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Facebook and mathematics teachers' professional development: Informing our community

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Nowadays, communication and cooperation on social network sites, such as Facebook, have become common. These kinds of sites are also used within teachers' professional development, both in formal and informal ways, as they create and form new opportunities to communicate and cooperate. In this paper, our aim is to discuss how mathematics teachers' informal participation in social network sites can inform the mathematics education research community.

Keywords: Professional development, social network sites, Facebook, mathematics teacher.

INTRODUCTION

It is well known that the present evolution of social media and social network sites transforms how people communicate, interact, and work together. Teachers use these different forums, such as: web sites, personal blogs, twitter or Facebook as resources in terms of networking, give and take advice and lesson plans, etc., for mutual benefit in their professional development (Manca & Ranieri, 2014). This is an informal professional development initiated and formed by the teachers themselves (Bissessar, 2014; Liljekvist, 2014).

Each forum serves different purposes: websites are often one-way communication and serve to inform others and share ideas¹. Such ideas can be lesson plans; hence websites where teachers upload their own planning documents to be shared with other teachers

occur (e.g., www.lektion.se). There are websites initiated by a municipality (e.g., www.pedagogvarmland.se), where active teachers, for instance, comment on pedagogical debates, or notify on-going developmental work. Furthermore there are teachers' personal websites where they gather materials of interest, such as lesson plans, but even research articles or links to other interesting web sites. (e.g., mattefroken.wordpress.com). Another form is the blog; some teachers have started blogs merely focused on their personal reflection in relation to their profession. 'Blogging' can be incorporated within a teaching position; for instance, one of the head teachers in a municipality can be responsible to share pedagogical ideas, etc. through a blog (e.g., <http://pedagogstockholmblogg.se/vara-blogger/>).

All of these media are mostly a one-way communication – a monolog. However, other media offer the possibility for (instant) dialogue. The micro blog Twitter is one such way, where comments on events and actualities are given and shared with followers. Another dialogic resource is social community sites, such as Facebook. Teachers in Sweden have started to use this resource to a great extent in the past year. Facebook offers the opportunity to comment and to share, like twitter and other websites, but it also offers the 'members' to ask questions and to get response from other members. Thus the members themselves activate pedagogical discussions on mathematics teaching and learning. This differs from how more monologue Internet resources work. In the next section a brief overview of the situation in Sweden will be given – regarding the use of Facebook by teachers.

1 The examples given in this paper are taken from a Swedish context. However, the phenomenon of Social network sites is not limited to merely Sweden, therefore the examples can be generalized.

Teachers' professional development

In a review of research on teachers learning from teachers, White, Jaworski, Agudelo-Valderrama and Goya (2013) find that there is a complexity of settings in which teachers learn. The complexity is "influenced by both global and local forces, such as the recent pressure on teachers to meet different demands imposed on them [...] directly by politicians and national laws" (p. 421). There is interdependence between the institutional context and the teachers themselves as learners. Thus: even if practicing teachers need to change their teaching because of external reforms, it can be difficult to integrate reform practices due to institutional and social expectations (Nickerson, 2008).

White and colleagues (2013) show that the relationships between the support given (e.g., by expert/experienced teachers, teacher educators, research/researchers) and the supportee (e.g., the individual teacher, a group of teachers) can be of different kinds, such as teacher educators as guides, teachers and researchers working together, or teachers working together to design their own developmental activities. White and colleagues point out the similarities and differences between the knowledge that teachers and teacher educators/researchers respectively bring to the learning interface. They state: "neither group had all the knowledge that was needed for the development of teaching, but working together they could become a unified, powerful developmental force" (p. 422). Mutual respect and collaboration that allow the input of critical elements of knowledge, by teacher educators, colleagues etc., are found to be valuable to developmental practice and hence deepening their pedagogical content knowledge. In a review of teacher education Leder (2008) put forward the core factors of 'community building' and 'networking' as a means for in-service teachers' out-of-class meetings. She continues:

Providing time out of class for meetings and involving academics to supplement the expertise within the group, for example, to add a stronger research dimension to the network's activities, have also been found to be facilitative, if not critical. (p. 361)

Nevertheless, White and colleagues (2013) stress that teachers' knowledge is pre-eminent in the in-school situations, and researchers and teacher educators have "much to learn about issues that influence what

can happen in schools, and what is needed to put research-based knowledge into practice" (p. 422). As social network sites can be seen as such out-of-class meetings, a systematic study of social network sites will give the opportunity to look at the factors and issues of importance.

