British Journal of Educational Technology *Vol 45 No 5 2014* 863–879
doi:10.1111/bjet.12114

Membership, participation and knowledge building in virtual communities for informal learning

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Abstract

This paper reports on a study involving the design of a virtual community for informal learning about Thai herbs. The community relied on social networking tools and a database of expert knowledge as well as community coordinators. One group of coordinators (Community A) concentrated efforts in recruitment of members on those individuals most likely to be interested in Thai herbs. The second group of coordinators (Community B) recruited from among friends, family and acquaintances. Analysis and *t*-tests of measurement of membership, participation and knowledge building revealed higher rates for Community A. Results pertaining to the design of the virtual community, which showed that members mostly used the database, provide evidence to support the hypothesis that members' access to expert knowledge positively influences participation and knowledge building in a virtual community for informal learning. Results of the comparison of Community A versus Community B provide evidence to support the hypothesis that interest in the subject of the community positively influences membership, participation and knowledge building in a virtual community for informal learning.

Introduction

Informal learning is learning that is not "institutionally sponsored" (Selwyn, 2008, p. 1), not restricted to learners of a particular age (Colley, Hodkinson & Malcolm, (2003) and not intentionally structured or intended for certification purposes (Hemphill & Leskowitz, 2013, p. 1). In terms of its importance as compared with formal learning and using an iceberg analogy, ". . . the submerged two-thirds of the structure would be needed to convey the much greater importance of informal learning" (Coffield, 2000, p. 1). Formal learning, Coffield (2000) argued, represents only a small part of learning and, unlike informal learning, is dispensable.

While informal learning itself has a centuries-old tradition, it has only recently been able to benefit from the support of powerful information and communication technologies (ICTs). Learners can easily share and build knowledge by accessing free social networking tools such as blogs, bookmarking software, e-mail, discussion forums, wikis and podcasts. Given that much of informal learning takes place socially, the increased prevalence of and easy access to these tools

Practitioner Notes

What is already known about this topic

- Virtual communities represent a means for geographically and organizationally diverse individuals to share common interests.
- These communities can rely on social networking tools to build and share knowledge outside formal educational institutions and without the formality of organization or the centrality of instruction.

What this paper adds

- This paper provides insights into how virtual communities may be designed using social networking tools and databases of expert knowledge.
- This paper identifies how members' interest in the domain or subject combined with access to expert knowledge play a role in promoting membership, participation and knowledge building in a virtual community for informal learning.

Implications for practice and/or policy

- To promote and foster membership, participation and knowledge building, virtual communities for informal learning should provide members with access to some form of expertise through, for example, domain experts, databases or links to repositories of learning objects.
- Recruitment of members to virtual communities for informal learning should focus on those most interested in the domain.

are highly relevant. ICTs change how individuals build and share knowledge (Cox, 2013) and are leading to more possibilities for informal learning. The ubiquity of ICTs has also resulted in increased opportunities to study the phenomenon and to consider what Sefton-Green refers to as a "wider 'ecology' of learning" (Sefton-Green, 2004, p. 4). One of these opportunities to study the phenomenon lies in virtual communities for informal learning.

Virtual communities for informal learning

Virtual communities are important for informal learning, which takes place outside educational institutions, without a professional curriculum or pedagogy, and which is more practical than theoretical (Andreatos, 2007). A virtual community potentially makes it easier for individuals to informally build and share knowledge because it exists in cyberspace, which cancels physical distance, thus making it easier to find individuals who share interests (Ciffolilli, 2003). Virtual communities are "online social networks in which people with common interests, goals, or practices interact to share information and knowledge, and engage in social interactions" (Chiu, Hsu & Wang, 2006, p. 1873). Such communities may include individuals from a variety of backgrounds who come together on the basis of commonality of interest to share or obtain knowledge (Hung & Cheng, 2013). Virtual communities as self-organizing social systems (Fuchs, 2007) represent a means to learn through social participation (Ma & Yuen, 2011).

Theoretically, a virtual community for informal learning can be conceptualized from the perspective of communities of practice (Lave & Wenger, 1998; Wenger, 1998, 2001). Communities of practice consist of individuals who share an interest or passion about a particular subject or shared domain of interest. In such a community, the individuals want to know how to do something better. The community component arises out of members collectively interacting, learning and sharing with one another. Hubert, Newhouse and Vestal (2001) described

communities of practice in terms of individuals learning from one another either virtually or in a face-to-face context. Members in a community of practice are motivated by an interest in exchanging best practices, problems and experiences (van Winkelen, 2003). Such communities are social structures and support "knowledge flows" between members (van Winkelen, Section 2, The knowledge perspective).

