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Communication and self-presentation behavior on Academic Social Networking Sites: An exploratory case study on profiles and discussion threads on ResearchGate

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Abstract

Several Academic Social Networking Sites (ASNSs) have been launched in the last few years and their number of members is growing. Researchers using ASNSs come from very divergent scientific backgrounds and academic levels, prompting one to ask the question what kind of communication and self-presentation behaviors occur within these structures. The qualitative study presented in this article has analyzed the communication behavior of a selected sample on ResearchGate (RG). It investigates how researchers present themselves on their personal profile-sites and how they interact with other researchers. Overall, the results show that mostly young male academics without previous connections to each other (e.g., faculty colleges) use RG for their scholarly exchanges. In general, communication behavior is characterized by an objective, professional, unemotional choice of words and seldom the use of polite salutations or words of farewell. However, there seems to be a correlation between long discussion and an increased use of colloquial and emotional language. Based on our findings, we have derived preliminary practical recommendations for communications on

ASNSs in order to improve relationships in online academic interactions, to foster inclusiveness of gender and culture and to reduce insecurity in matters of communication, presentation, and the exchange of scientific data.

Keywords: Communication behavior; Academic Social Network Sites; ResearchGate; user profiles, discussion threads

Introduction

The social web has created new ways of communication and more open participation across what traditionally can be perceived as hierarchical academic and professional structures. Alongside private social networks such as Facebook, several academic social networking sites (ASNSs) have emerged, such as ResearchGate and Academia.edu. ASNSs are special platforms for academics, providing professional and social networks for researchers. ASNSs offer varying communication functionalities, which can include sending messages to other members of the ASNS, having an open discussion on a specific topic, and presenting information about their own academic background and research activities on a personal profile-site. Thus, ASNSs provide not only the possibility for exchange with other researchers by means of messages and discussions but also an option for self-presentation by means of a personal online profile-site. Even though the functionalities of ASNSs are aimed at a work-related academic purpose, the general functionalities are in part very similar to those of private social networks such as Facebook. Thus, ASNSs combine the characteristics of private social networks with the possibility to share publication, connect with peers and discuss research-related issues (Bhardwaj, 2017; Meishar-Tal & Pieterse, 2017; Ovadia, 2014).

With a growing number of participants, various written communication guidelines, such as Question & Answer (Q&A) guidelines, started to emerge. These are generally established by the website owner or an organization. For example, ResearchGate provides written Q&A guidelines to give particular advice on how to use their different functionalities. However, these written rules are not necessarily the same as social norms. Social norms are unwritten conventions that are socially negotiated and expressed through social interaction (Freestone & Mitchell, 2004). Social norms are also related to the term politeness (Brown & Levinson, 1978).

A systematic classification of social norms is provided by the review of Chung and Rimal (2016) who distinguish five types of social norms based on their underlying meaning. According to this classification, an appropriate communication behavior is related to

injunctive norms, meaning what should be done in a given situation. Injunctive norms differ from written rules (such as Q&A guidelines). Injunctive norms refer to general social beliefs, whereas Q&A guidelines reflect mainly the view of individuals, such as the website owner or the creator of the guidelines, meaning their social value is not verified.

In this context, two other kinds of social norms are also of interest: on the one hand, collective norms which describe the actual prevalence of a behavior, and on the other hand, descriptive norms that refer to the subjective perception of the prevalence of a behavior. These social norms are partly aligned with injunctive norms but can also differ. For example, “healthy eating” as an injunctive norm often differs from the collective norm (i.e., statistics show a large amount of overweight people consuming too much fat) and the descriptive norm (i.e., in everyday life one can subjectively perceive many people eating junk food).

Taken together, even though written rules exist for a communication behavior, it remains unclear how the majority of academics actually behaves on ASNSs (collective norm) and if this is in line with the appropriate behavior (injunctive norm) and the written rules provided by the owner of the website.

Taking into account the divergent academic backgrounds, the different fields of research, and the varying academic levels of the researchers who use ASNSs, the question arises what kind of communication and self-presentation behaviors (collective norms) occur within these structures. Are there specific communication patterns (see detailed definition below) or in other words specific communication behaviors that are most frequently demonstrated by the users (e.g., more frequently using a formal style, short sentences or polite salutations)?

The overall research aim of the qualitative study presented in this paper is to receive first insights into the actual communication and self-presentation behaviors of researchers on ASNSs.

In particular, the focus is on the self-presentation of users by means of profile-sites and on communication behaviors during short and long discussions on ASNSs. ResearchGate (RG) was chosen as a popular use case. RG provides researchers with several functionalities, such as the possibility to present themselves on a profile-site, including information about their academic background, their contributions (academic papers etc.) and further details. By “following” other academics’ profile-sites, researchers can connect with each other. Dialogue between researchers is enabled through “discussions” or “questions” functionality. Questions are related to a specific topic (e.g., medicine) and followers of a topic can provide answers (hereafter a question and its correlated answers are denoted as a “discussion thread”).

A sample of profile-sites were selected alongside a number of short and long discussion threads (details follow in the methodological section) to receive first insights into the actual typical communication behaviors and to identify any communication patterns. Prior research on computer-mediated communications and social networks had indicated gender-related differences in communication and self-presentation behaviors. Gender was therefore considered as an additional specific aspect (a control variable) for the analysis.

