

# The Relationship Between Social Presence and Group Identification Within Online Communities and Its Impact on the Success of Online Communities

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**Abstract.** In order to encourage more girls to choose STEM-study courses (Science, Technology, Engineering, and Mathematics) we created an online community and e-mentoring program for German high school girls and women engaged in STEM vocational fields. Within the online community, we brought together girls and female role models. A community platform was offered for getting to know and exchange with other community members. Within this community, we used quantitative methods to measure the students' levels of social presence and group identity, and tested to see if a correlation between those two factors exists. We further evaluated if the group identity has an impact on the girls interest and willingness to participate in STEM.

**Keywords:** Online communities, e-mentoring, social presence, group identity, STEM, gender.

## 1 Introduction

Girls and women are underrepresented in the areas of mathematics as well as the hard sciences chemistry and physics in comparison to boys and men [12, 17]. This is true from both a professional aspect [29] – and in particular with respect to academic careers and leadership positions – as well as the scholastic area [4, 6]. Interesting here is that these gender specific disparities grow with increasing ability levels [29]. The low levels of participation among girls in the international Olympics, which serve to identify and promote young talents in these areas, demonstrate this for the subjects of biology, chemistry, mathematics, physics and computer science [13].

Although massive gender differences were recorded in studies during the 1970's and 80's for performance in the areas of mathematics and the natural sciences [4, 15], performance levels seem to be evening out in these subjects for the time being [1, 8]. However, by the time they reach adolescence, girls in many countries demonstrate poorer achievement levels than boys [3].

Regardless of the degree of difference, or of the presence of achievement differences in the area of science, technology, engineering and mathematics (STEM), it

must be stressed that the slight discrepancy in performance cannot explain the phenomenon that women and girls almost completely avoid subjects in the areas of mathematics and the natural sciences. Consequently, the psychological approaches used to explain the poor levels of participation of women and girls in the areas of STEM have focused increasingly in the last decade on a lack of female role models in these talent domains [11].

### 1.1 CyberMentor-Community

Due to the lack of female role models in STEM and the low participation rates of women and girls in STEM in Germany, we created an online community to bring together women engaged in STEM vocational fields and German high school girls.

CyberMentor is an e-mentoring program that aims to foster interest and participation of high school girls in STEM through a web-based approach [19]. It provides suitable role models via mentoring, which involves a one-to-one relationship between women who work in the field of STEM (researchers, professors, engineers) and female high school students. The girls communicate with their mentors via e-mail. In addition to the e-mail communication between mentors and mentees, the members have access to a community platform with functionalities to communicate synchronous and asynchronous with other girls and mentors. For asynchronous communication there is a discussion forum and an internal messaging system. The discussion forum is used for questions concerning STEM but also for personal exchange. The posts in the forum are visible to all the other members. If wanting to communicate privately with only one other person, the participants can use the community-internal messaging system called CyberMail. For both, the forum and the internal messaging, users can subscribe e-mail notification which informs them about new messages getting in. The platform also offers the feasibility for synchronous communication. Participants find a chat room where they can have spontaneous meetings with other mentees and mentors as well as arranged chats with their mentors or other girls. On a regular term, chat meetings are being held and STEM-topics are being discussed. Mentors can act as experts and invite interested girls to their expert chats.

Furthermore, CyberMentor offers personal pages with pictures for each member to introduce herself and get to know other online community members. Each personal page includes a guestbook and the users can post on each other's pages. A web journal, called CyberNews, appears once a month and offers interesting articles about STEM, quizzes and interviews with female students talking about their study courses in the domain of STEM. Mentees and mentors can also write their own articles and upload them via an online submission form.