Social network sites

Bechmann and Lomborg (2012) describe three characteristics that define social network sites: 1) the communication is de-institutionalised, as each user has the ability to contribute, filter and share content, 2) the user is thus seen as both producer and participant, and 3) the shifting roles and communicative practice of the users can be described as interactive and networked.

Social network sites are widely used in Sweden; for instance, 50% of the inhabitants actively use Facebook every day (Findahl, 2013), although boyd² and Ellison in 2007 conclude that "...[social network sites] are primarily organised around people, not interests... structured as personal (or 'egocentric') networks with the individual in centre" (2007, p. 219). However, the rapid evolution of the Internet allows us now to see groups formed around a theme, and it is noteworthy that special groups for the issues of teaching and learning have been created on Facebook (see e.g., Bissessar, 2014; Ranieri, Manca, & Fini, 2012; Rutherford, 2010). Facebook offers the opportunity to comment and to share, as with Twitter and other websites, but it also offers the 'members' to ask questions and to get responses from others (henceforth: *posts and comments*). Thus the teachers themselves can activate pedagogical discussions of teaching and learning. This differs from how more monologue Internet resources work, such as blogs or web sites. Rutherford (2010) concludes that "Facebook provides teachers with an opportunity to engage in informal professional development that is participant driven, practical, collaborative" (p. 60).

Social network sites can be viewed as emerging communities of practice (Goodyear, Casey, & Kirk, 2014; Gunawardena et al., 2009). For example, some of the Facebook groups are specialised for mathematics teachers (e.g., "Mathematics course 2b for upper secondary school"; "Mathematics for lower primary school"). Other groups are gathered around more gen-

2 Note: danah boyd spells her name with lowercase letters.

eral themes in education (e.g., “The big five”; “Ipad in school”). Narrow thematic themes can have very few members, such as “Mathematics for course 2b in upper secondary school” with only about 60 members. Not surprisingly, more generic themes attract more teachers; hence the group “Mathematics for lower primary school” has 4 500 members. Generic themes that are interesting to all Swedish teachers can consist of groups of up to 20 000 members. Findings from various educational settings reveal how social network sites used as professional resources are not an isolated phenomenon and that the impact of social network sites on professional development varies (see e.g., Bissessar, 2014; Borbra & Llinares, 2012; Liljekvist, 2014; Manca & Ranieri, 2014; Pepin, Gueudet, & Trouche, 2013; Rutherford, 2010). However, Leder (2008) problematizes the tension between recognising results from particular studies and the wish to generalise the findings to broader settings. She calls for studies on whether, and when, interventions from professional development programs remain more permanently. She reflects on how the possibilities and the accessibilities of ICT are “opening new pathways for professional development with their own – often yet not fully realized – fresh strengths and challenges” (p. 368).

Some studies have been made of Facebook groups and teachers' professional development. One study investigated five Italian Facebook groups and focused on the motivation, activity level and outcome (Ranieri et al., 2012). This study gives valuable information about and insight into teachers' concerns and teachers' behaviour in the groups. Bissessar (2014) sees in her study that the teachers address issues on curriculum, and didactical and pedagogical concerns, but we need more studies to examine the extent to which critical discussions occur.

Aim of the paper

In this paper, we want to introduce a discussion in order to problematize some aspects when conducting a study in social network sites (in this paper: Facebook), and discuss how these kinds of studies can inform the TWG community on, for instance, how it influence teachers' practice. Webster-Wright (2009) points out in her review of research informing professional development practice that

There is a need for more research beyond the ‘development of professionals’ that investigate

the ‘experience of PL’ [professional learning] as constructed and embedded in authentic professional practice. (pp. 712–713)

She calls for research understanding more about the experience of professional learning – to support it more effectively; rather than just developing professional development programs. In teachers' social network sites, such as Facebook groups, we might find such an environment. In the following pages, we will outline some possible directions for our coming research on social network sites. We propose, with departure in our pilot study and literature review, three possible foci for further research into this new phenomenon: 1) mapping the arena, 2) inquiry into the collective knowledge created, and 3) consider the social network sites as extended working place learning. Our aim is to converge the discussion on the question: In what way can mathematics teachers' use of, for instance, Facebook inform the mathematics education research community?

SUGGESTION 1: MAPPING THE ARENA.

Some attempts have been made to map the arena of Facebook groups and professional development. One such study investigated five Italian Facebook groups and focussed on the motivation, activity level and outcome (Ranieri, Manca, & Fini, 2012). Such a map might be of interest concerning the Swedish Facebook groups as well giving valuable information and insights in teachers concerns and teachers behaviour within the groups. Two aspects are suggested to map: facts and professional development issues.