In summary, the overall research aim is focussed on collective norms. However, collective norms (as defined by Chung and Rimal, 2016) would refer to the actual behavior of the majority of all academics on all ASNSs. For practical reasons it was not possible to investigate all academics on all ASNSs. Therefore, this study concentrates on the actual behavior of academics on only one ASNS (RG) and presents initial qualitative and explorative results. The generalizability of our findings is therefore limited in two ways (see also the section entitled “limitation and outlook”). Firstly, the results are limited to academics on RG and would have to be validated in further studies for other ASNSs. Secondly, the generalizability is limited because of the rather small sample size of this explorative study and requires validation by further research with a larger sample size and more quantitative analysis.

In light of these limitations we chose to use the term “communication patterns” instead of the term “collective norms”, to make it clear that at this stage of our research the findings relate to the actual communication behavior demonstrated most frequently by the majority of users from a selected sample of one ASNS (RG) rather than the majority of all researchers on all ASNSs. The term “communication patterns” is used to denote the predominant communication and self-presentation behaviors which can be identified through specific indicators such as formal/informal language style (e.g. use of salutation/farewell, articulation), level of politeness (e.g. number of thank you, please), or the use of emotional words or symbols (e.g. number of for example happy/angry emoticons, ASCII) (for more details see the coding scheme section). These communication patterns (actual behavior of the analyzed sample) come close to collective norms (actual behavior of the majority). However, due to the above mentioned limitations further research is necessary in order to provide sufficient evidence that these communication patterns are in fact collective norms and are equally valid for ASNSs other than RG.

The next chapter describes related work in the field of computer-mediated communication and ASNS to set the context for this study. Research in areas such as communication behavior

as well as social media use has shown several gender-related differences. Therefore, a subchapter has been added to highlight gender as an important control variable for this study. Next the research questions addressed by this study will be presented followed by the methodology used and our findings. The paper closes with a discussion of the findings and an outlook into the future.

Related Work

In the last few years, numerous studies have been carried out to describe social web phenomena such as online social networks, blogs and chats.

The following section reviews existing studies on professional communication behavior in computer mediated communication (CMC) as well as outlining previous studies on ASNSs. Furthermore, the importance of gender-specific aspects of online communication behavior is highlighted. This section closes with a presentation of the general research aim and the specific research questions addressed in this study.

Studies on the language of professional Computer Mediated Communication (CMC)

With increased CMC technology use for professional purposes, different communication skills became necessary to facilitate the appropriate use of this technology and to identify an appropriate style of language in this context, for example, formal versus informal use of language (Smith, Caputi, Crittenden, Jayasuriya, & Rawstorne, 1999). Indicators of a formal versus informal language style are not limited to the use of formal phrases and correct salutations but in this context are also related to other aspects of communication such as response times, choice of words (short/long/simple/complex), expressions used (colloquial/professional) or typographic markers like paralinguistic signs (inverted commas, question marks, exclamation marks) (Kalman & Gergle, 2010). Furthermore, language cues such as emoticons (e.g., smiley face ☺) are being used to express disambiguation and affects (Riordan & Kreuz, 2010) and to communicate socio-emotional meanings (Vandergriff, 2013). Early studies on emoticons described them as a replacement for facial expressions and other bodily indicators which are missing in written communication (Kiesler, Siegel, & McGuire, 1984).

Another aspect of the analysis of CMC regards the influence of the status within the group and a person's educational level. Some studies found that CMC differed depending on the status within the group. For example, those with a low status wrote more conforming and agreeing texts. They also used more affective words and exclamation marks than high status members did. Messages written by those with a high status contained more didactic content,

complex words and references, than did those written by low status members (Dino, Reysen, & Branscombe, 2009). Based on these findings, the question arises if and how the academic position might influence the academic communication behavior. First findings on email communication showed that students often showed lower levels of courtesy in formulating their emails compared to those in higher academic positions (Biesenbach-Lucas, 2007). Similarly, Knight and Masselink (2008) claimed that students' emails to their professors often included improper style and content: they were often poorly written, incomprehensible, and often headed as 'urgent'.

Overall, these existing studies have revealed several important indicators of communication and self-presentation behaviors in CMC, that is indicators of a formal versus informal language style such as formal phrases and correct salutations as well as choice of words, expressions used and typographic markers, such as paralinguistic signs.

Studies on Academic Social Networking Sites (ASNSs)

In general, ASNSs (e.g., ResearchGate, Academia.edu, Mendeley) have gained growing popularity as a means of communication within the scientific community (Almoussa, 2011; Nentwich & Koenig, 2014). These networks offer more transparency and support the exchange of ideas and publications (Bartling & Friesike, 2014). Studies found that the main motivations for using ASNSs were self-presentation; establishing scientific contacts and interacting with peers; finding new research and publication possibilities; acquisition of professional knowledge; and getting out of institutional constraints (Bartling & Friesike, 2014; Jordan, 2017; Meishar-Tal & Pieterse, 2017; NPG, 2014). With regards to these aspects there is also a connection between academic online identity and formal academic institutional roles (Jordan, 2017). More specific findings by Jordan (2014) showed that young academics were the most active group on ASNSs. They were taking advantage of the more open, democratic and less hierarchical structures and possibilities to establish new contacts. Hence, it was concluded that ASNSs had the potential to reduce the impact of hierarchical obstacles (Fries, 2014). However, there is also empirical evidence showing ASNSs reflecting the more traditional academic structures and/or connections (Jordan, 2017; Thelwall & Kousha, 2014). A study by Goodwin, Je, & He (2014) explored the influence of different interface designs on communication behavior over the years (in 2009-2011, 2011-2012, 2012). The findings showed no changes over time regarding the core communication behavior among researchers when sharing information and opinions. However, it was noted that researchers were more

polite in the initial group discussion design (2009-2011). In addition, there was a shift from one-to-many discussions to one-to-one posts over time.

