Boosting Participation in Virtual Communities

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Abstract. We have been experiencing an explosion in the market of social websites that aim not only to entertain us, but also to help us enlarge our professional networks, to redefine business models and capture new customers, to modify the way learning and teaching are performed, among others. So far, little research has been done on what drives individuals to contribute to online communities, as there is not enough empirical evidence to validate well-established models. In this research we propose to design, develop and test a set of principles and functionalities a virtual community should have in order to attempt to achieve a high degree of activity by its members. We will focus, at first, on the particular case of educational virtual communities. We would like our results to cover more of the scenarios and area regardless of its content and context.

Keywords: Motivation, Participation, Virtual Communities, Social Networks, Collaborative Work, Collaborative Learning.

1 Introduction

Over the last few years, we have witnessed an explosion in the development of social networks on the Web, dramatically changing the way applications and services offered by various providers are used. This is the case of participative websites like YouTube, with more than 10 billion videos played each month, Wikipedia, with more than 10 million articles in 250 different languages and of different social networks such as Facebook, with more than 500 million users, MySpace, LinkedIn, among many others that expect to reach 1 billion users by 2012 [1].

In the particular case of social networks, and mainly virtual communities, social websites are well accepted and widely used in everyday life by a large number of web users. These communities exist because people with similar goals, beliefs or values lay the basis of an agreement to form and sustain a virtual existence [2]. This way, internet users belonging to a particular community can track interesting information being promoted, discussed or tagged on the Internet [3].

However, these ties may not be strong enough to sustain the existence of the community over time, resulting in members gradually leaving the virtual community,

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leading to its extinction. For example, Butler states that 50% of social, hobby and work mailing lists had no traffic over a 122-day period of monitoring. Moreover, the lack of a minimal number of contributions is a problem even in successful communities: fewer than 50% of subscribers had not posted even a single message in a 4-month period [4].

Some researchers have already studied the reasons why some people are willing to contribute and why others tend to be passive. For example, in [5] the authors say that research on members who have never actively participated (also referred as to "lurkers") has revealed many reasons for such inactivity. A study by Preece, Nonnecke and Andrews [6] found that because lurkers felt they did not need to post or that they needed to find out more about the group before posting. They thought they were already being helpful by participating in the community, they could not make the software work, and in some cases, because they did not like the group. On the other hand, there is a group of community members that Kim [7] describes as "elders", who are active members of the community, regularly posting to share their knowledge and the culture of the community. Some of the contributions on why less involved members do not participate can be seen in [5] and [8].

Online communities are also used as a way for companies to enhance demand for their products [9]. They are also sometimes depicted as one of the most effective business models. However, the achievement of this goal depends on a comprehensive understanding of the members' motivation for contribution, so that the community has enough public goods for consuming. Public goods are defined as those that anyone might benefit from, regardless of whether they have helped to contribute to their production [10]. Moreover, current business model trends regarding e-content show a shift from getting revenues from selling content to the end users towards getting revenues from advertisement, and sometimes even providing content free of charge [11]. Today, companies are interested in developing more new business opportunities, based on participative web sites, where social media and customer-oriented virtual communities are the key factors in developing revenues for companies in terms of advertising, and increasing customer satisfaction with regard to brands, products and services.

In the e-learning field, even if online participation and interaction do not necessarily translate into higher grades at the end of an academic period, students who did not pass the course have been seen to interact less frequently than students who did pass [12]. Therefore, motivating students to participate in educational virtual communities would be a plausible way to improve their learning experience.

So far, there is not enough field testing on which elements may trigger participation in virtual communities. However, design principles of which functionalities may motivate members to contribute can be seen in [7] and [13], such as improving the usability and sociability of user interfaces, as well as defining roles and members' lifecycle in the community among others. Janzik and Herstatt present a set of incentives, such as: peer recognition, status, reputation and identification, in which community members can contribute [14].

More than listing a review of what is currently trendy in the fields of participation and virtual communities, we are interested in defining a model that helps us understand why people contribute to these kinds of web sites and how it is possible to boost participation and increase contributions in both quality and quantity.

In this research we propose to design, develop and validate a set of principles and functionalities that a virtual community should have in order to increase the chances that it will be successful. By successful we mean that there will be a high degree of activity by its members. In the following sections, we will present the results of preliminary testing one of these functionalities, as an example of the methodology, because presenting all of them would go beyond the limits of this paper.