Challenges to studying virtual communities for informal learning

In spite of the importance of informal learning, it tends to be understudied, except outside "mainstream educational psychology" (Bransford *et al*., 2006, p. 217) and in nonwestern contexts (eg, Margaret Mead). Instead, learning generally tends to be discussed in relation to formal education systems (Sefton-Green, 2004). In general, forms of learning that take place outside normal educational settings tend to be not well understood (OECD, 2010). While the value of virtual communities for learning in professional contexts has been given ample attention (see Barbara & Dina, 2006; Duncan-Howell, 2010; Wilson, 2012), much less attention has been paid to informal learning using virtual communities. This may be partly because, as Pachler (2007) observed, informal learning is challenging to research.

This lack of attention to informal learning in virtual communities means that there is a paucity of knowledge about what makes virtual communities for informal learning succeed or fail (Ardichvili, Page & Wentling, 2003). Their failure may be due to what Chiu and Wang (2007, p. 531) referred to as "weak-tie relationships" because members are not rewarded financially for contributing knowledge. Their success may be dependent on what Chiu *et al* (2006) described as members' "willingness to share knowledge with other members" (p. 1873) or with active participation (Ardichvili *et al*, 2003). Their success or failure may also be related to the types of ICTs available to members of the virtual community.

Although there have been discussions of use of ICTs for informal learning with youth, incorporated into or as an adjunct to formal school-based learning (see Sefton-Green, 2004; Selwyn, 2008), informal learning with adults in virtual communities using ICTs has received less attention. Unlike a "physical" or "real" community that is largely unmediated, a virtual community does not depend on synchronous place or time in order to operate and must be supported by ICTs. Those ICTs mediate between community members and afford coming together to participate in the building and sharing of knowledge about a particular topic.

In a context of formal learning in universities and colleges, these ICTs would typically be contained within an online learning management system (LMS). Examples of the latter include proprietary LMSs such as Desire2Learn™ (desire2learn.com) and open-source LMSs such as Moodle™ (moodle.com). Users of these LMSs in, for example, a distance education course, come together to participate in formal learning. The formality is a result of top-down, prescribed and predetermined institutional program guidelines as well as starting and finishing times. The formality is also evident in the role of the instructor who defines the content and determines through assessment and evaluation procedures whether the learner has participated and met the learning outcomes.

An LMS therefore is more suited to formal learning. A virtual community for informal learning requires what Downes (2005) refers to as an environment versus a system that does not rely on institutional or corporate applications (e-Learning 2.0 section). Fortunately, the Internet features many free and customizable tools (applications, software, media, etc) that can be used to support a virtual community for informal learning. There are ICTs that afford social sharing using social networking tools such as Facebook. However, while the social aspect may be important for vitality of the community, it is not enough. Informal learning needs to go beyond social sharing and provide tools for knowledge sharing about a particular domain or subject. In that regard, it may

also need a base of knowledge about the domain, ie, the area of interest that motivates members to join the community.

One important challenge, therefore, in the study of virtual communities for informal learning is to be able to first create the environment or system in which the community might operate. Fortunately, the increasing prevalence, sophistication and accessibility of social networking tools are diminishing this challenge. However, a further challenge relates to the lack of a central presence or coordinator in a virtual community for informal learning. Unlike in a formal context of learning, there is no teacher or instructor in a virtual community for informal learning. Coordinators play an important role in a community's effective formation and operation (Akram, Allan & Rana, 2005). A community of practice must include some members who are experts (Lave & Wenger, 1998) and who can support and foster membership, participation and knowledge building in a virtual community for informal learning.

Purpose and phases of the study

Thailand represents a relevant and opportune context in which to study informal learning.

In Thailand, informal learning is perceived as critical to ensuring lifelong learning (UNESCO, n.d.) and is considered so vital that there exists a Thai Office of Non-formal and Informal Education (see ONIE, n.d.). According to the Higher Education Commission of Thailand (2003), "Informal education shall enable learners to learn by themselves according to their interests, potentialities, readiness and opportunities available from individuals, society, environment, media, or other sources of knowledge" (p. 10). Informal learning in Thailand may take place in a variety of noneducational settings such as community centers, temples, art galleries, parks, historical sites as well as in libraries, museums, science centers and educational parks, as some examples (Chanchalor & Boonlue, 2007; Kaewsaiha, 2001).

In Thailand, there are also opportunities for informal learning through educational radio and television programs (see ONIE). The study reported in this paper focused on informal learning in a virtual community supported by ICTs and by community coordinators. The subject or domain chosen for the study of the virtual community for informal learning was that of Thai herbs. In Thailand, the study of Thai herbs has a long tradition of informal learning in face-to-face contexts with knowledge passed on from generation to generation. The building and sharing of this knowledge were important because Thai herbs are frequently used not only in cooking but also for medicinal purposes.