Another study examined users' ratings (upvotes) of answers on RG. It found that the status of the person responding, shorter response times as well as greater answer length were directly related to a positive rating of answers. In contrast, answers containing social aspects led to less positive ratings (Li, He, Jeng, Goodwin, & Zhang, 2015).

In summary, prior research on ASNSs has indicated that aspects of the communicating person's social status and indicators for polite behavior ought to be taken into account when carrying out research in this field.

Gender-specific aspects

Gender-related differences are a well-known phenomenon in communication behavior. Social psychological literature differentiates between a feminine versus a masculine communication style. Cooperation and sensitiveness, understanding and compassion characterize a feminine communication style, whereas a masculine communication style is more task-oriented, dominant, analytical and competitive (Kennedy, Wellman, & Klement, 2003). In relation to online communications Guiller and Durnella (2007) found that women communicate on a highly supportive and positive level, in contrast to men who were more likely to post negative comments. Furthermore, a study by Fox, Bukato, Hallahan and Crawford (2007) has shown that women used more CMC cues than men and wrote their messages more expressively to convey socio-emotional content through CMC cues. Some other studies also examined the impact of gender on politeness in the context of the World Wide Web. For example, studies on gender differences in email-politeness revealed that in email conversations men violated principles of courtesy more often than women (Jessmer & Anderson, 2001; Kaul, 2010; Khani & Darabi, 2014).

However, it remains an open question if and to what extent gender-related differences in online communication behavior have changed as a result of the increasing popularity of social media. For example, Tomai, Mebane, Rosa, and Benedetti (2014) suggested that using social media might diminish gender differences in communication behavior.

In contrast, other studies suggest that for distinct internet uses the gender differences remain (Helsper, 2010). In the early years of social networking, female students in the US and the UK were much more common users of social networking sites in general (Hargittai, 2007, Tufekci, 2008; Dutton & Blank, 2011) and Facebook in particular (Acquisti, & Gross, 2006; Valenzuela, Park & Kee, 2009) than their male counterparts. Interestingly, studies on

Facebook and MySpace (Fogel & Nehmad, 2009; Tufekci, 2008) showed that women had more concerns about privacy than men. For example, more men than women displayed their phone numbers or addresses and had more ‘friends’ added to their profile (Fogel & Nehmad, 2009). Yet, despite more privacy concerns, women tended to write more messages on other people’s profiles than men (Fogel & Nehmad, 2009) and were more likely to display their favorite interests (Tufekci, 2008).

In summary, the findings on persistent gender-related differences in communication behavior and the use of social media suggest that gender is an important variable that ought to be considered when investigating communication behavior and social media in general (Herring, 2001). Therefore, gender was included as an additional specific aspect informing the sample selection for this study. Gender was also included as a control variable for the analysis of the communication behavior.

Research questions

The overall research aim of this study was to receive insights into the different kinds of communication behavior that have emerged on ASNSs. The overall research aim was addressed by applying the following research questions (RQ) to the sample of users’ profile-sites and discussion threads:

- RQ1: How do users present themselves on their personal RG profile-site with particular regard to the photos used, personal details, their activities and contacts?
- RQ2: What kind of communication patterns, meaning the most frequent behaviors displayed, (e.g., choice of words, formal versus informal style, response time, level of politeness, emotional phrases) emerge in the discussion rooms on RG?
- RQ3: What, if any, is the difference between discussions that have a typical number of answers compared to discussions with many answers on RG?

Method

The ‘Grounded Theory’ was chosen as a methodological approach for this study. This method suggests an exploratory alternation between data collection (everyday life data) and the development of theoretical concepts. This process of continually collecting and analyzing data in a qualitative or quantitative manner and subsequently developing assumptions about the phenomenon of the study leads to a constant and critical comparative analysis (Charmaz,

2014). Based on the prior studies discussed above, several important indicators of communication and self-presentation behaviors (e.g. informal language style, politeness, status, use of emotional words) were derived. Exploratory alternation based on the Grounded Theory was used mainly for the development of the research questions, the derivation of analyzed variables and their assessment by a coding scheme. Accordingly, a pre-analysis of the functionalities contained within RG was carried out, namely the options for creating an online profile-site for self-presentation and the options for discussing specific topics with other researchers. Based on the functionalities of RG (e.g., user can create an online profile-site with a picture) the research questions were developed and rough variables of interest and related coding categories derived (e.g., profile picture is provided or not). This rough set of variables was enhanced further with variables that had been identified from related research as important influencing factors in communication, for example, the use of polite salutations or the use of emoticons.