## 2 Background

*“Social Presence is the degree of person-to-person awareness, which occurs in the computer environment.”* [24, p.34] Short, Williams, and Christie define Social

Presence as the “*degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships*” [21, p.65]. Gunawardena sees social presence as “*the degree to which a person is perceived as a ‘real person’ in mediated communication*” [9, p.151]. Biocca further explains “*the minimum level of social presence occurs when users feel that a form, behavior, or sensory experience indicates the presence of another intelligence.*” [5, sect. 7.2]

Social presence has been recognized as an important factor in the context of computer-mediated communication, online learning or virtual communities. Gunawardena and Zittle report findings that in a computer-mediated communication system, social presence is a strong predictor of satisfaction [10]. Different researchers report that social presence affects the degree of social interaction taking place in computer-supported collaborative learning environments [9, 22, 23, 25, and 26]. Venkatesh and Johnson found positive effects of social richness, which is an important indicator of presence, on motivation, subsequently leading to a higher system usage [27]. Furthermore Perse, Burton, Kovner, Lears and Sen recognized a positive relationship between social presence and a student’s perception of his/her own computer expertise [18]. Concerning the participation rate within online environments, social presence is also an important indicator. Leh found that when social presence within an environment is lacking, the participants see it as impersonal and the amount of information shared with others decreases [16].

Asch found with his conformity study that people generally want to fit in groups [2]. At a collective level fitting behavior happens, when one sees trends in the behaviors of others, e.g. clothing, and changes his/her own style in dressing to fit in. Whiteman states “*People feel more comfortable around us when they believe we share a kinship or common values*” [28, p.8]. Further do Shaffer and Anundsen believe that communities are built on a person’s sense of belonging and yearning to belong; when people share identities and values, communities are constructed [20]. An experiment by Cosley, Lam, Albert, Konstan, and Riedl showed that people generally want to fit in their group [7]. In their experiment within an online movie rating system, they divided all subjects into four groups. The groups were seated in separate rooms and told to rate movies they had seen before. Groups A, B, and C saw system-predicted ratings for the films they were rating. Group D did not get this information. The result of this experiment show that a significant proportion of the rating given by groups A, B, and C correlated with the system-predicted values those groups had been seen before rating. This shows that users tried to conform to the predictions [7].

The statements and studies mentioned above show that social presence and belonging to a group (group identity) both are important factors in online environments. In our study we want to find out if there is a relationship between social presence and group identity in online communities, and if a higher level of group identity affects the interest level of girls in STEM and their willingness to get involved with STEM.

### 3 Empirical Study

In our empirical study we wanted to test the hypotheses that (H1) the level of Social Presence has an impact on the level of Group Identification, (H2) the level of Group Identification influences the interest-level in STEM, and that (H3) the level of Group Identification furthermore has a positive impact on the involvement with STEM.

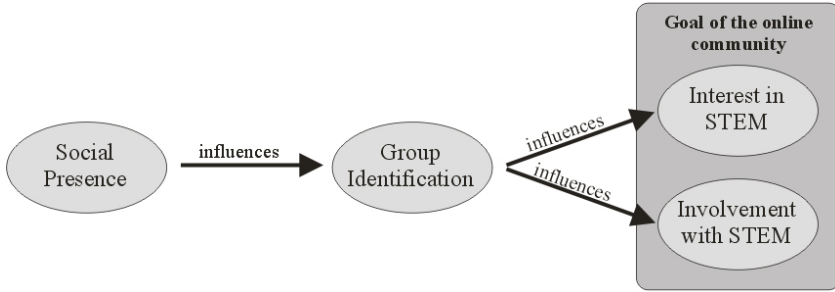


Fig. 1. Hypotheses we want to test with our empirical study

#### 3.1 Online Community and Its Members

The Online Community we are referring to in our research was created in October 2005. 107 volunteering mentors engaged in STEM-vocational fields and 107 girls visiting grades six to thirteen ( $M = 9.35$ ,  $SD = 2.12$ ) were members of the Online Community. Each high school girl was matched with one mentor. Besides exchanging with their mentoring partners via e-mail, the online community members had access to an interactive community platform described above.