The importance of informal learning in Thailand represents an ideal context in which to study this phenomenon and provides an opportunity to gain insight into how membership, participation and knowledge building can be promoted in a virtual community for informal learning, particularly through the activities of virtual community coordinators. The context also provides an opportunity to investigate the role of ICTs and the types of electronic tools that can support membership, participation and knowledge building in such a community.

The study's objectives were as follows:

1. Design and create a virtual community about Thai herbs using ICTs;
2. Select and assign roles to two sets (A and B) of community coordinators;
3. Compare between Community A and Community B the following: (1) membership, (2) participation and (3) knowledge building.

We describe the methods and results for Objective 1 followed by Objectives 2 and 3 together.

Objective 1: Methods

Objective 1 began with identification of prototype websites in the Thai language related to Thai herbs using search engines with keywords such as *thai* + *herbs* or *Thailand* + *herbal*, and excluding

search terms such as *restaurants* and *shops*. This process resulted in the identification of the top-ranked site in the search (http://www.samunpri.com). This site included a searchable and comprehensive herbal database as well as explanations of the medicinal uses of herbs. The second site selected (http://www.rspg.or.th/plants_data/herbs/herbs_200.htm) is highly regarded and ranked in Thailand because of its sanction by the Thai royal family. The site included a database of medicinal properties classified according to symptoms as well as a general knowledge section. The third site selected was created by a renowned Thai herbal expert (*ไทยสมุนไพร.net*) and classified content according to the medicinal properties of herbs. Unlike the other sites, the latter included videos demonstrating use of herbs in promoting health. Identification of these prototypes supported the development and design of content about Thai herbs for the virtual community.

The technical development of virtual community was supported by reliance on the following tools: Adobe Macromedia Dreamweaver™ (Adobe, San Jose, CA, USA), Adobe Macromedia Flash™ (Adobe), PHP Language, MySQL database (Oracle Corporation, Redwood City, CA, USA) and JavaScript (Oracle Corporation). Once the virtual community had been created, its URL was sent electronically to three specialists: one on Thai herbs and two university instructors in website and social network design and development. The study's principal investigator (PI) met face-to-face with each of these individuals separately to discuss the changes needed. Some of the changes related to fonts, overall presentation, navigation, content about herbs and images of herbs.

Objective 1: Results

The final version of the virtual community was made available for use online at http://www.networkherbs.com. It included a welcome page with graphics of herbs, a registration and login tool, and a navigation menu providing links to the following:

1. An asynchronous discussion forum for sharing knowledge and asking questions (comment and reply);
2. A synchronous chat room;
3. Three searchable databases about herbs (dictionary, medicinal uses and culinary uses);
4. Two games for testing knowledge about herbs;
5. Members' profile pages;
6. A Facebook page.

Those who registered and became members could interact and communicate using the discussion forum, chat room and the Facebook page, and could make comments in the databases. Those who "liked" on Facebook could discuss (assuming they write and read Thai) about Thai herbs and their properties, but they could not interact, discuss or access any part of the network beyond the main page without registering for the virtual community nor could they comment in the database.

Figure 1 presents the main page of the community called *Network Herbs*. The figure includes such items as a site menu, login or create an account tool, profile pictures of those who liked the Thai herbs page on Facebook and links to pages related to medicinal and health properties of Thai herbs.

Each of the tools is described below:

Asynchronous discussion forum

The text-based forum served as the main tool for interaction and communication. It was a place where members could ask questions, fill in gaps in knowledge and obtain support about using the social networking tools. Each post featured the member's profile picture and date of post. The forum included a reply-to feature with threaded responses. All members could read all posts, but members could only reply within their respective communities. Figure 2 provides a screenshot of sample posts in the discussion forum. Note that the number 2555 refers to the Thai year corresponding to 2012. The specific topic of discussion is about herbs that help treat allergies, coughs and healing of scalded skin.

Figure 1: Main page for the social networking tools

Synchronous chat room

The purpose of the chat room was to facilitate communication and interaction between community members. Unlike the asynchronous discussion forum, the chat room operated in real time. Like the asynchronous forum, it was text based. Figure 3 presents a screenshot of part of the chat room. The topic is about the medicinal properties of morning glory, for example, in relation to vision.

Herbal databases

The three herbal databases were created using PHP language and MySQL (Oracle Corporation). In all three databases, members could leave comments and select the option "send to friend."