Following pre-analysis, the actual use of each selected profile-site and the associated communication behavior were examined in depth. During this analysis, the coding scheme was continually refined in line with the research questions and the emerging data (e.g., details of the photos: portrait, clothes, surroundings, facial expression).

The following section describes the key insights gained from pre-analysis. Next, the coding scheme is presented, followed by a narrative regarding the application of said coding scheme to the analysis of the RQs. The section closes with a description of the process used for selecting the sample.

Pre-analysis: Frame conditions

The pre-analysis revealed that the registration process of RG generates a predefined basic structure for self-presentation. The registration conditions automatically restrict members to a selection of people with academic background. On their profile-site, members have the opportunity to provide personal information and to display their academic skills and their scientific working papers. However, there is no obvious space for private information. RG's privacy and data protection guidelines also provide written rules for appropriate behavior. The functionality for discussions with other researchers is structured rather simply as asking questions and receiving answers. For communication during discussions, the Q&A guidelines offer specific written rules for how to ask questions and provide answers. Here is a sample of Q&A content from ResearchGate.com (retrieved 03/2015):

- ‘Make sure your Question title is clear, concise, and asks a Question.

- Search to see if your Question has already been asked before posting.
- Upvote good Answers instead of saying thank you.
- Follow a mixture of broad and specialized Topics.
- Keep it professional, and help us maintain a high standard
- Add your Answer: Identify yourself as an expert in your field by providing high-quality Answers'

In case of misspelling or using a foreign language (other than English) RG reserve the right to remove or correct the content. RG also encourage members to use the upvote and downvote function instead of writing 'thank you' and to highlight content of low quality.

It is important to note that RG use a quantitative evaluation mechanism of member profiles based on a user's activities. This means that in order to achieve higher RG scores the user has to be more active in uploading publications, answering questions, and entering into exchange with other RG users.

Overall, the pre-analysis lead to the following categories to be included in the coding scheme: gender, name, position, degree, country, photo, number of displayed skills, number of followers and followees, activities, value of impact points and RG score.

Coding scheme

As mentioned above, the coding scheme was based on the functionalities of RG identified in the pre-analysis and was augmented with further categories derived from literature. Additional categories were also identified during data analysis.

For the analysis of the profile-sites, the coding scheme ultimately included the following categories in relation to options for self-presentation and related functionality on RG: gender (identified by a distinct male/female surname or photo), name (surname/forename), position (academic/working title), degree (student, PhD/postgraduate, postdoc, professor, other, none), country (location of displayed institution), photo (yes/no, photo details: facial expression, background, clothes etc.), number of displayed skills, number of followers/followees, activities (e.g. number of answers, questions, publication uploads etc.), value of impact points/RG score.

Additional remark: The indicator for country reveals the place of work and not necessarily the birthplace (nationality). For this reason, the country will only be reported in the sample description. Information on age was not visible and was therefore not included in the analysis.

For the analysis of the discussion threads, categories were established for the main elements of the discussion, such as the number of answers, ratings (upvotes, downvotes) and followers. Furthermore, the following categories were developed to aid analysis of the discussion threads' content:

- Indicators of the language used: number of technical terms (topic related terminology), length (short sentence: no nesting, no listing, no including; average sentence: max. 1 nesting or listing or inclusion; long sentence: over several lines), sentence construction (number of paragraphs, lines) response time (number of days), orthography (number of misspelling, lower-case words), abbreviations (number, colloquial, e.g., cu (see you) or technical, e.g., ASTM standard), emphasis (number of underlining, bold), and number of integrated or attached links, documents or graphics.
- Indicators in relation to a formal/informal communication style: salutation/farewell (yes/no and form: e.g., use of title, Dear Sir, Hi, bye, regards), articulation (colloquial or professional language), level of politeness (number of thank you, please), and use of ratings (number of upvotes, downvotes, criticisms).
- Indicators in relation to an emotional communication style: use of emotional words (number of, for example, happy, angry), use of symbols (number of emoticons, ASCII), capitalization (e.g., ANGRY), and exclamations (number of exclamation marks, questions marks).

The listed categories on discussion threads were used for the analysis of both RQ2 and RQ3. The analysis of the seven long discussions with 10 or more answers (RQ3) specifically examined any differences between these and the typical discussions examined in RQ2 as well as any anomalies or irregularities.

Application of the coding scheme (for the analysis of the RQs)

RQ1 was examined using the categories which relate to the way that users present themselves on their personal profile-sites on RG (e.g., using academic titles or photos). The frequency of the assessed indicators was analyzed in order to understand how people present themselves in communication with their peers.

After analyzing the profile-sites, an in-depth analysis of communication in the discussion rooms was carried out, focussing on the content of discussion threads in order to explore communication patterns (RQ2 & RQ3). Initially, the first three (or less) answers were analyzed because this was the typical number of responses across the sample. In order to answer RQ3 the communication behavior displayed in discussions with 10 or more answers

was analyzed at the content level, taking into account the above categories. This was an attempt to examine if and how discussions with a typical number of discussants and those between many discussants differed.