2 Previous Work

There are already some previous research works providing guidelines on improving participation in virtual communities. In this section we will present some of them:

2.1 Design Principles

One of the first well-established works on this topic is presented in [7]. This work presents nine design strategies that characterize successful, sustainable communities. Taken together, these summarize an architectural, system-oriented approach to community building (called *Social Scaffolding* by the author).

The *Reader-to-Leader* framework [13] presents guidelines for designing robust virtual communities. The authors claim users are relatively shy at first and do not interact in an appropriate way with the platform. The longer users are engaged, they pass through a natural evolution process, from reader to contributor, to collaborator and finally to leader. Interfaces should include well-thought-out usability and sociability features, such as adaptation to the general context of the community, easy access to relevant content through navigation or search, and easy-to-use bookmarking mechanisms, among others.

Girgensohn and Lee [15] present some design strategies for virtual communities. The main idea behind their model is to perform a continuous design idea for the growth and changes of the community, as well as creating and maintaining feedback loops and empowering members through time. The social interaction is based on a persistent identity which is based on the users' behavior, the possibility of modifying rules over time pertaining to collective resources and having means to monitor and control users' activities on the site. In order to ensure an appropriate level of activity, as well as regular updates of the site, notifications should stand as the core instrument for the system administrator to utilize in tuning the system.

According to Koh, Kim, Butler and Bock [16], it is important for virtual communities to support various kinds of multimedia content, as well as to clearly define roles following a lifecycle having a leadership pattern.

In online groups, sometimes members seem to lack loyalty, as they often switch from one community to another or use their community less over time. Brandtzaeg and Heim [17] discuss the reasons why users become less active or even quit online communities. On the other hand, Arguello et al. [18] refer to identifying factors such as: Group Identity, Cross-posting, Group Size and Volume, Newcomer Status, Messages' Topical Coherence, Word Choice, Linguistic Complexity.

A framework for social web design is presented in [35]. It is worth highlighting the *AOF Method*, a simple prioritization scheme for designing social web applications.

This method proposes to focus on the activities (i.e., what is the audience doing?), to identify the social objects and to choose a core feature set.

2.2 Theories Derived from Social Psychology

Beenen, Ling, Wang and Chang [19] state that although not all users in a virtual community need to contribute to make a group successful, those with a large proportion of non-contributors have more difficulties providing the services required by its members. Also, if contributions tend to be unique, community members will be more motivated to work collaboratively as they feel they will have a greater impact in the final result.

Cheng and Vassileva [20, 21] propose a motivation strategy based on persuasion theories of social psychology addressing the problem of having too few users willing to make contributions in online communities. They introduce a set of hierarchical memberships into a Peer-to-Peer community and reward active users with better quality of services by defining a function that measures participation in both quantity and quality of contributions.

Ludford, Cosley, Frankowski and Terveen [22] claim that some of the factors that may trigger participation are: satisfaction of personal needs, learning, and contribution to the common good. However, in a group, sometimes people think others will do the work. A common belief is that the more the members of a group are similar, the better the reception among the other team members will be, thus improving the quantity and quality of contributions. However, users of a group with dissimilar members tend to contribute more, as they like to find out how they are unique within a group thus providing them with this information increases their participation.

New users in a virtual community who find their declared friends in the network collaborating, are more eager to share more information thereafter [23]. This is because people tend to follow other people's behavior, even without external stimuli.

A model that may help to explain ways to motivate member contributions to online communities is presented in [24]. External rewards may affect the degree of intrinsic motivation, so socially-advanced users' contributions may cause lurkers to be more active in the community. In order to improve contributions, trust is an important factor, and it also lowers the costs and risks of contributing. Also an easy-to-use website will have a positive impact in the quantity of contributions, as well as offer a sense of group identity and cohesion.

2.3 Motivation in Online Learning Communities

It is worth highlighting the particular case of virtual communities supporting e-learning and cooperative learning, since there are many sites devoted to this goal. Laghos in [34] presents the concepts of e-learning and e-learning communities, as well as a review of relevant research in these areas.