After being a member of the online community for nine months, the girls were asked to participate in a voluntary web based survey which included the questionnaires mentioned in the following paragraph. 51 online community members took part in the survey and answered the questions.

#### 3.2 Measurement Tools

To test our hypotheses we used quantitative methods. The Group Identification was measured with an adapted and translated version of Henry, Arrow and Carini's group identification scale [14]. We adapted the questionnaire and used six items instead of nine. The 6-item questionnaire was highly reliable with  $\alpha = .90$ . For measuring the level of social presence, we translated and adapted Gunawardena and Zittles' Social Presence Scale [10]. In our version we used 12 items instead of 14. The  $\alpha$ -value of our Social Presence scale was .90. Interest in STEM was measured with a 6-item questionnaire ( $\alpha = .89$ ), Involvement with STEM with a 5-item questionnaire ( $\alpha = .90$ ). Table 1 shows the measuring tools we used and lists two example items of each scale. The answer options reached from "1-completely disagree" to "6-completely agree".

**Table 1.** Information about the measuring tools we used

| Scale for measuring... | Number of Items | Alpha | Example Questions   | Answer Options   |
|------------------------|-----------------|-------|---|--|
| Social Presence        | 12              | .90   | <i>The CyberMentor-Community is an excellent medium for social interaction.</i>                         | 1 - completely disagree  |
|                        |                 |       | <i>I felt comfortable conversing via e-mail, forum, chat and cybermail within the online community.</i> | 2 - disagree<br>3 - rather disagree<br>4 - rather agree<br>5 - agree<br>6 - completely agree |
| Group Identity         | 9               | .90   | <i>I am happy to be a member of the CyberMentor group.</i>  |  |
|                        |                 |       | <i>I see myself as quite similar to other members of the group.</i>                                     |  |
| Interest in STEM       | 6               | .89   | <i>I like STEM classes at school.</i>   |  |
|                        |                 |       | <i>Getting good grades in STEM-classes is important to me.</i>  |  |
| Involvement with STEM  | 5               | .90   | <i>I can imagine choosing a STEM class as a major in High School.</i>                                   |  |
|                        |                 |       | <i>I can imagine studying a STEM course when going to college.</i>                                      |  |

### 3.3 Results

51 users filled out our questionnaire about social presence. We grouped those users according to their level of social presence by the help of a median split. Those users with a value above 4.4 on a 6-point likert scale were grouped to “High SP”, users with a value of 4.4 and lower were grouped to “Low SP” (see table 2).

**Table 2.** Group statistics: social presence

| Group   | SP value | N  | Mean | S.D. |
|---------|----------|----|------|------|
| High SP | > 4.4    | 25 | 4.91 | .43  |
| Low SP  | <= 4.4   | 26 | 3.66 | .54  |

To test hypothesis **H1**: “*The level of Social Presence has an impact on the level of Group Identification.*” a t-test was computed for the grouping variable “Social Presence group” and the test variable “Group Identity”. The responses were measured on

a 6-point likert scale (from ‘strongly disagree’ (1) to ‘strongly agree’ (6)). A significant difference between the two groups ‘High SP’ and ‘Low SP’ could be found using a t-test ( $p < .01$ ;  $t = 6.97$ ;  $df = 47$ ). Table 3 presents the mean values and standard deviations for the groups ‘High SP’ and ‘Low SP’.

**Table 3.** Mean values of ‘Group Identity’ for the groups ‘High SP’ and ‘Low SP’

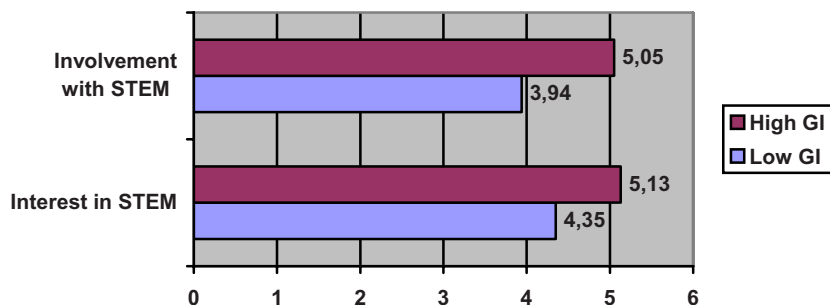
| Group   | N  | Mean value group identity | S.D. |
|---------|----|---------------------------|------|
| High SP | 25 | 5.06                      | .53  |
| Low SP  | 24 | 3.73                      | .79  |

