A Proposal of SNS to Improve Member's Motivation in Voluntary Community Using Gamification

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Abstract—**Recently, the number of voluntary communities such as local communities and university club activities are increasing. In these communities, since there are various types of members and there are no binding forces, it is usually difficult to maintain and improve member's motivation. To maintain and improve member's motivation, most of these communities use social networking services (SNSs). However, since existing SNS offer few functions for voluntary community, it is difficult to solve this problem. This research focused on the concept of gamification and proposed an SNS to improve member's motivation of voluntary community. First, the authors analyzed the current conditions and members of a voluntary community. Based on this analysis, the authors found that an SNS to improve member's motivation of voluntary community requires functions which support member's personal activities and also functions which increase social activities. Next, the authors built an SNS that had these functions by applying the concept of gamification. The authors implemented the SNS for a University club's activities for one month and showed the effectiveness of our SNS.**

Keywords—Gamification; Voluntary Community; Motivation Management

I. INTRODUCTION

Recently, the number of voluntary communities such as local communities and university club activities are increasing. In these communities, since there are various types of members and there are no binding forces, it is usually difficult to maintain and improve member's motivation. Under this situation, companies, schools, and municipalities are quite actively using social networking services (SNSs) with the aim of revitalizing communication within communities formed in the real world, along with maintenance and improvement of motivations among members. However, application of SNSs in non-profit and voluntarily-formed communities has found it difficult to maintain and improve their motivation. This is because of a feature of voluntary community: users who belong to voluntary community have different motivation. There are various types of members (beginner, expert or highly motivated users, unmotivated users) in a voluntary community. Moreover, the purpose of belonging to voluntary communities is ascribed not to financial profit, but to a sense of satisfaction and amusement.

In addition, most of the SNSs run by voluntary communities do not have binding forces, where each individual user has different motivation. In order to manage users' motives effectively in voluntary community, users probably need to keep motivation by means of certain methods other than some binding forces. The authors thought that SNSs had potentials to solve the problem. However, since existing SNS offers few functions for voluntary community, it is difficult to solve this problem.

Gamification has attracted much attention recently as a method to help users to maintain and improve their motivation. Gamification is defined as "to use gaming elements, such as concept, design, and mechanics of a game, for social activities or services other than the game itself." This idea became widespread after 2010, and has empirically been applied to course design in university education [1], rehabilitation activities in the medical field [2], communication on the network [3], and e-learning [4] with the aim of maintaining and improving users' motivations. This application has produced beneficial effects. At the same time, however, this field is still in the sprouting stage. Only a few attempts have been made so far at verifying the effectiveness of implementing and running an SNS system.

This paper is organized as follows. In section 2, the purpose of this research is described. In section 3, previous researches on profit-oriented communities are reviewed and gamification is explained. In section 4, the results of analysis of the data obtained from a questionnaire and interview study are described. Based on the results, in section 5, the SNS with four functions, owing to the concept of gamification that maintains and improves motivation are proposed. In section 6, results of analysis of the experiment are described. Section 7, concludes the paper.

II. THE PURPOSE OF OUR RESEARCH

In this research, the authors focused on the Senshu University Philharmonic Orchestra (SUPO), a voluntary community, as the experimental subject. The authors built and evaluated an SNS called f-simo for users to maintain and improve their motivations based on gamification; more specifically for each member to maintain and improve their motivation for practice. Our ultimate goal is to build a motivational support and im-

provement SNS that fosters a better environment for community members to participate. The authors built an SNS that has these functions by applying the concept of gamification. The authors implemented the SNS for the university club activities for one month and showed the effectiveness of proposed SNS.

III. PREVIOUS RESEARCHES

A. Existing SNS for Profit-Oriented Communities

Use of SNSs in profit-oriented communities with the purposes of information sharing [5], knowledge management [6], and communication support has achieved certain positive results and contributed to profit-earning activities.

In voluntary communities, however, although SNSs are used with the purposes similar to those of profit-oriented communities, similar achievements are not always guaranteed due to the differences in responsibilities and the binding force for belonging to a community. In voluntary communities, it is especially difficult to care for the amount of website traffic and also retain active users continuously [7]. It is necessary to develop functions in SNS for motivation improvement based on the features of a voluntary community. Moreover, it is important to propose appropriate functions considering attributes of the user who belongs to voluntary community.

