A Case Study of a Longstanding Online Community of Practice Involving Critical Care and Advanced Practice Nurses

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Abstract

The aims of this study are: (1) to examine to what extent critical care and advanced practice nurses' participation in an online listserv constituted a community of practice, and (2) to explore how the nurses use electronic media to communicate with one another. Findings suggest that the online listserv environment, as a whole, did function as an online community of practice, where participation not only served as an avenue for knowledge sharing situated in the actual context of the nurses' everyday work experience, but also helped to reinforce identity of the nursing practice itself. Motivations to participate included a way to network with others who shared a similar working situation, and an opportunity to learn new knowledge and work practices. The most common type of messages posted was "Sharing knowledge", followed by "Solicitation". Regarding the types of knowledge shared, the most common ones were "Institutional Practice" and "Personal Opinion".

1. Introduction

Organizations and professional associations are increasingly examining the potential of online communication networks to enable members to share knowledge and engage in ongoing workplace learning and professional development [16]. An important area within such sharing of knowledge and professional development is the notion of communities of practice, which has gained significant ground in recent years [32, 22], particularly in the corporate world [29, 38]. According to Wenger and Snyder [38], communities of practice can be described as groups of people who are informally bound together by shared expertise and a passion for joint enterprise. They can be viewed as informal networks that support professional practitioners to develop a shared meaning and engage in knowledge building among members [18]. The theoretical construct of communities of practice is grounded in an anthropological perspective that studies how adults learn through everyday social practices rather than focusing on environments that are intentionally designed to support learning [16].

According to Johnson [23], one main reason for the increase in interest in communities of practice is dissatisfaction with traditional learning methods. Traditional learning methods have been described as codified learning, one that is removed from the place where the learning is to be applied [27]. Organizations often do not see a direct relationship between business results and their investments in traditional learning methods because much traditional formal learning is limited in its transfer to the daily workplace [31]. In contrast to knowledge transfer, corporate learning should be characterized by sharing knowledge, capturing experiences, reusing them, creating new knowledge, and recognizing and solving workplace problems, in a process-oriented, collaborative manner [11]. Such learning can be supported by communities of practice.

Learning in communities of practice is situated learning [36]; it involves learning that is not codified because it takes place at the time and place in which the actual tasks are performed [23]. In other words, the social practice and activities that underpin the practice are fundamentally interwoven with cognition and learning [7, 22, 24].

However, despite the strong interests among practitioners, the study of communities of practice is scarce of empirical research [19]. The term "communities of practice" itself was popularized after the article written by Brown and Duguid [8] was introduced; yet Orr's study of technicians in Xerox is one of the few studies conducted in natural settings [18]. Furthermore, the study of communities of practice in nursing practice is scanty. In addition, there is a knowledge gap with regard to online communities of practice [4]. The original concept of

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communities of practice addressed learning that occurred in face-to-face situations such as apprenticeships of Mayan midwives in Mexico, work-learning settings of the United States Navy quartermasters, and among non-drinking alcoholics in Alcoholics Anonymous [24]. With the advent of information and communication technology, (e.g. the Internet), there has been an increase in interest to examine how such technology might support distributed communities of practice [37].

A pertinent question that had been raised by Johnson [23] was whether the current web-based and text-based environments are conducive to allow communities of practice to emerge and operate as learning entities. Johnson [23] was confident it does, provided that support in the form of extensive scaffolding is available. Gray [16] was also of the same opinion. Wenger [37, p. 24] suggests that "there is the potential for professional associations to facilitate and enhance informal learning by providing opportunities for the development of online communities of practice". In contrast, however, Haney's [17] research in one of the most technologically sophisticated firms in the world, suggests that despite elaborate, sophisticated, and expensive technology, no discernable online community of practice was observed.

1.1. Characteristics of a community of practice

Wenger [36] delineates four main characteristics that distinguish learning in a community of practice: practice; community; meaning; and identity. First, learning takes place in practice. Second, learning occurs as being a member of a community. Membership implies a minimum level of knowledge of that domain—a shared competence that distinguishes members from other people. Third, learning is a part of experience and, as a result, becomes meaningful. Fourth, through practice and meaningful learning in a community, a member of such a community develops an identity. Members of a community of practice engage in joint activities and discussions, help each other, and share information. Through such interactions, they form a community around their domain and build relationships with one another. Whether it is a group of high school teachers or a community quilting club, a community of practice consists of individuals with a shared domain of expertise who voluntarily learn together about practices that matter to them [16]. Gray further argued that shared learning and interest are what keeps communities of practice together.