Facts

Concerning the facts: Statistics can be obtained on the fluctuation of the number of members in the groups. A relevant question to look at would be when people become a member, if that is related to specific timeslots in the year, or special events (e.g., yearly events, or more specific as launching new curricular goals). Statistics can also reveal when people are most active, what time of day for instance. This could shed a light on in what way Facebook is experienced as a formal or informal way of professionalization. One could argue for the idea that teachers, who are active on Facebook during working hours, look upon this phenomenon as a formal way of professionalization. Teachers who only are active during after-working-hours might

look upon these Facebook groups as informal ways of professionalization.

A questionnaire posted on the site would give some first indications on the motives for joining the Facebook group, but also expectations of what teachers expect to gain from participation in the specific Facebook group. Members in this group could be contacted to conduct interviews in order to gain deeper insights in their motives and expectations of membership within the group. A strategic choice of members should be made: for instance new members, active members in responding to posts, or active members in posting a status, etc.

Questions to be asked will be of the kind: 'why did you chose to join the group', 'when do you decide to post a question within this group', 'what kind of questions do you post', 'what kind of questions do you respond to?', 'what kind of topics do you discuss' etc.

Professional development "issues"

A pilot study revealed that different types of questions appear in the groups at different time during the year. For instance, at the beginning of the school year a common post would be to ask for help with a good starting exercise for the beginning of the semester. Just before the summer holiday, a lot of teachers posted questions about textbooks – often explained by the motive that they were about to change textbooks and needed advice on qualities in different items. Prior to public holidays, questions were asked about suitable exercises for 'Easter', or 'Christmas', etc. Hence, the teachers' pedagogical considerations, as they differ over the year, can be studied more in detail. This informs teacher educators and professional development programs in terms of when to address specific topics or support teachers.

Furthermore, our pilot study revealed that different groups address different types of questions. For instance, one of the Facebook groups has a focus on discussing relevant and interesting research papers. All posts in that group concern either the choice/argumentation for a specific paper, or the content of the chosen paper. This indicates teachers' diverse conditions (e.g., depending on school level, topic, etc.) and what kind of support specific groups of teachers need.

As the description of TWG18 says, research has focussed on "topics like reflection, collaboration, or

teachers' professional growth. In particular, models and programmes of professional development, as well as their respective contents, methods, and impacts were described and analysed" (Call TWG18, CERME9). With Facebook being another kind of arena: teachers' social network sites, to 'map' this new phenomenon inform the community of professional development of mathematics teachers on new reflections, collaboration and professional growth.

Mapping the arena is of importance as the discussion at CERME9 revealed that Swedish Facebook groups might differ from Facebook groups in other countries concerning the norms within a group. As we described a positive open non-anonymous atmosphere in the groups, other participants of TW18 at CERME9 described similar groups in other countries as hostile, with anonymous members, and a focus on complains.

Nevertheless, however interesting mapping the arena might be, more information is 'hidden' in the Facebook groups that could inform the community of professional development of mathematics teachers. Besides mapping the arena, two more suggestions are of interest. We don't suggest that further research consist of merely one of our suggestions, nor that is the only possible ways to conduct research. Mapping the arena probably is a prerequisite for the following two suggestions, starting with an inquiry of the collective knowledge in Facebook groups.

SUGGESTION 2: INQUIRY INTO COLLECTIVE KNOWLEDGE

Some studies have looked at single posts within specific Facebook groups. Rutherford (2010), for instance, has looked at one Canadian Facebook group, and categorized each posts in this group according to Shulmans' categorization of teachers knowledge. To continue on such categorization, we suggest going further than the individual posts, and hence look upon each Facebook group as a whole to make an inquiry in the collective knowledge. Facebook can be looked upon one of the emerging communities of practice (Goodyear, Casey, & Kirk, 2014; Gunawardena et al., 2009).

To do so, one could categorize all posts in a similar way as Rutherford did, but with the difference not to distinct each post, but to look upon the results as an indicator for the collective knowledge of the com-

munity of teachers in the specific Facebook group. Previous studies have looked at discussions where they have taken out single posts, meaning: if a question was posted and nobody responded, that question was not taken into consideration for data analysis (Rutherford, 2010). However, once teachers can formulate their questions, they have reflected upon their own teaching knowledge. Therefore, we argue, that both the questions posted and the reactions from the group show us the collective knowledge, expressed through the members' communication – including single posts. Again it is of importance to point out that the norms in the groups influence such collective knowledge and this might be different in different cultural settings as expressed by the TW18 at CERME9.