Cooperative learning has been shown to be a successful teaching strategy in which small teams, each with students with different levels of ability, use a variety of learning activities to improve their knowledge. Students work through the assignment until all group members successfully understand and complete it [25]. When using an electronic platform, such as an e-learning management system, there is a real advantage

when providing integrated functionalities for content authoring and management, interpersonal communication activities, assessment, learner tracking, among others [26].

However, assessment may be considered the "weakest link" in e-learning systems. E-learning designers have relied predominantly on tools that are aimed at supporting the construction of test items. The drawback of such items is that they tend to focus on the measurement of low-level retention of isolated facts, rather than on the application of knowledge to solve ill-structured problems [27, 28]. This problem is tackled and some guidelines are presented in [29]. Lebrun explains in [30] and [31] the methodology to design a proper e-learning platform, as well as the problem of motivation, or lack of it.

Vonderwell and Zachariah found in [32] that technology, user interface design, content-area experience, student roles and tasks and information overload have a key factor on influencing online learners participation and their patterns.

3 A Framework for Boosting Users' Participation

In this research we aim to define a framework with the key social factors that might have an impact on the success of virtual communities by triggering motivation and boosting participation. Therefore, we decided to test some ideas derived from social psychology theories and some strategies designed by some authors.

Because of the expanded use of virtual communities and collaborative work in a large number of fields, this research may have a positive impact towards creating "social cohesion" among its members by triggering participation. The promise of social participation applications is huge, generating a steady flow of entrepreneurs and technology activists who are experimenting with new approaches with either commercial or personal goals [13].

Until now, some authors have recognized and tested particular factors that may improve participation in social groups. However, evidence provided by these works is only valid for a particular factor and situation. We propose to define a framework that might be validated (or rejected) with empirical testing, also giving hints about the relative degree of impact of each one of the factors. At first, we will consider these factors simply as claims. In this research, we propose five social factors in which that we would like to quantify their impact: rankings, peer moderation, challenges, matchmaking and notifications. As literature suggests, these are the most critical ones when designing a virtual community.

Our goal here will be to test the pertinence of these elements, as well as analyze the impact they have on users. We will study the reasons why people get motivated to participate in social websites and in which areas community managers and interface designers can exploit in order to ensure members' participation over time.

We will focus at first in the problem of motivating learners in the context of educational virtual communities. However, we expect to generalize some of these results, as well as testing the proposed claims in other different kinds of communities in the near future.

The framework we propose is seen in figure 1. In such a framework there should be a model of the type of community for which we are going to address. In this case this is represented by a standard core structure with the following functionalities:

- User Profile
- Friends and Private Messages
- Groups
- Like/Unlike a comment/action/entity
- Public Blog and Forum
- Wiki Pages (for Collaborative Work)

In order to achieve this, we developed a small prototype where we are testing, one at a time, the different functionalities that form our proposed model. We chose them because of the reported impact they have on triggering participation in previous research experiences when studied independently.

The model we propose is divided in three main sections:

Social Network Model: we address the social networking model that we will be working on. This includes the main features that are expected on these kinds of websites, including standard features, such as forums, blogs, messages, comments and wiki pages, among others.

Technologies: including web-based virtual communities as well as mobile-based virtual communities. We aim to work in different kinds of mobile devices, such as smartphones and tablets including geolocation features and an exploration in the use of audio-user interfaces. We will also be interested on exploring the use of web standards (HTML5 and CSS3).

Features that are being tested: including the functionalities that were designed and are being tested for validating (or rejecting) them.

1) *Rankings*: we aim to measure the value of contributions by measuring quantity and quality, as Cheng and Vassileva did in [20, 21]. In fact, by adding this kind of feature we expect to encourage members to contribute and engage more with the group. We will also be interested in exploring how this feature would impact the context of a specific virtual community, as well as the way metaphors (this is, the specific terminology in the form of labels, tags and categories) need to be defined. A reward system linked to users' ranking in contributions will also be designed. We will also define a "participation function" that will calculate a quantitative factor that reflects the level of participation of a user in a given time in the community. We will consider different elements, such as the number and time of log-ins to the server, the number of blog/forum topics created, the number of comments that are made in posts, the active use of the features offered in the website, among others. Each one of these define an "expected task" that will be associated to a weight-factor that will finally add-up the value of this function. The iterations of this method will be performed periodically (for example, once a week). During a first stage, users will be left free to use the different tools and then they will be initially classified into three groups: HIGH-participation (10% of the users), MEDIUM-participation (60% of the users) and LOW-participation (30%). Each group will obtain rewards that are linked to their