2. Research questions

Two schools of thoughts have been discussing the possibility of designing an online community of practice. Some contends that a community of practice, even online, should emerge naturally (e.g., [30]); others claim that it is possible to design an online community of practice (e.g., [6]). Thus, the aims of this study are twofold: (1) to examine to what extent critical care nurses' experiences in an online environment constituted a community of practice, and (2) to explore how the nurses use electronic media to communicate with one another. Specially, the following research questions were addressed:

1. To what extent the participation of nurses in an online environment constituted a community of practice? If yes, what are the critical success factors that sustained it over the years?
2. What types of messages and knowledge did the nurses share with one another in the online environment?

3. Brief description of the case

The Nurse Practitioners listserv, an e-mail based private discussion forum, is one of the most established and largest in nursing that can be found in the United States. We call the examined listserv NP-l in this paper. It was founded in 1993; to date, there are more than 1044 members from all over the country who participate in various discussions. The NP-l originally began as a dos-based listserv at a research university with 100 members before moving on the *Yahoo! Group software* platform. Increase in membership was about 10 nurses every week, according to the moderator of the listserv. The listserv affords a venue for clinical nurse specialists, nurse practitioners, educators, administrators, physicians, and other professionals interested in advanced practice nursing acute and critical care, to meet at any time or place to network with one another. Members post queries by sending an email to a NP-l address. The moderator screens membership applications to the listserv, as well as messages to reduce the number of advertising and other inappropriate postings. No attachments are allowed in the messages in order to prevent the spread of viruses.

All new members to the NP-l are informed of netiquette rules to help facilitate good communications among members. The rules include:

1. Post messages that are germane to advanced and critical care nursing practice only.
2. When replying to a message, do not include the entire message to which you are responding. If

you feel it is necessary include part of the original message.
3. If you have a continuing disagreement with another member, use individual mail instead. Do not use the listserv for such purposes.
4. Use a “signature" at the end of your message with your name, address, affiliation, and telephone or fax number.
5. Avoid offensive language, racist or sexist remarks.
6. Keep messages short and to the point.
7. Patients should not be identified.
8. The "Subject" title should accurately reflect the content of the message.

4. Research methodology

A qualitative case study involving the constant-comparative approach [25] was adopted in this study. We believed that such an approach was appropriate given the exploratory and inductive stance that under grids the study; where we seek to gain a holistic understanding and a deep view of the case at hand.

4.1. Participants

Participants in this study were 14 nurses (one male, 13 female) who are members of the NP-l. Eight had more than 20 years of nursing practice experience; three had more than 15 years; and three had less than 10 years. Such experience includes pediatric care, trauma, general medicine, cardiology, oncology, adult critical care and surgical critical care. All participants had a master’s degree in nursing. A majority of the participants (n=10) had participated less than five years in NP-l (see Table 2 for the participant profiles).

Table 2. Characteristics of the fourteen participants

Participant	Gender	Years of experience	Years in NP	Areas of specialty
Nurse A	F	25	10	Pediatric care
Nurse B	F	25	8	Pediatric care
Nurse C	F	8	1	Trauma, general medicine
Nurse D	F	25	2	Patient safety
Nurse E	F	25	4	Cardiology
Nurse F	F	21	1.5	Adult surgical
Nurse G	F	29	5	Cardiology
Nurse H	F	25	9 months	General ICU
Nurse I	M	16	3	Surgical care
Nurse J	F	17	7	Medical critical care
Nurse K	F	18	4	Adult critical care
Nurse L	F	9	3	Acute care
Nurse M	F	27	4	Oncology
Nurse N	F	8	2	Surgical care

4.2. Methods

Online observation. One of the strengths of observation is that it allowed us to obtain information about human behavior directly without having to rely on the retrospective or anticipatory accounts of others [15]. In the present study, we observed the online communications among the nurses in the NP-l for the months of March 2001 to 2005. We chose March 2001 because it was the month immediately succeeding the time that NP-1 migrated to the new *Yahoo! Group software* platform from an old dos-based listserv. (We did not choose February 2001 itself because NP-1 just began operation with *Yahoo Group Software* in that month; we wanted to capture the daily communications among the members rather than teething migration-related communications.) For consistent purposes, we subsequently chose the months of March 2002, 2003, 2004, and 2005. Online observation was deemed suitable given the fact that the nurses were located in various locations throughout the entire country; hence making direct face-to-face observations in their workplaces difficult.