Selection of the sample

In 2016 RG had more than 10 million members from around 193 different countries. The data collection was made in 3/2015 and the numbers listed below relate to that point in time. For practical reasons only a small selection of data could be analyzed. It was not possible to select a representative sample because not all researchers around the world use RG and there was also no detailed statistical information available about the members of RG. Thus, the following rationale was chosen for sample selection.

Based on prior research on gender-related differences in communication and media use (see introduction), gender was explicitly considered in the sampling strategy. Therefore, it was decided to choose one discipline with predominantly men, one with predominantly women and one discipline with a balanced male/female distribution. RG did not offer any information about the distribution of their members in relation to gender and discipline, and so the general statistical reports of DESTATIS, the German Federal Statistical Office (<https://www.destatis.de>) were used as a point of reference. DESTATIS provides freely available statistical information on politics, administration, education, economy, and population in Germany. It should be noted that this statistical information on the distribution of gender and disciplines from universities in Germany provided a rough indicator for the identification of male-dominated, female-dominated and gender-balanced topics, while the selected sample actually consisted of international researchers. This ought to be taken into account when considering the data on gender and discipline.

Based on the official statistics of DESTATIS suitable topics were chosen on RG that also had a sufficiently large number of topic-followers. For these topics the gender distribution reported by DESTATIS (for Germany) was verified against the gender distribution of the first 100 (international) followers of the corresponding topic on RG. It is worth noting at this point that followers on RG are sorted by the date that they first started to follow a topic. Thus, there might be a bias, in the sense that the 100 most recent followers are not fully representative for all followers of the topic.

This process eventually resulted in the identification of the following three disciplines which included a sufficiently large number of questions and followers: the male-dominated topic of electrical engineering (EE) (140938 followers, 1055 questions), the female-dominated topic

of nutrition (NUT) (11831 followers, 284 questions) and the gender-balanced topic of medicine (MED) (396694 followers, 811). The gender distribution within these topics was as follows:

- Male-dominated topic EE: 9 women, 72 men, and 19 unidentified
- Female-dominated topic NUT: 73 women, 36 men, and 1 unidentified
- balanced (male/female) topic MED: 47 women, 51 men, and 2 unidentified.

For the data sample of this study, the first 10 questions of the discussion threads for each of the three topics were selected and the gender and academic status of the researcher who asked the question analyzed. Where the first 10 questions did not include all of the main academic positions (Professor, Postdoc, PhD/postgraduate, and student) and each gender, further questions were added to complete the sample. The final data sample for each of the three topics included questions and discussion threads from both male and female researchers representing each of the academic positions. Therefore, the final sample comprised 43 questions: the first 10 questions of each topic (30 questions) and an additional 13 questions to cover the whole spectrum of academic positions and gender. It is worth noting that on RG the questions are sorted by the date of publication of the question and its answers, or in other words, the first questions represent the most recent discussions. Therefore, the selection of questions might be biased by the date of publication and may not be fully representative of general discussions on ResearchGate.

For the analysis of the profile-sites (RQ1) all questioners' profiles (42) and all respondents' profiles (104) that had been included in the communication analysis were examined. In total, 146 profile-sites were used for the analysis. The resulting data were analyzed in anonymous form to ensure data protection.

For the analysis of short discussions (RQ2) the first three (or less) answers of every discussion thread were examined, as the majority of discussion threads had only three answers (25 questions with 1-3 answers; 11 questions with 4-9 answers and 7 questions with 10 or more answers).

For the analysis of long discussions (RQ3) all questions and answers within the total sample of discussion threads that had received 10 or more answers were examined (7 out of the total sample of 43).

Results

This chapter starts with a description of the sample, followed by a presentation of the results. These are arranged by research question.

Sample description

The final sample comprised of 146 profiles (42 questioners and 104 respondents). Gender and academic position of the sample were not equally distributed (see table 1). The prevailing majority of the sample was male PhD/postgraduates.

TABLE 1. *Questioners / Respondents by Topic and Gender*

	questioners		respondents			all	
<i>topic</i>	female	male	female	male	unidentified	total female	total male
EE	5	10	0	37	0	5	47
MED	8	6	7	27	1	15	33
NUT	7	7	12	23	0	19	30
total	20	23	19	87	1	39	110

N= 150 (data set: communication (with duplicate cases))

In relation to the distribution by topic, the sample comprised of 50 researchers for EE, 49 for NUT, and 49 for MED. Most of the analyzed questioners and respondents within EE were men (5 women, 47 men). The data for MED included 33 women and 15 men, while the data for NUT included 19 women and 30 men. This demonstrates that neither the higher number of women in the field of NUT nor the equal distribution of gender in the field of MED among the followers of these topics were reflected correspondingly in the numbers of questioners and respondents within these topics. Rather in general, men participated more in discussions compared to women – irrespective of the topic. In all three topics, the majority of participants were postgraduate or PhD students (EE 28 of 58; NUT 23 of 49; MED 25 of 49). Looking at country – based on information about the workplace - most of the people contributing to the topic EE were from India (16), while NUT and MED had mainly contributors from the US (NUT: 9; MED: 10).

It is worth noting that the manual extraction of additional discussion threads in relation to academic position and gender had caused a bias in the distribution. Nevertheless, across all topics the respondents were mostly male (87 of 107) postgraduate/PhD students (62 of 107).

