of postings, her invisible participation was perceived, recognized and captured. Using a knowledge co-construction perspective, the nature of the postings was re-interpreted and showed a dramatically different picture of the lurking learners.

This study contradicts commonly held beliefs and assumptions concerning the conventional definition and meaning of the term lurking as applied to learners. Rather than anecdotally inferring that lurking is a valid and meaningful mode of participation (i.e., [15]), this study denies certain audience assumptions and re-conceptualizes the meaning of intentional lurking through the use of empirical data. Intentional lurking, in our study, is considered to be a reflexive, social, and co-constructive activity, rather than consisting of lazy, passive, and independent message submission. If we are to understand better what online lurking actually is and how it may be studied empirically, we have to employ a more collectively-oriented theoretical framework for such a mode of learning.

As with any research, certain limitations of our findings must be noted. The results occurred very probably because Lain is an online community of voluntary participants. Rather than using a point-for-post method to access individual performance, group members were free to participate at their own pace. There was no specific mandate to produce a minimum number of messages. The operationalized definition of lurker – members with a ratio of postings to logins of one standard deviation below the average – was appropriate and responsive to the data present. The findings therefore need to be viewed with caution as they would not necessarily be representative of other types of online collaborative learning environments. Moreover, in analyzing the inter-subjectivity of group members' postings, we purposely selected one thread which contained the largest number of postings in their group forum. It is not our intent to imply that intentional

lurkers were all engaged in the deepest level of involvement, but to unlock the value of the kind of lurkers like Snowlove in a knowledge co-construction community and to expand the spectrum of the lurking learners' potential position in a group.

Our research has contributed to the body of knowledge on how to better understand limited online postings by revealing two important considerations. Substantially speaking, on the one hand, as the value and meaning of lurking behavior is still quite debatable, lurking phenomena may well be diverse and complex. Additional lurking classification could support and improve clarity in the field. Three different types of lurkers are defined in this study. Although the intentional lurkers posted more than did the traditional non-posting lurkers, the paradoxical collaborative learning phenomenon they exhibit is deserving of significant attention.

Methodologically speaking, on the other hand, little to no research has explored the nature of the lurking learners' postings. We discovered that the active posters might not know the most and that, on the contrary, lurking learners might be more knowledgeable than the rest. It is adequate to evaluate only isolated messages, but the inter-subjectivity of these messages matters if we want to get a more complete picture of how members contributed to group learning. In the present study, for example, Snowlove, who posted sporadically but logged in frequently, de-lurked surprisingly to be a *Complicator* in critical moments in group knowledge co-construction. Online discussion, as a kind of collective learning, is never a matter of submitting or stealing individual ideas, but a matter of sharing and scaffolding each other.

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