The first database described the herb's properties, popular and scientific name, and where it might be found. It was similar to a pictorial dictionary for herbs. The second database focused on medicinal use of herbs. The third database focused on the culinary use of herbs. Figure 4 provides a screenshot of part of the herbal database. Members could search herbs by name alphabetically using the left-hand vertical frame of the figure or by photo and name in the right-hand frame.

Figure 2: Screenshot of part of the discussion forum

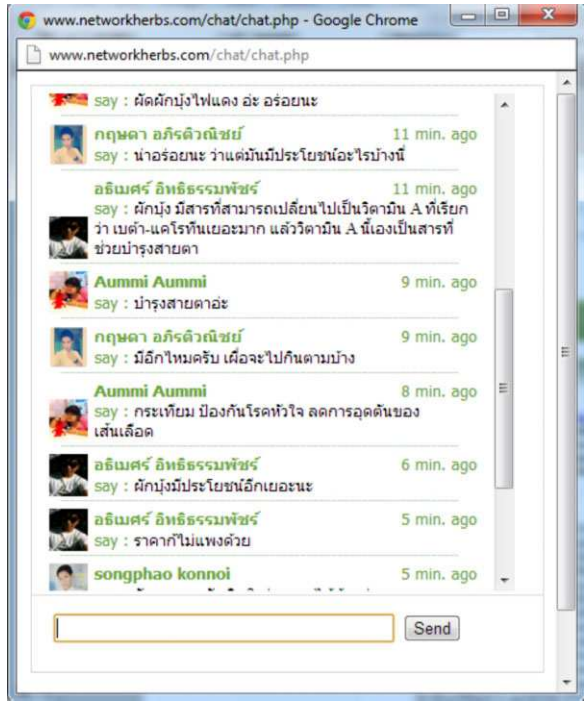

Figure 3: Screenshot of part of the chat room

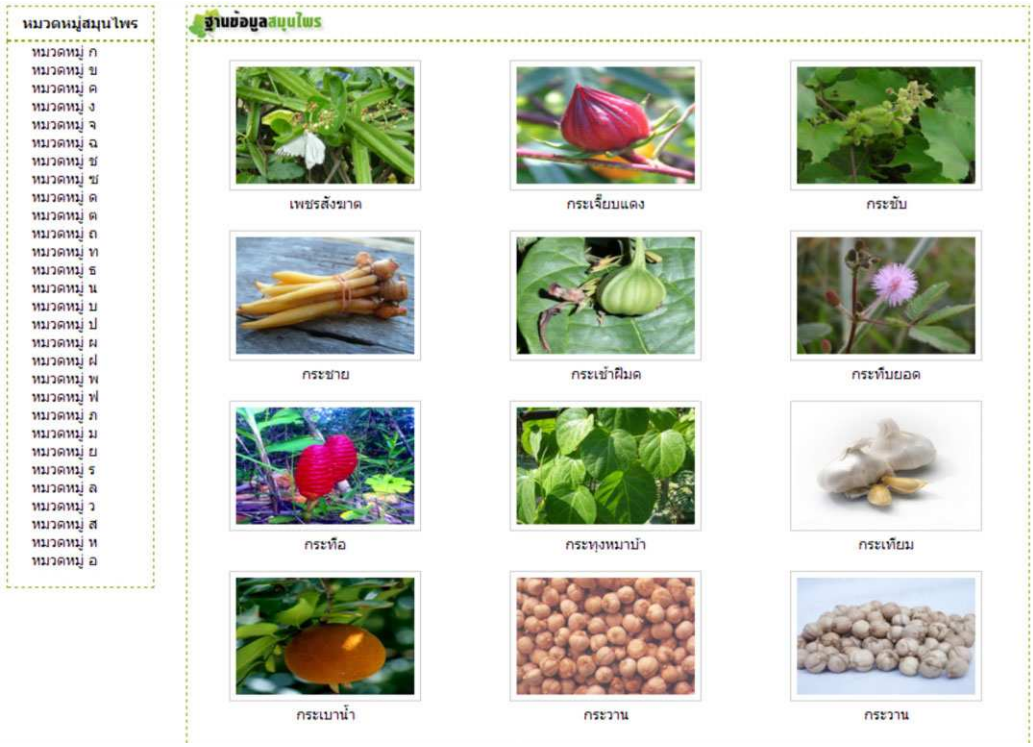

Figure 4: Screenshot of part of the herbal database

Games

The two games were designed to help members test their knowledge about herbs. The first game, called *Herbal Hunting*, helped members learn the names of herbs by matching names with images. The second game, *Herbal House*, was designed to help members test their knowledge of herbal remedies. In both games, members could calculate their score. A screenshot of the first game is provided below in Figure 5.