Therefore, this research focused on gamification that has attracted much attention recently as a method to help users to maintain and improve their motivations through an SNS. It is possible to improve user's motivation and activity using gamification.

B. What is Gamification?

Gamification is defined as "to use gaming elements, such as concept, design, and mechanics of a game, for social activities or services other than the game itself." The following seven methods are included as the gamification.

1) Honorific badges or titles are given according to achievements

2) Names and scores of competitors are displayed on a real-time basis

3) The graphic interface shows the progress of each task

4) Virtual currency is introduced to promote purchases of virtual goods

5) Rewards such as coupons or gifts are provided

6) Assignments that encourage users to collaborate together are presented

7) Simple games are prepared between activities in order to keep users from being bored

In voluntary communities members do not always maintain and improve their motivations simply by financial rewards. For example, they do so by confirming their growth. As a motivation that aims toward personal growth, humans have a need for their achievements to be recognized or commended by others [8][9], in addition to the convenience that can be acquired after growth. Incorporation of gamification in SNSs is likely to meet the need for recognition of each individual user, maintain and improve the individual motivation, and enhance the entire community performance.

IV. ANALYSIS OF THE CURRENT CONDITIONS

A. Analysis of the Experimental Subjects

The experimental subject, the Senshu University Philharmonic Orchestra (SUPO), is an amateur orchestra consisting of volunteer students. All the members are different in their position in this orchestra. For example, a section leader exists in each musical instrument section. As for analysis of the current conditions, in this research the authors conducted a questionnaire survey regarding motivations of the members of SUPO in order to clarify the motivational problems that this orchestra had.

First, the authors conducted questionnaire and interview surveys regarding "Problems associated with maintenance and improvement of motivations" for 25 male and female members of SUPO. As a result of the survey, existence of the following two problems became clear.

- It is difficult for members to realize the benefits of self practice

- Achievement levels of practice of other members are not supplied

With respect to the problem of difficulty for members to realize the benefits of self practice, the authors considered the visualization of the amount of practice. Performing technique of musical instruments is evaluated significantly based on sensations. In other words, it is very difficult to measure performing skills of each individual player on a quantitative scale. For this reason, each individual cannot realize his/her own growth that much, and this makes it difficult for him/her to maintain and improve motivation for practice. Humans are motivated when they realize their own growth, and their motives are improved [10]. Based on this reason, the visualization of the amount of practice can probably solve this problem.

With respect to the problem of not being able to know the achievement level of practice of other members, the authors examined methods for sharing information regarding the achievement level of practice which could be effective and understood intuitively. During weekdays, each individual member of SUPO practices voluntarily. This makes it difficult for each of them to know the achievement level of performance of other members. Specifically, the section leaders devote their practice time to observe each member to understand their achievement level of performance. Therefore, these problems could be solved if an SNS could show the achievement level of performance of other members in a form by which all members can understand it. This means that the section members can understand the achievement level of practice of each other, and since information sharing produces a competition, this encourages members to improve their motivation for practice. As a result, the amount of practice probably increases.
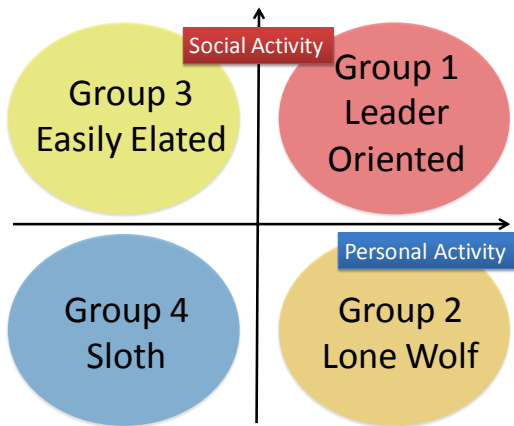
Fig. 1.   Grouping by personal activity and social activity

This research propose functions that incorporate the gamification elements, the visualization of achievement level of one's own practice and a method for the sharing of information regarding the achievement level of performance of other members, in order to maintain and improve users' motivation effectively.