The users who filled out our questionnaire about group identity were again grouped into two groups according to their level of group identity by the help of a median split. Users with a group identity value greater than 4.5 were grouped to “High GI”, while users with the value 4.5 and lower were assigned to “Low GI” (see table 4).

**Table 4.** Group statistics: group identity

| Group   | SP value | N  | Mean | S.D. |
|---------|----------|----|------|------|
| High GI | > 4.5    | 25 | 5.17 | .40  |
| Low GI  | <= 4.5   | 24 | 3.67 | .65  |

Another t-test was computed to test **H2**: “The level of Group Identification influences the interest-level in STEM”. Grouping variable was the “Group Identity group” (see table 4) and the test variable was “Interest in STEM”. The same was done for **H3**: “The level of Group Identification has a positive impact on the involvement with STEM” with the test variable “Involvement with STEM”. Figure 2 shows the mean values of the two groups ‘High GI’ and ‘Low GI’ for both test variables. The t-test results proved significant differences between both groups concerning ‘Interest in STEM’ ( $p < .01$ ;  $t = 3.28$ ;  $df = 40$ ) and ‘Involvement with STEM’ ( $p < .01$ ;  $t = 3.39$ ;  $df = 40$ ).



**Fig. 2.** Mean values of the variables “Involvement with STEM” and “Interest in STEM” of the two groups (High GI and Low GI)

Table 5 summarizes our results. With our study we found that the level of social presence does have an impact on the identification with the online group. If the users' levels of social presence are higher, their identification with the online group is also higher. Further, the group identity does positively influence the members' interests in STEM and also the involvement or willingness to get involved with STEM.

**Table 5.** Summary results for our hypotheses

| Hypothesis  | Confirmed |
|---|-----------|
| <b>H1:</b> <i>The level of Social Presence has an impact on the level of Group Identification.</i>      | Yes       |
| <b>H2:</b> <i>The level of Group Identification influences the interest-level in STEM.</i>              | Yes       |
| <b>H3:</b> <i>The level of Group Identification has a positive impact on the involvement with STEM.</i> | Yes       |

## 4 Discussion and Future Prospects

The results we gained through our empirical study showed that social presence is a crucial factor within online communities. Other studies mentioned above proved for example, that social presence is an important factor concerning the participation rate [9, 16, 22, 23, 25, 26, and 27] within online communities or satisfaction within an online environment [10]. With our study we could expand the list of positive impacts social presence has within online environments. We showed that social presence influences the users' identification with the group, which in turn is an important factor within online communities as well. In the case of our online community, the factors *Interest in STEM* and *Involvement with STEM* were important. We showed that higher group identification strengthens those factors. A higher identification with the group leads to greater interest in and more involvement with STEM. This demonstrates that group identity is a factor which positively influences the groups' goals.

In this study we only measured the level of social presence among the student online community members. We have not considered the mentors so far. It would be interesting to find out which level of social presence the mentors sense and if there is a difference between the student and adult members of the online community. Furthermore, it would be interesting to compare the participation rates of those users with a higher level of social presence and those with a lower level of social presence.

Now that we know about the importance of social presence and group identity within online communities, our next goal will be to find ways to strengthen those factors even more. What leads to an increase in the levels of social presence and group identity in online communities? We assume that through the presentation of social cues within online environments, social presence can be strengthened even more, and therefore we will try to find ways to foster social cues and their presentation within online communities.

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