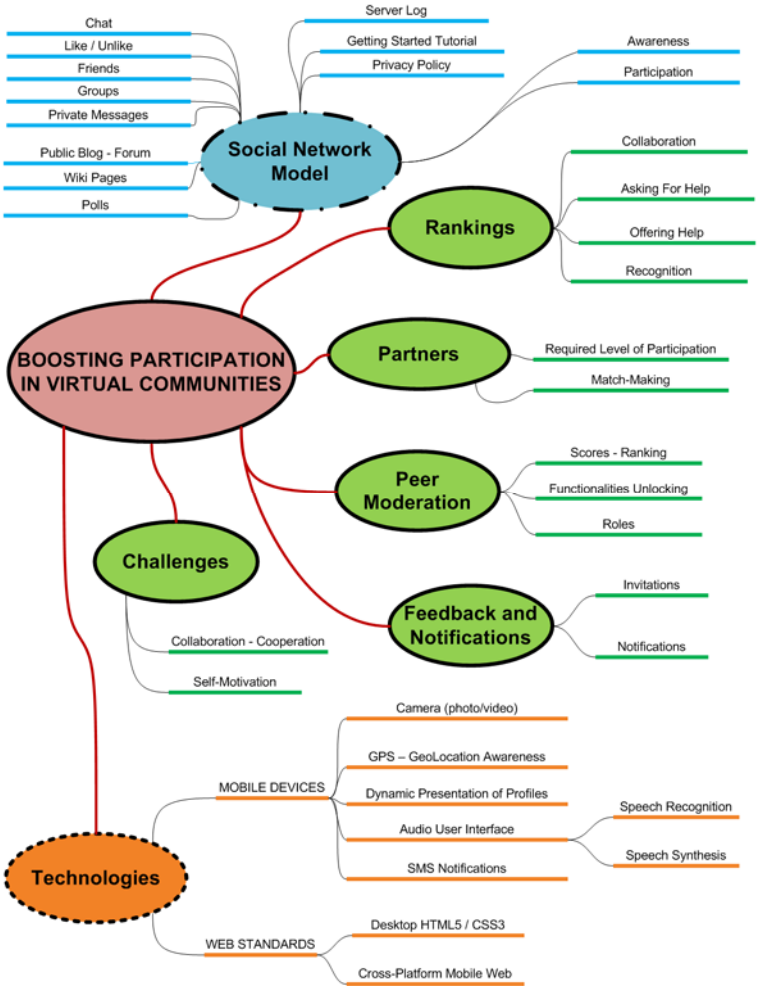

Fig. 1. Functionalities to be tested during the whole research. In this first paper, we will discuss one of them: *Rankings*.

category and will either improve or lower their rank. This category will be displayed to the whole community, either in form of a simple text-label or an icon that reflects it (a golden star for HIGH level users, a red warning sign for LOW ones).

2) *Peer moderation*: as an extension of the previous point, we will add a feature that ensures a certain level of quality on contributions when added to the computation of a ranking function, as well as empowering members over time by establishing a set of categories (as suggested by Kim on [7] and Preece and Shneiderman in [13]). This idea has been previously explored and tested by one of the researchers in the development of an iPhone application dedicated to informal mobile learning in Chinese language for French-speaking people [33] and we expect this time to gather more field evidence on how members' relationships are built, as well as members' life

cycle in the community. This kind of feature can be linked to with the ranking system, where we will also consider the moderation made by the whole group in order to ensure a certain level of quality of the collaborations. If the users get a higher rank, they will be given more permission in order to edit or delete content and ensure their role as "community leaders".

3) *Feedback and Notifications*: the idea behind this point is explored in [20, 21], [15] and [13], among many others. It states that sending feedback to users inside the application or via email might help to boost participation at specific stages defined by the community manager. During this research, we will analyze the relative impact of this feature when boosting participation, as well as studying the existence of a *critical mass* of notifications and its effects, such as a decrease in the number of collaborations due to *information overload*.