Interview. Lincoln and Guba [25] point out that the virtue of the interview is that “it permits the respondent to move back and forth in time – to reconstruct the past, interpret the present, and predict the future.” (p. 273). Interview was thus chosen as one of the data collection methods because the nurses’ experience of starting with the online community of practice was now in the past, and also because their perceptions and opinions could not be observed. We used the semi-structured interview format, where the interviews were focused and guided by issues pertinent to the study’s research questions. Each interview, lasting about 30-40 minutes, was conducted over the telephone. Informed consents to audio record all the interviews were obtained from the participants.

4.3 Data analysis

In order to examine the extent the nurses' experiences in an online environment constituted a community of practice, the starting point for data analysis was a collection of categories pertinent to the characteristics of a community of practice from prior research and writings. In particular, Wenger's [36] characteristics were used as the lens for analyzing a community of practice.

To explore how nurses used electronic media to communicate with one another, we used the content analysis approach to identify and categorize the types of messages and knowledge that participants shared with one another online. We first identified exemplary postings that seemed to clearly illustrate the different types of messages and knowledge. These examples were then used as initial codes to guide the continued analysis efforts. We continued to refine the definitions of these codes during the data analysis process, using the constant-comparison method [25]. This involved moving back and forth among data sets to discover new codes and categories until each category was saturated – that is, until new data began to confirm rather than shed new light on the categories.

5. Findings and discussion

This section looks at the results and discusses its relevance in terms of the two research aims raised earlier.

To what extent nurses' participation in the NP-l constituted a community of practice

The findings in this study suggest that the NP online listserv environment, as a whole, did function as an online community of practice, where online participation not only served as an avenue for knowledge sharing situated in the actual context of the nurses' everyday work experience, but also that participation helped to reinforce identity of the nursing practice itself.

Sense of identity and meaning. One of the main defining characteristics of a community of practice is that it provides members with a medium for creating identity and meaning of and understanding a domain of shared interest [36].

Findings revealed that through their participation in the NP-l, members explored fundamentally important questions pertaining to the roles they play as critical care or advanced practice nurses; these roles, in turn, help formulate their professional identities. Even members who have been nurses for over 20 years found this meaningful and important. For example, nurse G said:

> We kind of validate [each other]. For example, if I've a question on something that I'm doing, I'll put up a message [in the listserv]. I'll usually get several responses back, agreeing or disagreeing with the things I'm doing. It's a good way of validating my practice . . . . So, if I'm doing something, I want to make sure that it meets the standard of nurse practitioner. And if I've to go to court, I want to be able to say that this is the standard by which nurse practitioners do.

Barab and Duffy [5] claim that this sharing of information helps members contribute to the construction of their own identity in relationship to the community of practice and reciprocally to the construction of the community of which they a part.

In addition, membership in the NP-l is self-selected. People in such communities tend to know when and if they should join; they know if they have something to give and whether they are likely to take something away [38]. New membership to the NP-l is easily established simply on the basis of the newcomer's identity - so long as the newcomer is either a critical care nurse or an advanced practice nurse. This self-selection type of membership helps to establish a sense of culture among the NP-l members; a culture that refers to what it is like to be a critical care or advanced practice nurse. Commenting on how culture is facilitated by the NP-l, nurse L remarked:

> Culture is created in how nurses practice. It is like a big jigsaw puzzle, where communication among nurses is one part of it. The NP-l helps to build a piece of the culture puzzle by facilitating communication among its members.

Community – interacting and learning together. As mentioned previously, the second characteristic of a community of practice is that members interact and learn together by engaging in discussions and sharing information [37]. Online observations revealed that on the average, about 138 messages were posted every month, or 35 messages each week. This shows that nurses in the NP-l were willing to interact and learn from each other despite their busy workload. When asked why the nurses participated in the NP-l, many said that it was a need to connect with other nurses (e.g., ask questions, seek pertinent information) that drove them to interact with one another. For them, the online environment represented a mechanism to reduce the isolation due to the job function and geographical location [16, 35]. For example, nurse K explained:

> I'm the only critical care nurse specialist in my hospital, in the whole town [about 25,000 people] as a matter of fact. As such, I don't have any contact with other [critical care] nurses in my town. This [NP-l] helps me to be in contact with other nurses from all across the

> country online on a regular basis. It allows me to ask questions…it's a godsend to me because it helps me to validate my practice and get information that I need quickly.