Analysis of the profile-sites (RQ1)

The analysis of the profile-sites showed that in general most members were willing to present both their professional data and photos in detail. Most sampled profile owners (143 out of 146) stated their names by forenames and last names starting with capital letters (exceptions: 1 person displayed no name; 1 person abbreviated the forename; 1 person used small letters). Only one person indicated their academic title directly in the name field. All others who stated their title (106) did so in a separate field entitled degree which means that the academic position was only visible on their profile-sites and not in the discussion rooms.

Most of the profile-sites showed a photo of the profile owner (96 men out of 106; 27 women out of 39). Men's photos were more often than women's serious in expression (46 men out of 106; 5 women out of 39) and showing professional clothing (49 men out of 106; 8 women out of 39). In considering the listed activities in the profiles (e.g., number of answers, posted questions, publication uploads etc.), the data showed that predominantly male (102 out of 106) postgraduate (26 out of 30) or PhD students (71 out of 73) answered questions from other users. Also, members followed mainly profiles of males and often those with higher academic positions. Men had on average 89.44 and women 57.03 followers. In relation to academic position, professors had on average 322.33, postdocs 84.70, PhD/postgraduate 55.93, and students 21.00 followers.

Communication patterns in typical short discussions (RQ2)

For the sample of typical discussions, 43 questions were analyzed together with their corresponding first (up to) 3 answers. Overall, the analysis of the communication behavior revealed that predominantly young academics without any prior connection to each other (like follower, same institution etc.) and from varying countries used the network for their scholarly exchanges. In relation to gender, it was mostly men that were active participants. In 14 discussions only men were represented. In EE there were 10 discussions representing only men, in NUT and MED 2 each. Only one discussion in the topic MED had exclusively female participants. In 13 discussions initiated by a woman (i.e., the questioner was a woman) all responses were provided by men (EE 5, MED 3, NUT 5) and in 10 discussions, there was only 1 female among the respondents (EE 0, MED 4, NUT 6).

Language used. An analysis of the language used within discussions showed that the vast majority of participants paid attention to typography. For example, sentences were generally of average or short length (out of 150, 29 were of short and 103 of average length), and 126 out of 150 sentences displayed correct orthography. Most participants used at least one technical term (121 out of 150) and any abbreviations used were on a technical rather than colloquial basis. Moreover, it was common for participants to integrate or attach links, documents or graphics (37 of 150). These attachments were then acknowledged and discussed by the other respondents. Highlighting in the form of bold characters or underlining was used only as an exception (underlining: 2 out of 150; bold 3 out of 150) and 107 out of 150 participants did not use any paragraphs to emphasize and structure their content.

Response times were mostly very short. 62 out of 150 people replied within zero to two days and out of those 23 answered on the same day. Questions were on average five lines long ($M = 4.95$, $SD = 4.37$, $MAX = 18$ lines) and the respondents answered with an average of seven lines ($M = 7.45$, $SD = 9.92$, $MAX = 85$). In general, men formulated longer answers ($M = 7.92$) than women ($M = 5.42$) and postdocs gave the longest answers overall ($M = 11.77$ for postdocs; $M = 6.78$ for profs; $M = 6.23$ for PhDs; $M = 6.25$ for students).

Salutations and academic positions. An analysis of salutations in relation to the academic position showed that 116 out of 150 people used no form of salutation. This means that both the vast majority of questions and answers included no welcome phrase. Only PhD/postgraduate students sometimes used a polite salutation (6 out of 76). Also, most people did not write any farewells at the end of their posts (no farewell in 133 out of 150 cases). Again, only the PhD/postgraduate students sometimes used a farewell (12 out of 76 used farewells). Furthermore, the expressions used were mostly very formal and professional (133 out of 150 used professional language). Only a small number of participants (10 out of 150) used colloquial language (e.g., 'It works very well. It's easy to use also...', 'try it on'). Polite expressions such as 'please' (10 out of 150) and 'thank you' (6 out of 150) were used only occasionally. Furthermore, the downvote function was used only once, to express a negative rating for a question). In contrast, participants used the upvote function much more frequently: 13 upvotes for questions and 49 for answers (62 upvotes in total).

Emotional phrases. In general, the discussions comprised of no or only minor emotional phrases. Only six out of 150 people used written intonations through the use of capital letters (e.g., ACTIVITY). An emoticon was used just once ('And here is a file itself

:)))') and overall, only four emotional expressions could be found (e.g., 'Happy to discuss further'/'Great +best of luck').

Summary on communication patterns of typical (short) discussions. In summary, the communication patterns of discussions with a typical length were characterized by short response times, an objective, professional and unemotional choice of words, correct notation, and an infrequent use of technical terms. Furthermore, most of the analyzed participants did not use (polite) salutation or farewell words to begin or end their posts.