4) *Match-making and Partnership*: this idea, explored in [22], addresses the uniqueness and group dissimilarity and their impact on motivating participation. This point turns out to be particularly interesting since it could be a way to introduce new members into the community and facilitate relationships building between users with similar interests. We will also be interested in studying the pertinence of using decision-making algorithms for matching users in the community for collaborative work. Each user will be assigned a "partner" based on their personal affinities and characteristics. This can be established by a profile-form applied to the group of users. This can also be linked to the "challenge" feature, where users can be forced to reach specific goals by cooperation and collaboration. Users will keep their partner as long as they reach a certain level of participation; otherwise they will be separated and, maybe, be forced to change them. Following a natural evolution of the community, these groups will eventually be merged with others, thus ensuring a kind of interaction with the whole group or the entire community. As before, a small questionnaire will be applied to the members in order to obtain feedback from them regarding their feelings towards this kind of interaction.

5) *Challenges*: linked to the previous idea, we are interested in studying the power of challenging users in collaborative tasks, when they are forced to perform them individually or in groups. Previous research states that performance, rewards and high-reachable goals are interrelated [24]. That way, we expect to introduce new ways to participate in a community (other than posting, rating and commenting), improving the relative value of a website. This can turn out to be an important tool to motivate users to take part in marketing campaigns (in the form of participative *call-to-action* tasks), as well as analyzing the power of gaming features in geolocation applications in mobile-based virtual communities. We will place community members in both, individual and collective challenges. We think this will boost peer collaboration and cooperative work (in the case of communities that allow this kind of participation). For achieving this, we will define a set of reachable goals that then reward or punish users depending on their results. In order to ensure participation, we will establish a ranking where users will be graded either by the administrator of the community, or by the whole group. A small questionnaire will be distributed to the members for feedback on their feelings about this topic.

A conceptual design model that would help the task of design for participation, pointing out the kinds of interactions that motivate users, will come out as a result of

analyzing the behavior of community members towards each proposed functionality in different kinds of communities. This is the final goal of our whole research work.

As we first focus on communities linked to teaching and learning, we tested the "ranking" feature with a group of students enrolled in the *Advanced Programming of Distributed Applications* course at Waseda University during February 2011. This experience gave us the first feedback on the interest of students using these kinds of tools, as well as data, allowing us to redefine the design of the different functions.

4 First Results

During the first stage of the research, we aimed to test some of the principle ideas we think will boost participation, as well as gather field information about social patterns in collaborative-work environments. For doing this, we developed a small web application, as well as a website to provide support for the *Advanced Programming of Distributed Applications* course at Waseda University in February 2011.

The web support was developed in a standard Apache-MySQL environment, using the PHP framework Elgg as a core structure for the social network. Several modifications had to be made to the original front-end and back-end Elgg environment in order to adapt the different social functionalities offered to the course. These were: personal blogs, public forum, collaborative page creation (wikis), status updates (such as intra-site tweets), assignments module (for uploading, commenting and rating the assignments prepared by all the students).

The users of this website were divided in two groups: administrators (two of the researchers) and end-users (the group of 7 students enrolled in this course). Naturally, they were given different degrees of permissions, but the idea behind it was that all the students would be able to see the files uploaded by their classmates, first step into collaboration in the way of asking for and offering help. Also, the use of a public blog, forum and wikis allowed students to take and share notes with everybody.

All the students were free to use these tools as they liked, but we asked them to upload their assignments in the section that was dedicated to this. During the second week, we added a rating system to the assignments section (one of the core functionalities, in our opinion), as well as a rating system where all the users could easily see the level of participation of each student. These levels were: low, medium, high and they were calculated periodically (daily), considering the number of threads and topics created in blogs and forums, as well as the use of the different functionalities offered and the number of log-ins into the website.