Such ability to interact online with peers is likely to gain prominence and importance in the near future given that the current shortages in critical care personnel are projected to get far worse [3, 10].

It is also interesting to note that the NP-l environment also represented a valuable learning resource even for those who did not actively contribute through posting, but who just "lurked" in the background and read what was being discussed in the listserv. As remarked by nurse F in an interview:

> I read the messages posted in the listserv every day. Almost 25%-30% of what I read, I've found useful and have incorporated [them] into my actual practices. I don't, however, post messages or contribute often…perhaps once a month or so, and only when I need to ask questions or able to contribute something useful that I know to whatever is being discussed.

Such participants were in fact, engaged in "vicarious interaction" [33]. Sutton defined vicarious interaction as what "takes place when a student [participant] actively processes both sides of a direct interaction between two other students [participants]" (p. 4). Sutton found that those who interacted vicariously had read, appreciated, and learned from the interactions of others, but they felt no desire to interact themselves. This was also found in a study by Gray [16] on an online community of practice designed to support informal workplace learning, where participants "learned by lurking" and "picked up ideas" even when they only read the online postings but did not contribute themselves.

When asked whether and how the nature of the online environment itself helped to facilitate interaction among members, two main responses emerged from the interviews. First, the online environment helped members to be more open in sharing knowledge. This was mainly due to a non-competitive environment afforded by the online communication medium that connects members from different organizations. Traditionally, organizations have rewarded their employees based on their individual performance and know-how [1]. In such situations, it is expected that individuals will attempt to build up and defend their own hegemonies of knowledge rather than sharing with others [34]. However, distant and informal contact between professionals from *different* organizations might be an important mechanism to overcome such a barrier [28]. Our interview data supported this view by revealing that some nurses, who worked in different organizations, felt that they were able to share knowledge easier due to a non-competitive environment simply because they were not in the same organization. As remarked by nurse F:

> I actually get better communication from my peers on the listserv. People are more wiling to share things, especially when they are not your peers who may have ulterior motives…trying to work their way up the organization. You know what…they [people in the listserv] are not likely to run into you, and so they [are more likely] to tell you an honest opinion.

Second, the ubiquity of the Internet created a convenient and fast avenue for interaction:

> The Internet itself has made it so much easier to let people like us [at the east coast] to talk to people on the west coast. You can just like throw something off at the listserv and get people from all over the country to respond to you quickly [rapid turnaround time]. It's convenient for the people to respond when they like…it's also convenient for you to pose your question, since you can do it at any time of the day or night you want. (Nurse K)

Shared practice – a shared repertoire of resources. Finally, another characteristic of a community of practice is shared practice where they develop a shared repertoire of resources, such as experiences, stories, tools, and ways of addressing recurring problems [37]. There was strong evidence that such a shared repertoire was present in the NP-l. This will be elaborated further in the following section when we describe the types of messages and knowledge that nurses share in the NP listserv. At this juncture, however, it is worthwhile to mention that the shared repertoire of resources was one of the main attractions that drew many nurses to be members of the NP listserv. Nurses, in particular, appreciated the fact that many of the country's top names in nursing are current members of the listserv. These individuals are highly respected and well known in the nursing discipline and their contributions are well received by other members. Nurse H said, "The quality of the people that you actually get in touch with is just great. You can get nationally known people to comment or respond to your question, which you may not be able to do so elsewhere".

Besides having quality contributions from top authorities in the field, nurses also felt that the rich diversity of members in the NP listserv itself helped to foster a better repertoire of resources. For example:

> We really enjoy talking to other people [nurses] throughout the country…people with different backgrounds, experiences and opinions. We're sort of bred of the same institutions…we live in

> the same place [e.g. east coast]…but if we could talk to people of different settings, for example the west coast, we can get more interesting stories and ways of addressing a nursing issue. (Nurse K)

In summary, the NP online listserv environment functioned as an online community of practice. Participation in the listserv not only served as an avenue for interaction and knowledge sharing situated in the actual context of the nurses' everyday work experience (i.e. practice), but also helped to define identity of the nursing practice itself.