Analysis of long discussions (RQ3)

In order to answer this question, all discussions in the sample that included 10 or more answers were examined. This applied to 7 discussions. 3 came from the topic of MED and 2 each from the topics of NUT and EE. The largest number of answers (up to 48) came from a discussion in MED. The smallest number was 11 and came from NUT. In total, all 7 discussions included 112 respondents, 7 questioners, and 164 answers. With only one exception, all long discussions were initiated by a woman. Yet, the respondents were mainly men (80 men, 30 women, and 2 unidentified out of 112). Overall, their academic status was mostly doctoral degrees (43). PhD/postgraduate students (32), professors (22), and students (15) made up only a small proportion of respondents. On average, response times were very short (0 to 2 days). Participants used more emotional words (in 6 answers; e.g., 'happy'), written intonations (in 8 answers; e.g., 'ACTIVITY'), and exclamations (in 12 answers; e.g., Good point!) in the long discussions. Furthermore, they expressed some personal concern (in 19 answers; e.g., 'Hope this helps'), encouragement (in 11 answers; e.g., 'Good Luck'), and enthusiasm for the subject (in 16 answers; e.g., 'Works great!'). Respondents chose simple salutations like 'hi' or the forename (in 17 answers) but in general no (polite/formal) salutations such as Sir/Madame or the academic title were used. This colloquial form of salutation contrasted with the objective, professionally formulated content. Participants used academic titles explicitly only once in an intense and critical debate. Moreover, in the long communications it was also observed that positive reactions were more openly expressed in the form of compliments (in 12 answers; e.g., 'There are so many excellent Answers') and through the use of RG's upvote function (in total 125 upvotes in 7 discussions). Negative feedback was expressed through constructive criticism or questions (in 3 answers; e.g., 'Your Question is a bit inexact and misses context') and through 8 downvotes. Overall, the participants used noticeably more upvotes.. Some of these (22 in total - 18 men, 4 women)

were passive observers (i.e., not active questioners or respondents) who just upvoted questions and/or answers. 27 active participants also made use of upvotes (15 men, 12 women), all of which were PhDs/postgraduates. In some cases, even content with incorrect spelling got upvotes (7). The anonymous downvote function was harshly criticized by one discussant ('I think the 'Downvote' is a means to throw a rock and hide the hand; an innocent game for stupid people'). Most often it was the questions that got downvotes (5 out of 8 downvotes were for questions). In general, mostly men of higher academic positions (7 men and 2 women; 3 professors and 5 postdocs) expressed negative feedback (textual 3; downvotes 8).

Overall, there was a noticeable difference in communication patterns for long discussions and those for discussions of average length. In general, long discussions exhibited more rapport between participants characterized by positive/negative statements, criticism, enthusiasm and personal concern regarding others' answers or questions. In addition, more colloquial language and phrases expressing emotions could be observed.

Conclusion

Summary and discussion of findings

The findings of the pre-analysis of the frame conditions showed that the registration process for RG generated a predefined rough structure for self-presentation (without any space for private information) and was aimed at a selection of people with academic backgrounds. RG therefore represented a specific communications goal and addressed a specific target group of academics. When comparing the empirical results on users' profile-sites and communication patterns with the explicit rules of RG's Q&A guidelines it was remarkable to find that within the scrutinized discussions these guidelines were indeed adhered to. This indicates that the written rules provided by RG influence actual communication behavior. This can be interpreted to mean that the written rules provided by RG were interpreted by RG users as injunctive norms (perceptions about an appropriate behavior) and in turn influenced the formation of collective norms (actual prevalence of the focal behavior).

The analysis of the users' profile-sites suggested that, in general, most members made use of the option to present their professional data (academic skills and papers) and photos in detail. What seemed remarkable, was that many profile-sites showed photos in a private context or

wearing non-business attire. Women were more likely to use such pictures than men. Also, the academic title received little attention. These findings could be interpreted as indications for a less formal hierarchical structure than is usual in traditional academic environments.

Our general findings on the active questioners and respondents of discussion threads confirm the findings by Fries (2014) and Jordan (2014, 2017) that young academics take advantages of the more open, democratic and less hierarchical structures and possibilities to establish contacts. Another interesting finding was that no noticeable correlation between communication patterns and academic status could be observed. This differs from both the findings by Knight and Masselink (2008) and Khani and Darabi (2014) who found a significant relationship between educational level and disregarding communication rules (e.g., poorly written text) and those by Dino et al. (2009) who argued that low status communicants wrote more conforming and agreeing texts and used more affective words and exclamation marks.

Furthermore, the findings revealed that predominantly young academics without previous connections to each other used the network for their scholarly exchange. This is in line with a study by Alheyasat (2015). Yet, Alheyasat found many questions without answers, which was not true for this study. This may be due to the way that RG sorts questions by date of publication of the question and its corresponding answers. For the sample the first displayed discussion threads were analyzed. Questions with no answer would have been likely to be sorted into a lower position as they were overtaken by other questions (even if they were older) that showed recent activity. Due to this mechanism, questions without answers would only stay at the top of the listed questions for a very short time and would therefore not have been as likely to be included in our data sample.

The identified general communication patterns of discussions of typical length were characterized by short response times, an objective, professional, unemotional choice of words, correct notation, and a moderate use of technical terms. However, there was no obvious connection between rapid answering and the disregard of orthography and choice of words. Remarkably, most of the participants did not use polite salutations or farewell words to begin or end their posts. The use of 'please' and 'thank you' was also rare. This could lead to the assumption that politeness is not an important communications factor in this academic network. However, the professional, formal wording, as well as the correct spelling could be interpreted as indicators for respectful behavior towards other participants.