B.   Analysis of the member who belongs to SUPO

It is important to propose appropriate functions after considering the attribute of the user who belongs to voluntary community. Therefore, the authors classified the members of SUPO by the attributes. It became clear that the members can be grouped into four types from the viewpoint of individual practice and orchestral rehearsal (personal activity) and information sharing (social activity) as concluded from the questionnaire and interview survey the authors conducted before the experiments (Fig 1).

The feature of each group is described below.

- Group 1 Leader Oriented: Members who did more practice and information sharing positively. The presence of Leader Oriented members in the community makes it more active.

- Group 2 Lone Wolf: Members practice much but they do not contribute to information sharing positively. Although they are serious and important for voluntary communities, they are sometimes isolated.

- Group 3 Easily Elated: Members contribute to information sharing positively but they do not practice actively. Members who belong to the Easily Elated group might become good or bad.

- Group 4 Sloth: Members who do not contribute to information sharing positively and they do not practice actively. When members of Sloth group are large, it is not rare that a voluntary community collapses. Therefore, it is important to reduce them in number in a voluntary community.

The purpose of this research for SUPO is to increase practice time and to make more members shift to Group 1(Leader Oriented). In SUPO, all of the members perform same music at the concert. All of the members have to raise their performance

skill. Therefore, it is very important to increase the practice time of members who belongs to Group 3(Easily Elated) and Group 4(Sloth).

V.   PROPOSAL OF AN SNS FOR MOTIVATION MAINTENANCE AND IMPROVEMENT

With the analysis results of the current conditions, this research proposed an SNS called fortissimo (f-simo) that supports members to maintain and improve their motivation for practice by visualizing the practice achievements and understanding the achievement level of performance of each member (Fig. 2)[11]. In order to improve motivation, this research proposed and introduced methods incorporating gamification in f-simo. In addition, f-simo was made accessible from multi-devices, such as a personal computer (PC) and a smart phone. The authors prepared account for each member.

A.   The Outline of Our Proposed SNS

This f-simo provides the following four functions.

1) Improvement of the Avatar Using the Experience Points
2) Graphical Representation of Practice Time
3) Presentation and Sharing of Rankings
4) Character Shimosuke that Grows Up by Cooperation of All Section Members

As for these functions, 1, 2, and 6 of gamification methods (Section III-*B*) were incorporated. Next section will describe each of the above functions. The figure below shows the system image of f-simo (Fig.2).

After practice, users enter their practice time and concentration level regarding practice based on a self-evaluation scale of one to five. The concentration level is required to be entered because the practice achievements could depend on the concentration level even though each member spent the same period of time of practicing. The experience point is calculated from these two numerical values. The experience point is used
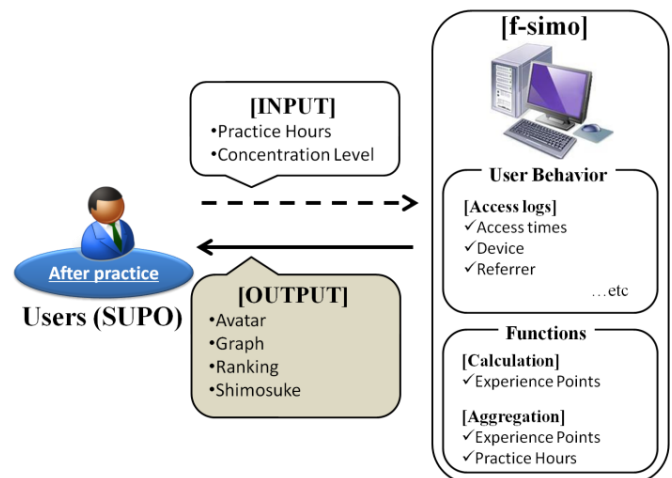

Fig. 2.   System image of f-simo

as an index which is being accumulated after practice. These items, the practice time, the concentration level, and the experience point, are also used for improvement of the avatar's level

and the character Shimosuke that grows up based on the cooperation of all orchestra members. Avatars referred to by this research indicate characters of users used in our proposed SNS. Level is an index of the experimental point which is able to compare with other member. When the level is improved, the title, and the background color of the avatar changes. "Shimosuke" is the character that grows up by collaborative of users.