Now that we have ascertained that the NP-l is an online community of practice, it is worthwhile to discuss the critical success factors that have helped sustain it over more than a decade in existence. We identified the following six success factors from our analysis of data:

1. *Self-selection type of membership*. As mentioned previously, such type of membership helps establish a sense of culture and identity among the members. However, it also does more than just that. Because self-selection means that members choose to contribute to the community entirely on their own accord, members feel no sense of being pressured to participate. Contribution to the online community of practice thus proceeds informally and naturally.
2. *A need to ask questions and validate one's practice with others who shared a similar working situation*. A community of practice's domain is defined through its practice. The validation of one's practice is one of its important processes. Because many members of the NP-l find themselves to be the sole critical care or advanced practice nurses in their organizations or towns, participation in an online community of practice is the only way to connect with other like nurses throughout the country in order to ask questions and validate their practices.
3. *A need to continually keep up with the current knowledge and best practices in the field*. In addition to helping validate one's practice, a community of practice also supports its members to engage in knowledge building. We believe the need to share knowledge is particularly crucial to the critical care and advanced practice nursing fields. Our interview data revealed that the need to continually keep abreast of the current technology and best practices of their disciplines is one of the main challenges many nurses faced in their course of work. Such a need consequently drove many nurses to join and participate in the NP online community of practice.
4. *A non-competitive environment*. The very nature of the communication medium also plays an important role in supporting and sustaining the online community of practice. Many nurses, when interviewed, appreciated the non-competitive environment afforded by the NP-l online medium because it fosters a more openness in sharing information among the members. Members felt that they did not have to hoard knowledge because there was no competition among them in terms of promotion or reward since many were working in different organizations.
5. *Asynchronicity nature of the online communication medium*. In addition, the asynchronicity of the medium affords a convenient avenue for members to communicate with one another at any time and any place. Our interview data supports the observations made by other researchers that listservs have the potential to enhance communication because they are independent of the constraints of place and time in traditional face-to-face settings [2, 20].
6. *Role of the listserv moderator*. The listserv moderator also plays a pivotal role in sustaining the online community of practice. First, by acting as a sieve or filter through which all messages are screened before they are posted on the listserv, the moderator helps keep the online communication focused on its core objectives—professional issues pertinent to critical care and advanced practice nursing fields. An interview with the moderator revealed that commonly rejected messages are those which seek to exploit the NP-l members (e.g. recruitment for some self-serving purposes). Note that this does not include genuine job advertisements useful for the NP-l members. Second, by acting as a "watchdog" of netiquette rules, the moderator helps keep the online communication civil and pleasant. For example, any unprofessional statement (e.g. personal attack on a member) is frowned upon, and the moderator is quick to caution those involved not to do it over the listserv. Such incidents are, however, on the whole rare. In the opinion of the moderator, they happen only about once every year.

In delineating these six success factors, it may be worthwhile to discuss why trust was not emphasized explicitly as a critical success factor of sustaining knowledge sharing among members of a community of practice. This may seem a direct contradiction with the views of other scholars who argue that trust is a crucial pre-requisite to help build strong ties among members in order to motivate them to share

knowledge [26]. We wish to highlight that, although trust is not emphasized in our findings, it is not to be viewed as completely absent. We infer from the data that trust, seems to be embedded in two critical success factors: a non-competitive environment and contributions from well-known and respected individuals with regard to sharing best practices in the field. Moreover, strong ties among participants do not necessarily mean that participants are more inclined to share information in an online environment [12]. Constant et al [12] found that information providers gave useful advice and solved the problems of information seekers despite having a lack of personal relationships with them.