In the data sample, most of the discussions included only two to three participants who provided answers. These frequently did not refer to what was said in previous answers. This could be interpreted as either multiple confirmation of an expert's opinion or as a lack of mutual communication or as a reduction in social interaction. In connection with RG's reward system in the form of an RG score this might indicate that the motivation to answer questions is at least partly based on the intention to generate higher values on RG in order to strengthen the individual's reputation. This interpretation is in line with the findings by Orduna-Malea, Martín-Martín, Thelwall, and Delgado López-Cózar (2017) that RG scores mainly reflect activity generated by asking and answering questions and therefore should not be used as an indicator of academic reputation.

An interesting change of the communication patterns was detected in relation to the length of discussions. The long discussions exhibited increased mutual interaction in form of coherent answers, colloquial language, emotional phrases and compliments. Furthermore, in the long communications positive reactions were more openly expressed through compliments and using the upvote function of RG. Even contributions with incorrect spelling got positive feedback in the form of upvotes. Similarly, negative feedback was expressed through constructive criticism or questions but not through downvotes. This changed pattern may indicate that in longer discussions the motivation for providing answers is based more on the intention of exchanging scientific knowledge and less focussed on increasing reputational values. It may also suggest that long discussions with more interactions create a kind of group feeling or a feeling of connectedness.

In relation to gender-related differences, it became apparent that in all areas men provided more detailed information and were overall more active, for example in answering questions. On average, they also had more followers than women. This is in line with the findings of Fogel & Nehmad (2009) who found that in private social networks men had more 'friends' added to their profile sites than women. Another remarkable finding of this investigation was that the active participants were mostly men, even in female-dominated topics. Thereby, our findings on RG (as a use case representing ASNSs) differ from prior findings on private social networks which showed that women tended to write more messages than men (Fogel & Nehmad, 2009). In addition, we could not find any indications for less politeness used by men as Jessmer and Anderson (2001), Kaul (2010), and Khani and Darabi (2014) had described for private social networks. Also, we could not report on a general difference of a feminine/masculine communication style (Fox et al., 2007; Kennedy et al., 2003). However, in the long discussion, more men posted critical statements or gave negative downvotes than

women. This is similar to Guiller's and Durndella's (2007) results who found that men made more negative comments than women.

Practical recommendations

The findings from this study have not only provided interesting scientific insights into communication behavior on ASNSs but also practical information beyond the explicit Q&A guidelines of RG. Out of the findings the following communication recommendations can be derived.

In order to improve relationships in online academic interactions, to foster inclusiveness of gender and culture and to reduce insecurity in matters of communication, presentation, and the exchange of scientific data, for contributions on ASNSs academics should consider ensuring that ...

- ... questions and answers consist of scientific content
- ... objective, professional language and content are used
- ... interaction with other participants is respectful
- ... attached graphics, links, and documents have a high scientific quality and respect privacy
- ... positive evaluation functions are used for general appreciation and open communication, as well as feedback for explicit recognition
- ... (anonymous) negative evaluation functions only be used in conjunction with constructive and openly expressed criticism
- ... all academics are welcome to the discussions – regardless of their hierarchical status

Limitations and Outlook

As mentioned in the introduction, this study provides first explorative insights into the communication behavior and self-presentation (in the sense of collective norms) of academics on ASNSs. However, there are limitations regarding the generalizability of our findings.

Firstly, the findings are based solely on RG as a popular use case. It remains a question to what extent these findings can be applied to other academic or work-related online networks in particular if they use different functionality. Secondly, cultural aspects were also not taken into account, even though they may prove key to understanding the phenomena of communication conventions in depth.

Furthermore, it is possible that the results are not representative of each of the chosen scientific topics in its entirety. The sample was selected according to the most recent discussions and the most recent followers of a topic. Therefore, the findings may be biased in reflecting the particular communication behavior at the date of data assessment and which may have changed over the years or at least since the establishment of RG, this is in fact likely as functionality on RG continuously changes and evolves. In addition, the activity of RG members may also change over time.

It is our recommendation that future research focus on a more systematic analysis of communication and self-presentation behaviors in relation to academic position, gender, and discipline. Furthermore, systematic comparisons of different cultures (e.g., Western versus Asian) would be helpful, including differences between native and non-native speakers. First insights into these differences in general interactions between students and professors are given by studies of Nia and Marandi (2014) and Biesenbach-Lucas (2007). They described a significant lack of knowledge about social online norms among the non-native speakers (Nia & Marandi, 2014) and found that native speakers expressed more politeness towards their professors than non-native speakers (Biesenbach-Lucas, 2007). In the context of ASNSs it would be useful to understand if the prescribed use of the English language by all users provides a common basis and helps to overcome cultural differences, or if instead it generates cultural misunderstandings and difficulties.

In general, communication behavior depends on various cultural influences, such as anonymity, copyright, data protection and different languages or legal systems. Interculturally agreed conventions, regulations, and manners for the use of ASNSs could provide a common basis, potentially leading to an increase in online publications and exchanges of academics worldwide. It is therefore our conclusion that it would be advantageous to develop general, intercultural, worldwide academic communication conventions in the form of injunctive norms describing an appropriate behavior. It is thought that these conventions should also include aspects of engagement, responsibility, tolerance, reliability, honesty and helpfulness in order to reduce insecurity in matters of communication, presentation, and the exchange of scientific data.. .

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