Members' profile pages

The members' profile pages were important in terms of building community because they provided an opportunity for individuals to learn about others in the community. The pages included a photo of each member as well as basic information such as name and birthday.

Facebook page

The Facebook page at https://www.facebook.com/pages/NetworkHerbs/475476275795904 served as a means to more publically "advertise" the virtual community, to make it known and, thus, to help in recruitment of members. Additionally, it served as another set of tools that individuals could use to discuss or share knowledge about herbs. It was open to the public in addition to the virtual community members.

The page's creator and administrator was the PI in the study using the Internet alias *Network Herbs*. As creator, she made frequent posts to the page on which community members could comment and which they could share and "like." The posts were related to the following topics: herbal remedies, beauty (eg, herbal shampoo or herbal skin care), facts about herbs, acceptance (herbal popularity in society), application (everyday uses), culinary (eg, in cooking), activities

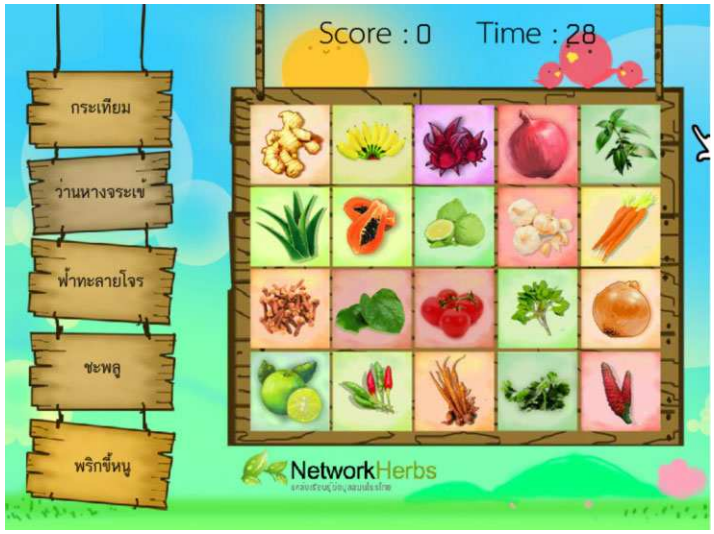

Figure 5: Herbal hunting game

(herbal sales, conferences, exhibits, etc) and media (eg, television and radio programs, or videos on herbs). Figure 6 provides a screenshot of part of the Facebook page. In the left-hand frame are the posts by the PI. In the right-hand frame are posts of individuals who were members of Community A or B. The posts are about topics such as detoxification using herbs, herbal color used in cooking and herbs used in mosquito repellents.

Objectives 2 and 3: Methods

Objective 2 involved selecting and assigning roles to two sets (A and B) of community coordinators. To identity potential coordinators, the PI visited one of many Thai schools that teach about herbs. The one in question was a large adult school in a Bangkok suburb. The coordinators needed to be experts who were interested in and knowledgeable about herbs. The PI informed students about the study and selected 20 individuals to complete a 2-hour, 3-part written test pertaining to knowledge about herbs. From this group, the PI selected 10 students with the highest score to participate in a 15-minute interview designed to assess their potential to complete the tasks that would be assigned to them throughout the study. An example of one question is as follows: "If you are a coordinator, how will you recruit group members, and how will you promote participation?"

From this process, eight individuals were selected and agreed to serve as coordinators and to be part of the study. The next step involved a group meeting with the coordinators. During this meeting, the PI randomly assigned half (four) of the coordinators to be responsible for Community A. Community A members would be divided into four groups, each with a coordinator. The other four coordinators were assigned to Community B whose members would also be divided into four groups, each with its own coordinator. Community A members were informed that they were to recruit members primarily from among those interested in Thai herbs.

During this initial meeting, the PI also outlined coordinators' roles in the community and the protocols for communication, and assigned each coordinator the following tasks:

1. Recruit as many community members as possible;
2. Ensure that, before partaking in the virtual community, all members understand their role, the purpose of the research and consent to participation in all activities;

Figure 6: Screenshot of part of the Facebook page

3. Administer pretests and posttests of members' knowledge about Thai herbs;
4. Provide technical support to members;
5. Promote participation and knowledge building within their community.

Objective 3 involved comparing between Community A and Community B in relation to (1) membership (2) participation and (3) knowledge building. This objective was accomplished over a 6-week period as follows:

Week 1

During Week 1, the coordinators began recruiting members. Coordinators sent daily reports and a weekly summary to the PI. The reports were not only numerical but also included information about how members were recruited.