To explore how nurses use an electronic media to communicate with one another

Content analysis of 341 online messages (taken from the first two weeks of the months of March 2001, 2002, 2003, 2004, and 2005) in the NP-l revealed six types of messages that were commonly posted by the nurses:

1. Solicitation – request for information, ideas, or participation. For example: "How do you treat the pain management of post-op liver transplants?"
2. Appreciation – offering thanks for some action. For example: "Thank you for all the work it took to do this for us."
3. Administrative – related to the administrative purposes of the online listserv, as well as the use of the communication medium. For example: "We're official!!! Thanks to all of you for taking the time to switch your subscription. You don't need to unsubscribe from the old." "I'm testing the sending of messages to this medium."
4. Advertisement – announcement of some job openings or positions. For example: "I'm writing to you to spread word about a new program we are implementing. We are seeking at least two full-time nurse practitioners to practice emergency medicine."
5. Clarification – giving more pertinent details about a topic (usually in response to a question). For example: "I just need to clarify one thing on my request for information. Although we do use XXX bed occasionally, my question was regarding the YYY bed."
6. Sharing knowledge – sharing book knowledge, practical knowledge, or cultural knowledge.

The majority of the messages shared was "Sharing knowledge" (57.9%); followed by "Solicitation" (31.2%) (see Table 3).

Table 3. Types of messages and frequency

Types of messages	Frequency	Percent
Solicitation (SO)	100	31.2
Appreciation (APP)	10	3.1
Administrative (ADM)	7	2.2
Advertisement (ADV)	15	4.7
Clarification (CLA)	3	0.9
Sharing knowledge (SK)	186	57.9

The fact that sharing knowledge was the most frequent type of message being posted in the NP-l bears strong testament that the listserv is an online community of practice, where its members continually develop a shared repertoire of resources, such as stories and ways of addressing recurring problems – in short a shared practice.

With regard to sharing knowledge, three categories were found. These categories were developed based on a previous empirical study of communities of practice for public defenders [18]. They emerged from and were grounded in the data [25]:

1. Book knowledge – facts, general regulations, statutes, or published works. For example: "The reference is the New England Journal of Medicine, 345(19)…"
2. Practical knowledge – book knowledge related to actual practice.
3. Cultural knowledge – is related to what it is like to be a critical care and advanced practice nurse and includes their profession identities.

Practical knowledge can be further classified into one of the following three categories:

1. Personal opinion – individual opinion not necessary representing best practices. For example: "I believe that we should always assess for pain in every patient at every encounter."
2. Personal suggestion – personal recommended solution to a problem or issue. For example: "You might want to talk to the people at the XXX in Washington, DC."
3. Institutional practice – knowledge related to what an institution currently practices or has practiced in the past. For example: "In our setting, all of our vented patients receive daily chest x-rays. Depending upon the status of our non-vented patients, the chest x-rays are ordered when needed. For our CV surgery patients, they have a pre-op chest xray, then daily chest x-rays until extubated."

Analysis of the types of knowledge shared revealed that the most common was "Institutional Practice" (60.8%) (see Table 4). "Personal opinion" knowledge, made up the second most frequent types of knowledge shared; followed by "Personal Suggestion". The relatively low count of "Book Knowledge" being shared among the nurses in listserv was not very surprising given the fact that many of the members are already very knowledgeable in their

content areas (a majority of the nurses have advanced degrees in nursing – e.g. a master's certification). In addition, it is worth noting that the typical types of book knowledge shared were the latest policies or regulations or evidence-based literature pertaining to nursing practice. Although "cultural knowledge" was not evident in the online messages, it should not be deemed as there was no or little recognition of this knowledge. "Cultural knowledge" was self-evident; each of the NP members being either a critical care or advanced practice nurse. In fact, as mentioned before, the entire NP-l is open only to individuals from such disciplines. Perhaps the self-evident nature of "cultural knowledge" eliminates the need for many explicit expressions of such knowledge in the communication among the nurses. It is also possible that the tacit nature of cultural knowledge hindered it to be openly and explicitly shared in the online messages [18].

Table 4. Types of knowledge and frequency

Types of knowledge	Frequency	Percent
Book knowledge (BK)	12	6.4
Personal opinion (PO)	40	21.5
Personal suggestion (PS)	21	11.3
Institutional practice (IP)	113	60.8
Cultural knowledge (CK)	0	0.0

Changes in the relative frequency of each type of messages were also analyzed over a 5-year period, as illustrated in Figure 1. Here, the "Sharing knowledge" type of message showed an overall increase over time. This is mainly due to the increase in membership over the years. Increase in membership was about ten nurses every week, according to the moderator of the listserv in an interview.