In the previous example, Shulman's categorisation was used to analyse the data. Different frameworks have described the knowledge needed for teaching mathematics (cf. Ball, Phelps, & Thames, 2008; Huckstep, Rowland, & Thwaites, 2003; Niss, 2004; Shulman, 1987). All of these have their own specifics (See Kaarstein, 2014, for an extended comparison of three of such frameworks) and hence, one of these could serve as a framework for analysis for posts within each Facebook group. Yet another option could be to analyse the mathematical content of the posts and focus on the mathematical topics addressed, including possible references to competencies (Niss, 2003) or proficiencies (National Research Council, 2001). The Swedish curriculum has changed recently and the pupils' possibilities to develop five competencies are the overarching principles in the current curriculum (Swedish National Agency for Education, 2011). Within Facebook groups for mathematics teachers at primary school, questions concerning the five competencies arise frequently. There is also one generic Facebook group 'The big five', aiming at teachers of all subjects.

This second suggestion, we believe, would inform the community of professional development of mathematics teachers via an explanation of the collective knowledge made in the groups, concerning the mathematical content as well as the knowledge needed for teaching mathematics.

SUGGESTION 3: EXTENDED WORKPLACE LEARNING

In the previous suggestions the attention has been on activity and on what kind of knowledge created in the Facebook groups of mathematics teachers. However, it can also be worthwhile to investigate how this knowledge is constituted. Social media and social network sites are, as we all know, used in professional development programs (for instance, 'Mathematical Boost', matematiklyftet.skolverket.se). In this paper, we want to discuss social network sites as an informal part of mathematics teachers' professional development; we suggest approaching social network sites as an arena for extended workplace learning. Professional development programs are culturally bounded and the Mathematical Boost is one such program that locally can influence in what way teachers look upon their extended workplace. Comments from TW18 at CERME9 implied that a detailed description of such programs is necessary in order to be able to clarify cause and effect.

Borko (2004) points out that teachers' discussions on work-related issues tend to be on a surface level, such as discussing ideas or materials; and that it takes support to foster critical discussions on teaching. She states that teachers need to "collectively explore ways of improving their teaching and support one another" (Borko, 2004, p. 7) in order to develop their teaching. Thus communication norms enabling a critical dialogue need to be established and maintained. In a study of Facebook groups it would be possible to study such communication practices, and examine to what extent these kinds of communication norms occur. Moreover, as we know the development of teacher communities is difficult and time-consuming (see e.g., Grossman, Wineburg, & Woolworth, 2001) are Facebook groups a way for teachers to foster such discussions – despite its instantaneous format and more or less loose gathered groups?

For instance, Bissessar (2014) sees in her study that the teachers address issues on curriculum, didactical and pedagogical concerns, but we need more studies to examine to what extent critical discussions occur. That is, does the informal arena of social network site nurture workplace learning? Can we see communication patterns changing due to changes in, for instance, curriculum, or due to impact of formal professional development programs? One way of looking at this

informal arena would be via inquiry as a developmental tool in a community of practice, as described in Goodchild (2014).

Webster-Wright (2009) thinks it is a lack in research designs in professional development programs. She states that it is necessary for us to learn from teachers' authentic learning situations: "To gain further insights to enhance support for professionals as they learn, there is a need to understand more about how professionals continue learning through their working lives" (Webster-Wright, 2009, p. 404). We believe that studying; for instance, Facebook groups can help our community understand more, since it is a situated digital, hence extended workplace for the teachers.

ETHICAL CONSIDERATIONS

Although it is not the main focus of the discussion of TWG18, we need to address some aspects of ethical concern when conducting research on social network sites. Normally in a classroom the observer might influence the practice, and now a new question arise: in what way does the presence of researching members in groups influence the group?

This is not merely a methodological question; the blurred distinction between the private and the public in social network sites must also be considered (Bryman, 2008).

SUMMARY

In this paper, we have introduced a discussion continued at CERME9 in the Thematic Working Group 18 in order to problematize some aspects when conducting a study in social network sites. We proposed three possible foci for further research into this new phenomenon: 1) mapping the arena, 2) inquiry into the collective knowledge created, and 3) consider the social network sites as extended working place learning. Our aim was to converge the discussion on the question: In what way can mathematics teachers' use of, for instance, Facebook inform the mathematics education research community concerning mathematics teachers' professional development? Regarding issues of teaching and learning mathematics in social network sites, the uniqueness of the Swedish Facebook groups should be taken into account where an open, positive climate describes the conversations in these groups.

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