Week 2

During Week 2, coordinators administered a pretest in a face-to-face context to all members recruited up to that time. The testing period lasted approximately 2 hours. The pretest was designed to assess their initial knowledge of Thai herbs. It was divided into three parts with a total of 40 items. Part 1 consisted of 10 items designed to test knowledge of herbal identification by matching the herb's name with its picture. Part 2 consisted of 20 items with close-ended questions pertaining to the herb's medicinal properties. Part 3 consisted of 10 items with open-ended questions inquiring about the application of herbs for medicinal treatment.

Weeks 3, 4 and 5
During Weeks 3, 4 and 5, the coordinators continued to recruit members and to encourage members to also recruit other members. The coordinators monitored participation and members' use of the forum, chat room, database and games. Coordinators sent a weekly summary to the PI. Participants used the database to gain knowledge about herbs. They not only posted the forum questions about items in the database such as particular properties about herbs but also contributed their own experiences. An example of the types of discussion that took place is as follows:

Somchai: I love to eat fried pork with Basil regularly. Is basil good?
Wisanee: Basil can control sugar and fat levels.
Uthai: Basil also reduces cholesterol levels and high blood pressure. It can prevent heart disease and stroke.

Week 6
During Week 6, coordinators administered a posttest to 37 members of Communities A and B with the same test items as in the pretest.

Week 7
Following the posttests, the principal researcher invited the eight coordinators for a focus-group discussion. Questions pertained to methods of recruiting community members, types of follow-up and support, and use of the various tools. In addition, all 127 members from Communities A and B were invited to a follow-up meeting with the PI. Thirty-five members accepted the invitation and participated in this meeting. Questions were related to the study's objectives and pertained to membership, participation and knowledge building.

Table 1 summarizes the weekly activities.

Data measurement and analysis
Membership was measured by the coordinators' daily reports with weekly summaries sent to the PI. The reports were not only numerical but also included information about how members were recruited. Participation was measured by coordinators' daily and weekly summaries regarding members' use of the forum, chat room, database and games. Knowledge building was measured by calculation of pre- and posttest scores, their standard deviation as well as *t*-tests for significance. In addition, the interviews, focus group and meeting provided addition insights into and triangulation of the numerical data. Analysis of these data involved inductive qualitative content analysis (Miles & Huberman, 1994).

Objective 3: Results
Membership
By the end of Week 6, there were 127 members in both communities. However, while Community A had 83 members, Community B had only 44. The focus group in Week 7 provided an opportunity to identify the strategies that each coordinator used. Coordinators in Community B

Table 1: Summary of activity for weeks 1–8

Week	*Activity*
1	Coordinators begin recruitment of members
2	Pretest of members administered by coordinators.
3,4,5,6	Members use virtual community tools to participate and build knowledge
7	Posttest of members administered by coordinators.
8	Focus group face-to-face meeting of principal researcher with all eight coordinators.
9	Informal group meeting of 26 members from Community A and 9 members from Community B to discuss their experiences.

Table 2: Number of community members by group

Community	*Group*	*# of members*
A	1	19
	2	26
	3	18
	4	20
	Total	83
B	5	10
	6	12
	7	11
	8	11
	Total	44

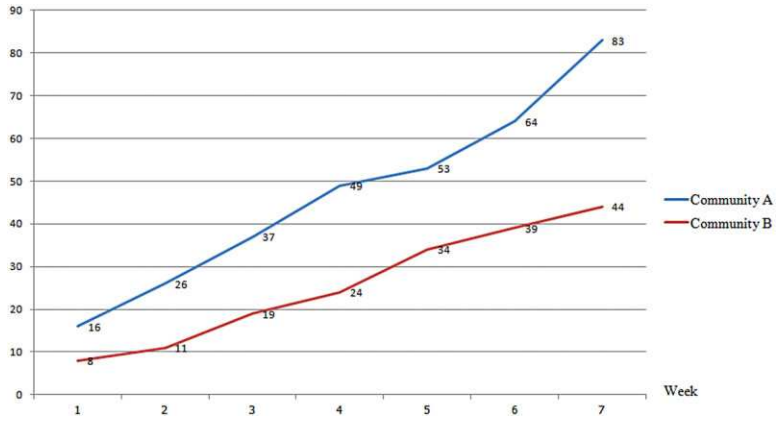

Figure 7: Comparison of the number of members per week

recruited primarily from among acquaintances, family or friends. Coordinator in Community A had been instructed by the PI to focus recruitment specifically on those interested in herbs and to encourage members to recruit other members specifically interested in herbs. The Community A coordinator who recruited the most members revealed his approach to recruitment as follows:

> We need people who are interested in learning about herbs. More importantly, they have to value the health benefits of herbs. Also, we must engage and encourage them to recommend the network to their acquaintances in order to expand it and make the members know each other better.