Analysis of Figure 1 also shows that solicitations appear to remain fairly constant over the years, with the occasional fluctuations in frequency. It is important to note that so far, only messages pertaining to the first two weeks of the months of March across 5 years were analyzed. Thus, the question of whether solicitations would also show an overall steady increase over time, as in the case of "Sharing knowledge" when new members are added, remain uncertain until a full analysis of the entire messages is done.

It can also be noted from Figure 1 that certain expected trends of types of message tended to hold. For example, "Administrative" messages decreased after the first year as members became more acquainted with the new NP-l *Yahoo! Group software* platform.

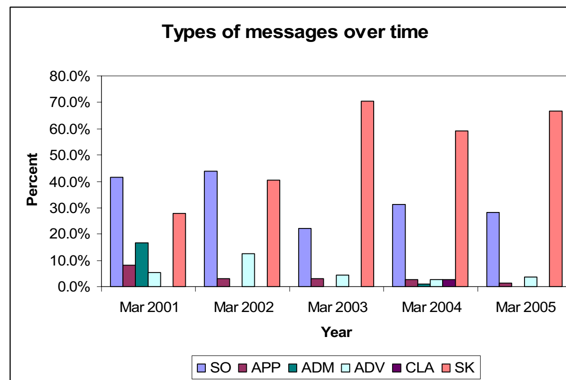

Figure 1. Changes of the types of messages over time

Changes in the relative frequency regarding the types of knowledge shared were also analyzed. Different trends were revealed for each of the knowledge types, illustrated in Figure 2. Here, "Institutional Practice" fluctuated among the five years; ups in March 2002 and 2004, but downs in Mar 2003, and 2005. "Personal Opinion", on the other hand, stayed fairly constant with the exception in March 2004. "Book knowledge" tended to decrease and over time and "Personal Suggestion" did not show a marked increase, averaging about 11.9 percent.

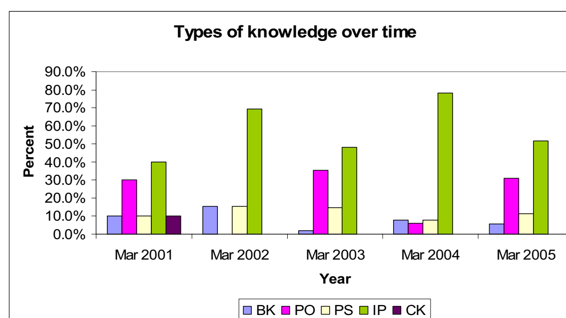

Figure 2. Changes of the types of knowledge over time

6. Conclusion

The findings in this study suggest that the NP online listserv environment, as a whole, did function as an online community of practice. The most common type of messages posted was "Sharing knowledge", followed by "Solicitation". Regarding the types of knowledge shared, the most common ones were "Institutional Practice" and "Personal Opinion". The critical success factors that have helped sustain the online community of practice include: (1) self-selection type of membership, (2) a need to ask questions and validate one's practice with others who shared a similar working situation, (3) a

need to continually keep up with the current knowledge and best practices in the field, (4) a non-competitive environment, (5) the asynchronicity nature of the online communication medium, and (6) the role of the listserv moderator. Future research would be conducted to verify and/or modify these factors.

One limitation of the study was that the current analyses of the online messages only attended to transcripts posted during the first two weeks in the months of March. It did not attend to other weeks, or other months. As such, the frequencies, as well as the trends of the types of messages and knowledge reported in the paper should be viewed with caution in terms of the completeness of the whole picture. Nonetheless, the findings reported here would still be useful in providing the reader with some ideas of how the nurses were using the NP-l to communicate with one another. Future research could be conducted which looks at a larger sample base of the online messages. Perhaps using a random sample (e.g. 20% of the entire archive of online messages) would offer the best method of enabling the research to be done without being too cost or time prohibitive.

Another limitation of the study was that it only interviewed nurses who were willing to participate in the research. As a result, the findings reported in the paper may have been slightly biased in terms of the nurses being favorable towards the NP listserv, as well as the extent it functions as an online community of practice. It would therefore be useful to examine the perceptions and opinions of novice nurses and nurses who have left the NP listserv.

Despite these limitations, we believe that the findings are useful not only to nurse practitioners, but also other professions. Many professionals struggle to catch up with rapidly changing knowledge base. We hope that this study will inform professional development via online communities of practice.

7. References

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