Our proposed SNS has four functions aimed at increasing personal activity and social activity. "1. Improvement of the Avatar Using the Experience Points," "3. Presentation and Sharing of Rankings" and "4. Character Shimosuke that Grows Up by Cooperation of All Section Members" corresponds to the improvement in personal activity. Moreover, "2. Graphical Representation of Practice Time" corresponds to the improvement in social activity. The feature of each function is described below. (IV-*B* and IV-*C*).

B. Functions to Improve Personal Activity

1) Improvement of the Avatar Using the Experience Points.
The authors set this function so that the user's avatar level increases by accumulating experience points and the avatar's title changes accordingly (Fig.3). The purpose of this function was to visualize the practice achievements not only with numerical values, but also with the title and change of color so that the user can realize his/her growth. This function was inspired by the first gamification method mentioned in III-*B*, "Honorific badges or titles are given according to achievements."

2) Character Shimosuke that Grows up by Cooperation of All Section Members.
The authors implemented a character that grows when all the members of each section spend a certain amount of time for practice (Fig.4). The aim of this function was to give a common assignment for all section members to work on so that they can strengthen their group ties and improve their motivation. This function was inspired by the sixth gamification method in section III-*B*, "Assignments that encourage users to collaborate together are presented."

3) Presentation and Sharing of Rankings
This function aims toward improving the users' motivation based on a sense of competition. There are two rankings, the practice time of the previous day and the accumulated practice time (Fig.5). These two different rankings were introduced in order to avoid a decline in the motivation for practice of those who cannot come to practice on weekdays. This function was inspired by the second gamification method mentioned in III-*B*, "Names and scores of competitors are displayed on a real-time basis."

C. Functions to Improve Social Activity

1) Graphical Representation of Practice Time
The authors implemented the graphical representation function so that each member can understand the transition of their practice time intuitively. This function also enables members to compare their own practice time with their average practice
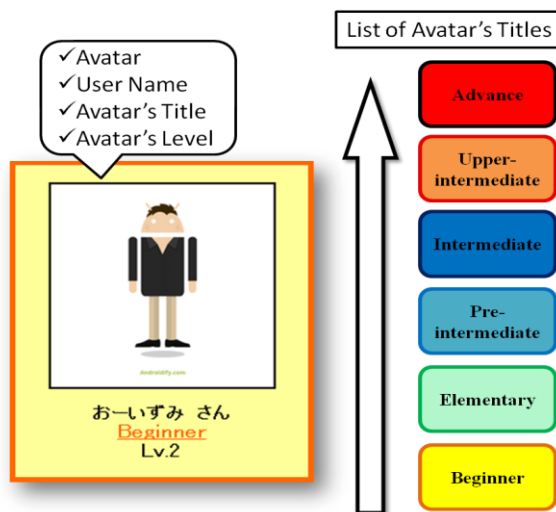

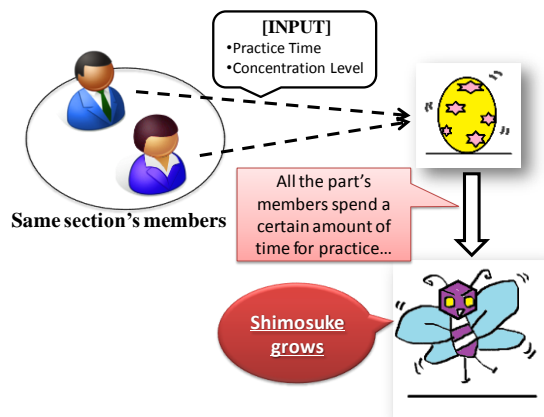Fig. 3.   The example of usage and list of avatar's titles

Fig. 4.   The image of the cooperation which uses Shimosuke

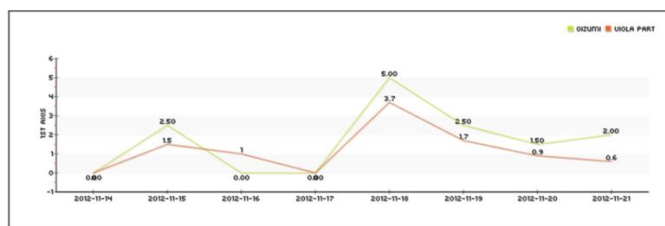Fig. 5.   An example of a graphical representation of Ranking

Fig. 6.   A user's average practice time and the practice time of other members within "viola" section

time and the practice time of other members within the same section (Fig.6). This function aims toward improving the users' motivation based on a sense of competition. This function was inspired by the second gamification method mentioned in III-*B*, "Names and scores of competitors are displayed on a real-time basis."