Total membership in each community is summarized in Table 2.

Regarding the rate of recruitment of members, Community A had a more regular and faster rate of recruitment compared with Community B. Figure 7 shows the differences between the two communities when comparing the number of members per week.

Participation

When comparing the participation for both communities, the most frequently used tools were the database (5310 accesses), followed by the forum (1983 posts), games (1172 plays) and chat room (948 posts). Community A members made the most use of the database with an approximate average of 50 accesses per member compared with an average of 26 for each member of Community B. Community A members made an average of 21 posts each whereas Community B members made only 5 each. Community A members also made more active use of the games with 11 plays each compared with 7 each for Community B members. Results were similar for the chat

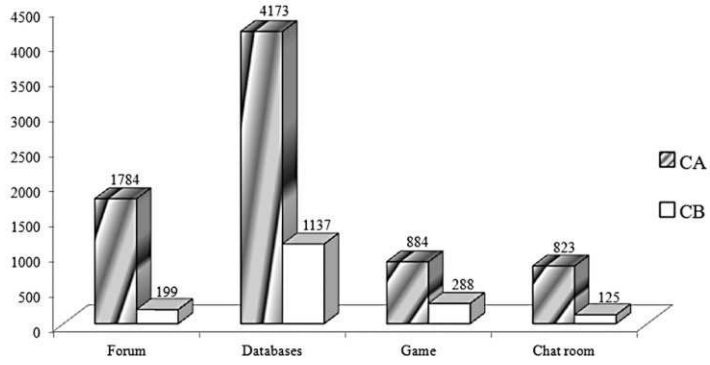

Figure 8: Comparison of the participation between Communities A and B

room use where Community A members made 10 posts each compared with 3 each for Community B members.

The low use of the chat room by both communities was likely due to the fact that, as one Community B member noted, "It is not a convenient activity because it requires members to interact at the same time. . . ." Some participants indicated that they liked using the database because they could find personal topics that they could then share with friends on Facebook. The positive reaction to the forum related to the fact that, as noted in the follow-up meeting and focus group, members could ask questions of others and receive many replies. For example, a question about how herbs might be used for facial masks generated extensive discussion and informal knowledge sharing. Figure 8 summarizes the participation according to tool use. CA refers to Community A while CB refers to Community B.

One coordinator in Community A commented as follows regarding participation: "To make people participate is difficult because they must be really interested in the topic. If they do, they will use the network tools continuously and also help and share knowledge with other members." The Community A member who participated the most in the activities commented as follows on participation:

> People will be interested in the topic that they want to learn about, but sometimes there is a problem of missing online participation or chat due to members' different schedules and availability. However, we solved this problem by leaving some questions or answers on the forum so that the members who were not online at the time could read them later.

Regarding participation on the Facebook page, although both Communities actively made use of this tool, a percentage calculation that took into account the difference in membership between communities revealed that Community A members participated more than did Community B members. That result is congruent with their participation using other tools. This is summarized in Table 3.

Knowledge building

Knowledge building was measured by calculation of pretest (Week 1) and posttest (Week 6) scores, their standard deviation as well as *t*-tests for significance. There was little difference between the mean of pretest scores of both communities. However, after 6 weeks of participation, Community A members' scores were significantly higher than those of Community B as indicated in Table 4 below.

Discussion

This paper described a study involving the design of a virtual community for informal learning about Thai herbs. The community relied on social networking tools and a database of expert

Table 3: Facebook participation

	% Commented		% Shared		% Liked	
Topic	A	B	A	B	A	B
Remedies	47	20	27	11	7	9
Beauty	37	18	34	16	10	14
Facts	13	9	2	9	3	2
Acceptance	5	4	1	5	1	2
Application	29	11	5	11	6	2
Culinary	34	16	30	14	10	7
Activities	11	7	2	5	5	2
Media	7	7	4	2	5	2
Other	10	5	1	2	2	5

Table 4: Comparison of Communities A and B for knowledge building

	Pretest		*Posttest*		*Gain score*		
Community	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t-test*
A	20.92	1.73	27.43	0.40	6.50	2.07	4.36*
B	20.72	1.14	22.38	1.12	1.66	0.80	

*$p < .05$.
M, mean; SD, standard deviation.

knowledge as well as community coordinators. One group of coordinators (Community A) were instructed by the PI to concentrate efforts in recruitment of members on those individuals most likely to be interested in the topic. The second group of coordinators (Community B) recruited from among friends, family and acquaintances. Results pertaining to the design that showed that members mostly used the database provide evidence to support the hypothesis that members' access to expert knowledge positively influenced participation and knowledge building in the virtual community for informal learning. Results of the comparison of Community A versus Community B provide evidence to support the hypothesis that interest in the domain positively influenced membership, participation and knowledge building in a virtual community for informal learning.