We formulated the following set of hypotheses to test:

(H1) Giving feedback to the students as a visible tag of their current level of participation triggers participation
(H2) The use of public blogs and forums helps students to work collaboratively in their assignments
(H3) The possibility of rating peers' assignments boosts participation when asking or offering help
(H4) End-users feel the website is more attractive when there are social functionalities
(H5) End-users feel that a rating system motivates them to participate in the community

(H6) End-users feel this kind of platform allows them to work better during their assignments
(H7) End-users feel that this kind of platform finally improved their learning

In order to test these hypotheses (either validate or refute them), we gathered information directly from the interaction between users on the website, as well as their individual behavior. Thus, we kept a log of the sessions where we placed attention on the blog/forum features and the interaction done in the Assignments section (if any). Using this data and during the second week of the study, we calculated on a daily basis, a "participation factor" which directly modifies the profiles of users with a label indicating their current level of participation, as well as giving advice on how they can boost this factor. We classified the whole group at first, for having a 25% of "high" participation students, a half of them with the "medium" tag, and finally a 25% of "low". A table was completed with their daily participation levels in order to keep track of the evolution of the process through the second week of the study (hypotheses H1 through H3).

This information was completed with a questionnaire that was applied during the last lecture of the course (hypotheses H4 through H7). This survey allowed us to find out if students were conscious of their having boost their own participation through the experience, as well as obtain their opinion on the usability and interest on the social features offered in the website. Figure 2 shows the evolution of the social participation considering the actions performed by each member of the community. Figure 3 shows the difference of raw participation score between two consecutive iterations for each student.

For calculating each participation score, we considered the total number of collaborations to the community. These were creating a blog entry or a forum thread (earning

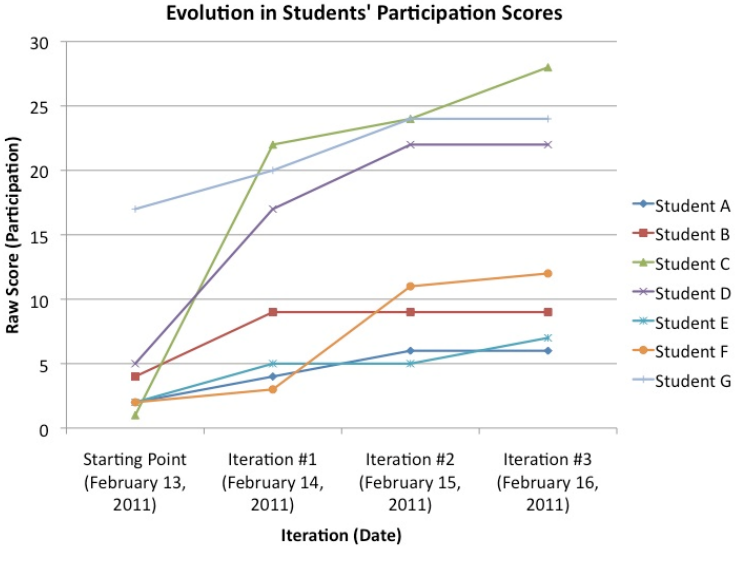

Fig. 2. Evolution in the Participation Score of each Student during the Experience

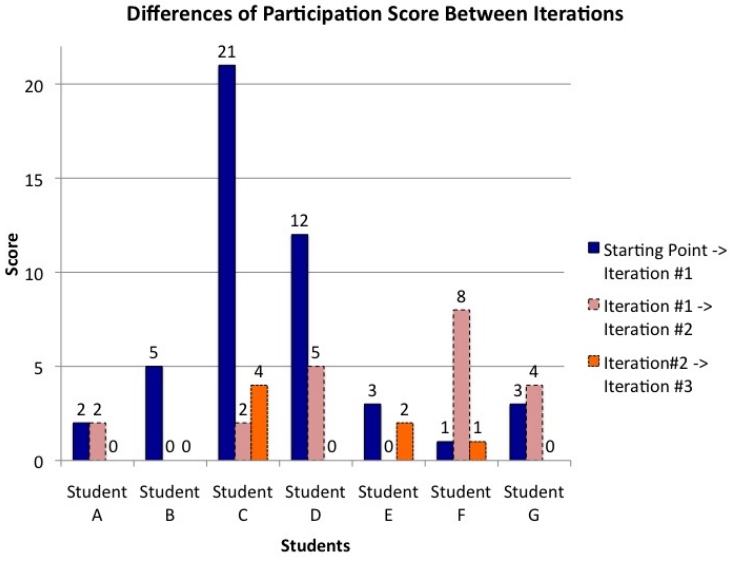

Fig. 3. Differences of the Participation Score between Iterations, for each Student

2 points each), posting comments on assignments or blogs entries or forum threads (1 point each), rating classmates' assignments (1 point per rating, limited to one point per assignment and a student can't rate his own work) and 1 point bonus for outstanding use of the different tools offered by the site (for example, exploring how to send messages to a specific user, update their own profile, among others).