VI. ANALYSIS OF EXPERIMENTAL RESULTS AND ACCESS LOG

In order to verify the effectiveness of our proposed SNS, the authors conducted an experiment with 25 male and female SUPO members as the experimental subjects by having them use our proposed SNS for one month, from November 25 to December 15 of 2012. In this verification experiment, the authors studied the effectiveness of our proposed SNS regarding the two items:

1) Members' motivation for practice

2) Evaluations of each function

Item 1 above was determined by quantifying the number of practice sessions of members per day and the transition of practice time before and after our proposed SNS was introduced (TABLE I). Item 2 above was determined based on the results of the questionnaire survey conducted after the experiment (TABLE II). Members evaluated our proposed functions on a scale of 5 from the following questions (TABLE II). The tables below summarize the experimental results.

TABLE I shows that the number of practices and practice hours increased each week. With respect to the point as to whether all section members improve their motivation for practice, as shown by TABLE II, the average number of practice sessions and time per day increased as the weeks went by. With respect to the evaluations for each function, in all functions, evaluation values of questionnaire of after 3rd week was higher than that of after 2nd week. Moreover, the authors interviewed section leaders after the verification experiment and the authors got opinion that management of the section member became easy using visualization functions.

On the other hand, a low average evaluation value of questionnaire was confirmed with respect as to whether Shimosuke could serve to strength the section ties. This is likely due to the short experimental period, just one month, so that the change of the character based on the collaborated assignment could only slightly be confirmed. Actually at the end of the experiment, the character brought up by the members of only one of four sections was confirmed to have grown from the initial stage. The characters of the other three sections remained the same as the initial stage. This point shows that the parameters related to the character growth needs adjustment. When compared to the evaluation value of questionnaire of after 2nd week, however, the evaluation value of questionnaire of after 3rd week did increase. This shows that continuous use of this function could strengthen the ties within the section.

TABLE I. COMPARISON OF THE NUMBER OF PRACTICE SESSIONS AND PRACTICE TIME BEFORE AND AFTER OUR PROPSED SNS WAS INTRODUCED

	Before the introduction	After 2nd week	After 3rd week
Number of practice sessions (average times)	0.4	0.6	0.8
Practice time (average hours)	1.0	1.2	1.7

TABLE II. EVALUATIONS FOR EACH FUNCTION

Question	After 2nd week	After 3rd week
Did the change in your avatar make you realize your growth more than ever before?	3.16	3.36
Did graphic representation of practice time and ranking presentation increase your sense of competition?	3.24	3.36
Did Shimosuke serve to strengthen the ties within your section?	2.60	2.80

A. Analysis of Practice Time Based on Classification

In this section, the authors describe the detailed analysis of practice time and access time based on user classification.

First, the authors classified the SUPO members using individual practice and orchestral rehearsal (personal activity) and information sharing (social activity). In this research, social activity refers to information sharing, such as a practice situation and practice contents. Generally, communication is being activated in the community with many members who contribute information sharing positively. Information sharing is very important to maintain and improve member's motivations in voluntary communities. The classification was performed using access time of 1st week from the experimental start and practice time of 1st week. In Fig. 7, the authors show a scatter-plot of users where the vertical axis is social activity and the horizontal axis is personal activity.

The authors classified the SUPO members into four groups along with four quadrants of Fig.7. The number of members belonging to each group is shown in TABLE. III. The members of Group 3 (Easily Elated) and Group 4 (Sloth) are with short practice time at the start of the experiment. TABLE III shows that there are 11 members in Group 3 (Easily Elated) and Group 4 (Sloth). Focusing on these 11 members, the authors analyzed effectiveness of gamification functions using access log, by comparing practice time in the 1st week to the 2nd week