In relation to the first hypothesis, of note is the finding that the tool used most by members of both communities was the database. For example, Community A members used the database on average five times more than the chat room, four times more than the games and twice as much as the discussion forum. Community B used the database approximately nine times more than the chat room, four times more than the games and five times more than the forum. This finding suggests that expert knowledge may play an important role in virtual communities for informal learning. In a virtual community for informal learning in a domain, for example about how to play guitar, an encyclopedic database might not be relevant. Yet, there may need to be some access to expertise either in human form or for example, a repository of annotated video clips of performances by masters.

In relation to the second hypothesis that interest in the domain positively influences membership, participation and knowledge building in a virtual community for informal learning, it is also possible that those who are most or more interested in the domain have a degree of expertise in

the domain that others might not have. That expertise is then potentially useful to others in the same way that the database might be. In that regard, a third hypothesis might be that individuals will be more likely to join a virtual community for informal learning if they know that they will be able to access knowledge from experts.

In a formal context of learning (eg, in an institution), learners' participation is, in most cases, motivated by an extrinsic reward such as a course credit, professional development credit, degree or certificate. In an informal context, where there are no extrinsic rewards, participation is motivated intrinsically, in this case, by an interest and by access to expertise related to this interest. The results indicate that, as Hoadley and Kilner (2005) observed, "learning . . . does not have to be the explicit goal of the community, nor does the community need to be school-like" (p. 32), but we hypothesize it should offer expertise in some form.

In Community A, those members who were recruited were specifically interested in herbs and were more likely therefore to have a need to build and share knowledge. Sangwan (2005) attributed an important part of the success of a virtual community to its ability to "fulfill its member's needs . . ." (p. 8). From the theoretical perspective of communities of practice, (Lave & Wenger, 1998; Wenger, 2001), membership implies commitment to the domain of interest. Community A's higher levels of membership, participation and knowledge building may therefore be due largely to commitment to or interest in the domain of interest but as well to access to expert knowledge. In general, it is noteworthy that in less than 2 months in this community, there were more than 5000 databases accesses and nearly 3000 asynchronous and synchronous in a voluntary community without any monetary rewards, formal certifications or sanctioning. The level of participation is evidence that virtual communities for informal learning can attract participation on the basis of more intrinsic rewards such as access to expertise and opportunities to build knowledge.

Limitations and implications

The study reported on in this paper was limited in its scope. It did not explore concepts beyond participation, membership and knowledge building. Other concepts that might be investigated in future studies include interaction. It was beyond the scope of this study to measure or map interactions between members. Likewise processes such as problem solving (see Murphy, 2004a), critical thinking (Perkins & Murphy, 2006), social presence (Nippard & Murphy, 2007) and collaboration (Murphy, 2004b) have been analyzed in online discussions in formal contexts of learning and could be measured in virtual communities for informal learning.

It is possible that members of both communities participated in ways that were not measured by the study. As Kahnwald (2007) found, lurkers or nonposters who rarely post messages in a virtual community may nonetheless participate indirectly in the learning process. Additionally, the virtual community was for informal learning and recruited many members from a formal school of learning on the same topic. We did not investigate how the knowledge gained in this informal setting did or did not improve learners' formal knowledge. The contribution to formal learning of virtual communities for informal learning may therefore represent an important area for future inquiry.

The researchers did not specifically investigate the role of Facebook in the dissemination of information about the communities and the recruitment of members. It was used as an additional tool to recruit members, but we do not know how many members were recruited directly because of Facebook. Facebook offered an asynchronous discussion in a social context. We do not know if, on its own, without access to tools such as the database, it would have generated as much participation. Future studies might investigate use of Facebook or other social networks for use in informal learning.

The importance of the database as a tool for knowledge building in the virtual community has potential implications for the design of future virtual communities for informal learning. One potential implication is that communities should be designed to provide members with access to a form of expertise. That expertise could be an expert person in the domain or field of the learning. It could be in the form of a carefully selected set of links to external expert resources on the topic. The expertise could be housed in an internal or external repository of learning objects (eg, merlot.org). It could also be provided in the form of a database.

Acknowledgements

The authors would like to thank the Office of the Higher Education Commission, Thailand for funding the research reported on in this paper. Thank you to the three reviewers who provided useful comments and feedback to improve the paper.

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