Table 1 presents the evolution of each student's rank:

Table 1. Evolution of the Rank of Students Enrolled in the Course

Student	Starting Point *February 13*	Iteration #1 *February 14*	Iteration #2 *February 15*	Iteration #3 *February 16*
A	MEDIUM	MEDIUM	MEDIUM	LOW
B	MEDIUM	MEDIUM	MEDIUM	MEDIUM
C	LOW	HIGH	HIGH	HIGH
D	HIGH	HIGH	HIGH	HIGH
E	MEDIUM	MEDIUM	LOW	LOW
F	MEDIUM	LOW	MEDIUM	MEDIUM
G	HIGH	HIGH	HIGH	HIGH

Based on this data, we conclude:

1) These results only apply to this specific group, because the population is not large enough to be considered as statistically representative.

2) The group of users tends to modify their behavior towards the community when their assigned rank is "LOW". In fact, after the starting point during iteration #1 and during iteration #2, the students C and F modify dramatically their ranks, maintaining

them until the end of the experience. It is worth noting that the student with the worst raw score at the beginning of the evaluation period came up with the best score at the final iteration.

3) One user in particular (student G) takes spontaneously the role of "community leader" by keeping a log of his class notes in the website, allowing classmates to read them at any time. He also encouraged discussions and created several topics for allowing his classmates to participate. He got the best raw score at the beginning of the evaluation period.

4) Once the users got the label "HIGH", they kept it during the whole evaluation period by participating constantly. Otherwise, those who were put in the "MEDIUM" group were not eager to modify their rank as long as they do not lower their reputation in the community. In future experiences, it would be worth considering "rewards" and "punishments" for users who grade up or down in their ranks.

5) One of the most critical features used by the users to improve their participation in the site was the "rating" (in the form of golden stars) given to the different assignments of their classmates.

6) The quality of contributions (posts / comments) remained of high quality during the whole evaluation period. Some students even used the forum to create discussions not necessarily related to their lectures, their assignments or they used it for asking for help. However, this may be due to the fact the evaluation period was quite short and the users maybe did not understand how their scores were calculated nor the impact of creating a topic or commenting on different posts.

After this first analysis, we may validate in this group hypothesis (H1) - "*Giving feedback to the students as a visible tag of their current level of participation triggers participation*", since users C and F dramatically changed their ranks after noticing their status. In the same way, we confirm for this group hypothesis (H2) - "*The use of public blogs and forums helps students to work collaboratively on their assignments*" after examining the kind of threads and blog entries created, that were related to asking for help while performing their tasks. Finally, we confirm for this group hypothesis (H3) as well - "*The possibility of rating peers' assignments boosts participation when asking or offering help*", since this element was positively used by students to improve their ranks.

Table 2 summarizes the mean score given to each item in the questionnaire taken by the group of students at the end of their course:

Table 2. Mean Score given to each Item in the Questionnaire

Item	Mean Score (Out of 5)
Do you think the social features of the website make it more attractive?	4.50
Do you think the rank given to you in the website (HIGH – MEDIUM – LOW) motivated you to participate more in the website?	4.33
Were you interested in using the website to ask for help when doing your assignments?	4.17
Do you think you improved your learning by discussing the blogs or forums in the website with your classmates?	3.83

Hypothesis (H4) – "*End-users feel the website is more attractive when there are social functionalities*" – was validated in this group. In fact, the mean score given to this item in the questionnaire was the highest one of all. In an open question, we asked the students to state the elements they considered to have motivated them to participate on a website. The range of answers here starts from standard web 2.0 tools (such as blogs and forums), towards a more interactive and synchronous participation in the form of online chat rooms (because they think it takes time to get replies in a blog or forum). One of the students also stated the use of the "my state" feature (a microblogging service, in the same spirit as Facebook status and Twitter).