TABLE III. THE NUMBER OF MEMBERS WHO BELONGS TO THE RESPECTIVE GROUPS

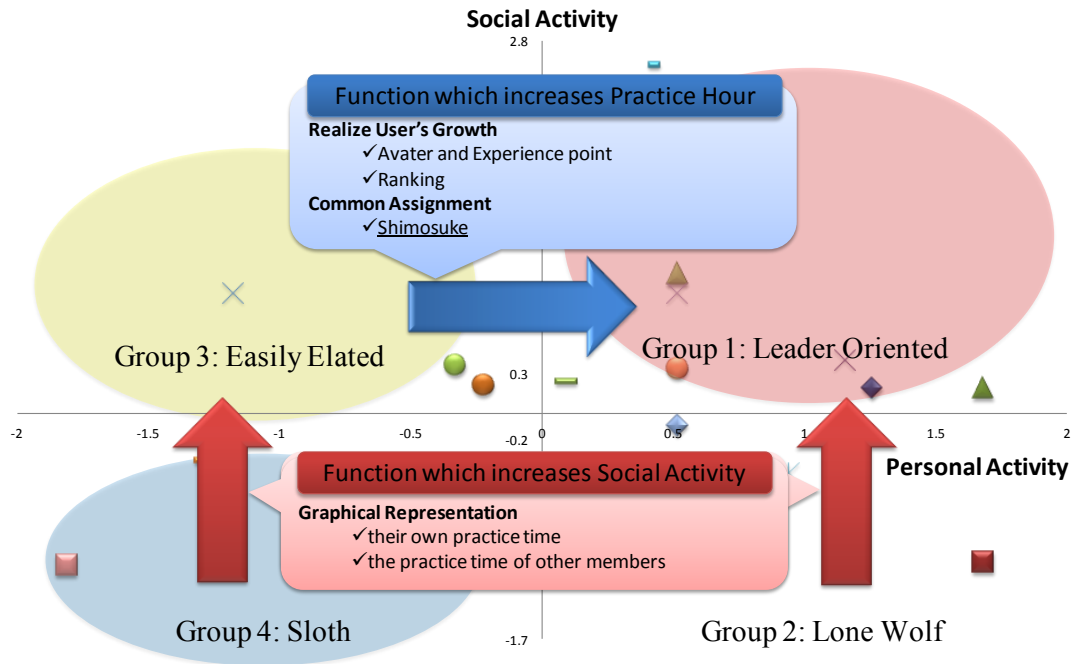| Group Name	Number of Users
Group 1 : Leader Oriented	9
Group 2 : Lone Wolf	6
Group 3 : Easily Elated	3
Group 4 : Sloth	8

Fig. 7.   The scatter diagram which set social activity on vertical axis against personal activity on the horizontal axis, and the placing by the proposal functions

TABLE IV.   AVERAGE OF MEMBER'S ACCESS TIME WHO INCREASED PRACTICE TIME

	1st week	2nd week	3rd week
Avatar	8.4	11.6	9.2
Graph	1.6	4.6	1.0
Graph other members	0.4	1.6	0.2
Ranking	2.0	3.6	2.4
Shimosuke	0.8	2.0	0.8

TABLE V.   AVERAGE OF MEMBER'S ACCESS TIME WHO DECREASED PRACTICE TIME

	1st week	2nd week	3rd week
Avatar	9.8	5.0	5.0
Graph	0.8	0.0	0.3
Graph other members	0.8	0.0	0.5
Ranking	2.0	0.3	0.5
Shimosuke	1.3	1.5	0.5

and in the 2nd week to the 3rd week.

First, the authors performed comparison of the 2nd week with the 1st week. 9 out of 11 members showed upward tendency at practice time. Moreover, about 70 percent of the members whose practice time improved also increased the number of times of accesses. Focusing on members who increased practice time and the number of times of accesses, on the 2nd week, they more often accessed pages of graphical representation of their own practice time and the practice time of other members and Shimosuke, compared with members who decreased practice time (TABLE IV and TABLE V). Through the result, members who belong to Group 3 (Easily Elated) and Group 4 (Sloth), i.e., members who did not practice positively, increased, from the 1st week to the 2nd week. Moreover, they often used the gamification functions on our proposed SNS.

Second, the authors performed comparison of the 3rd week with the 2nd week. Focusing on the members whose practice time improved and whose number of times of accesses increased on the 2nd week, it became clear that about 80 percent of users decreased practice time a little from the 2nd week to the 3rd week. However, compared with the 1st week, all the members increased practice time. Moreover, members who decreased practice times also decreased the number of times of accesses. Analyzing the access log, it was found that they decreased the number of times of accesses to pages of gamification. On the other hand, these numbers of times of accesses are as large as those of members who decreased practice time (TABLE IV and TABLE V).

Results of analysis of comparing the 1st week to the 2nd week and of the 2nd week to the 3rd week, the effect and problem of our proposed SNS became clear. First, from the 1st week to the 2nd week, positive correlation was seen between the number of times of accesses, and practice time. Moreover, many of the users who increased practice time, used functions using gamification. The authors performed independent t-test, to compare the mean of two different members. As results, p-value was below 0.10 (10%), we could reject the null hypothesis and conclude that there is a statistically significant difference between the two population means with significance level 10%. From these results our proposed SNS gave a certain effect on the user who often used this SNS.

On the other hand, some members did not use our proposed SNS. The authors need to reconsider our proposed SNS so that it becomes easier to use. Moreover, from the 2nd week to the

3rd week, the downward tendency was seen in the number of time of accesses and practice time. Restriction of practice time is considered as one of the cause of the result. The member who belongs to SUPO is a university student, and the practice time which can be spared for orchestra activity is restricted, i.e. each member's practice time may have reached its limit of being spared. Another cause is the problem with setting of parameters of gamification. For example, at the end of the experiment the character Shimosuke brought up by the members of only one of four sections was confirmed to have grown from the initial stage. In the interview after the end of an experiment, there are some options such as "I want to raise a level more" and "I want to know how to make Shimosuke will grow up." When using gamification in a voluntary community, it is important how to change outputs, i.e. avatar, level and character. Change outputs attract the user's interest and leads to improvement of the rate of utilization. Moreover, it is necessary to also consider game balance and outputs simultaneously. For example, in social games, users can get experimental points easily at the beginning. Therefore growth is easy to realize. Members may find difficulties to realize growth and become weary to the function as a result. The authors need to develop more interesting functions, and to make users to use them continuously.

Through these experimental results, the authors consider that the effectiveness of our proposed SNS was successfully verified. These results clarify that the following gamification methods are effective for voluntary communities: 1. Badges obtained according to the achievement level, or level determination, and 2. Presentation of the names and scores of the current competitors on a real-time basis. When it comes to method 6, "Assignments that promote collaborative work," the continuous use of this function could increase the effectiveness of this system to a greater extent.

VII. CONCLUSION

In this research, the authors proposed an SNS for improving motivation by utilizing gamification, targeting one university club, the Senshu University Philharmonic Orchestra, as an example of voluntary communities. The purpose of this research was to maintain and improve the motivations of each individual orchestra member for practice. In voluntary communities, since there are various types of members and there are no binding forces, it is usually difficult to maintain and improve member's motivation. To maintain and improve member's motivation, most of these communities are using SNS. However, since existing SNS offers few functions for voluntary community, it is difficult to solve this problem. First, the authors analyzed the current conditions and members of voluntary community. Based on this analysis, the authors found that an SNS to improve member's motivation of voluntary community requires the functions which support member's personal activities and the functions which increase social activities. Next, the authors built an SNS that visualized practice achievements and enabled sharing of information among section members, while applying the concept of gamification in order to reinforce these functions. The effectiveness verifica-

tion experiment conducted for one month verified the effectiveness of our proposed SNS with respect to the following functions: "1. Honorific badges or titles are given according to achievements." and "2. Names and scores of competitors are displayed on a real-time basis." With respect to function 3, "6. Assignments that encourage users to collaborate together are presented," continuous use of our proposed SNS will probably strengthen the ties between members.

The authors analyzed access logs and practice time further. Focusing on members who did not practice positively at the start of the experiment, we analyzed effectiveness of gamification functions using access log, by comparing practice time in the 1st week to the 2nd week and in the 2nd week to the 3rd week. About 70 percent of the members whose practice time improved also increased the number of times of accesses and positive correlation was found between the number of access times, and practice time in the 1st week to the 2nd week. Moreover, they often used the gamification functions on the proposed SNS. On the other hand, the downward tendency was found in the number of time of accesses and practice time in the 2nd week to the 3rd week. They may be attributed two facts. One is that since the member who belongs to SUPO is a university student, the practice time which can be spared for orchestra activity is restricted. The other is a problem with setting of parameters of gamification. The proposed SNS need to be improved to be easier to use.

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