Hypotheses (H5) – "*End-users feel that a rating system motivates them to participate in the community*" – and (H6) – "*End-users feel this kind of platform allows them to work better during their assignments*" – were related to the interest of the students towards the website when working and participating. We may also validate them according to the mean score given to each item by this particular group. However, some students criticize the fact that the lessons, worked examples and supports were not updated regularly enough and there was a lack of feedback and comments from professors in order to encourage them to participate more between them (some students feel the others are too proud to ask and offer any kind of help).

Finally, from the results of hypothesis (H7) – "*End-users feel that this kind of platform finally improved their learning*" – we conclude there has to be a strong feedback from professors in order to encourage students to participate, as well as enhancing the values of collaboration and of the community. Perhaps, a teacher should take a more active role in the form of a "community manager", going further than sharing knowledge and enabling students to ask and offer help while doing their assignments.

It is worth pointing out that these claims are only applicable to this specific group, because it is not statistically representative (the number of users and the duration are too slam to produce significant results) and since it is not clear if the contribution trends will continue of the experiment lasts longer. In fact, previous work [20, 21] shows that contribution levels usually spike after introducing the incentive mechanism but later they decline, which could be due to the "novelty effect". This first field experience was a very short-term study aimed to explore the usefulness of the research methodology.

5 Future Work

This paper presents the first results on this research. In order to validate the model we propose, we are currently testing the design of the other functionalities with a group of Chilean high-school students (14-18 years old) and teachers, in collaboration with *Innovacien* (http://www.innovacien.org), a centralized network of schools. These schools are physically separated from one another (some of them in different cities), and they work independently on different learning projects guided by this group. By developing this virtual community, we aim to make the different groups to interact with each other and finally work collaboratively.

This virtual community will be in service during, at least, for three months and it will serve as support to the educational projects carried out by this group. Moreover,

students and teachers will have a place where they are able to collaborate in order to achieve common goals, as well as have a central communication hub.

Our goal with this experiment is to measure how and why the different elements involved in a virtual community are used, quantify the degree of participation before and after enabling in the community our designed features and, as a general objective, analyze the ways that impact the group members' behavior in order to trigger motivation and boost participation.

This virtual community was developed taking the framework we designed and using the social networking engine Elgg with some minor and major modifications in its core structure. It runs under an Apache-MySQL-PHP environment supported by *Innovacien*. Also, a set of customized plugins was developed in order to test each social feature.

Members are divided in three categories: *system administrators*, *group leaders* (which will be mainly teachers) and *students*. Each role interacts within its scope, defined by the project that they are enrolled in. Teachers will also have access to guidelines prepared by *Innovacien* in order to work smoothly with their students.

In a future work, we plan to redefine this framework in order to be able to deal with mobile virtual communities, as well as exploring the pertinence and impact of using these social functionalities. Some ideas to explore at this stage are the use of geolocation support and audio-user interfaces (AUI) to ensure mobility. We will also explore the use of web standards (HTML5 and CSS3) and how this impacts the development of these kinds of applications in different kinds of devices, both desktop-based and mobile. The last stage of this research will concern decision-making patterns, as well as intelligent recommender social algorithms in collaborative and cooperative relationships.

6 Conclusions

In this paper we presented the design of a model of functionalities that may have an impact on boosting participation in virtual communities. Finding ways to trigger motivation in social groups will have a wide impact on a large group of fields, from e-business, marketing and management where companies use social media techniques for generating revenues and increasing their market share, to education, where boosting participation will be reflected in a better learning experience.

We explored one of the features we designed in a group of college students and the results are quite promising. As this paper is being developed, we are performing experiments testing the other functionalities defined in the proposed model.

We learned from this first experiment that the members of a virtual community can easily adopt this initial approach, as it was positively revealed during this experience. Therefore, we will carry out more elaborated research trying to test more social features, as well as evaluating the perceived impact on the members. We will also quantify the eventual changes on the level of participation of each user and refine the model in order to develop a methodology for designing social features to boost participation in virtual communities.

In a future work, we will study the effects of such a redefinition in mobile virtual communities, mainly working with geolocation features and audio-user interfaces. We will also explore the use of Web Standards, such as HTML5 and CSS3, and analyzing

the pertinence of decision-making patterns and algorithms, as well as intelligent recommender systems.

Finally, a conceptual design model that would help the task of design for participation will come out as a result of analyzing the impact of these functionalities in different kinds of communities.

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