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To cite this article: Yvonne Elisabeth Liljekvist, Ann-Christin Randahl, Jorryt van Bommel & Christina Olin-Scheller (2021) Facebook for Professional Development: Pedagogical Content Knowledge in the Centre of Teachers’ Online Communities, Scandinavian Journal of Educational Research, 65:5, 723-735, DOI: 10.1080/00313831.2020.1754900

To link to this article: https://doi.org/10.1080/00313831.2020.1754900
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ABSTRACT
As teachers’ informal professional development is visible in social media, this study probes teachers’ participation in self-organized Facebook groups in mathematics or Swedish-language education. In total, 553 posts from six Facebook groups were categorized using Shulman’s knowledge-base framework, and analysed using systemic functional grammar. Teachers use “questions” and “offers” most frequently (88%). Within these speech functions, pedagogical content knowledge dominates (63%), indicating that these groups constitute professional learning communities that teachers use as a professional development resource, focusing the interaction on pedagogical content knowledge. This study finds a largely similar practice in Facebook groups across the two subjects.

ARTICLE HISTORY
Received 2 September 2018
Accepted 2 April 2020

KEYWORDS
Knowledge base for teaching; professional development; social media; speech functions

Introduction
This article discusses teachers’ professional approach to engaging in teacher collaboration and professional development. We are interested in teachers’ participation in a specific type of Facebook group, namely self-organized teacher interest groups addressing subject-specific teaching and learning. Talbert (2010) emphasizes that participating in professional networks of collaboration and development entails creating an environment of trust and risk-taking, as well as upholding a culture of sharing successes and strategies. This atmosphere of open practice and professional reliance is also emphasized in the review by Vescio et al. (2008). School culture, however, arises in both formal and informal environments (Little, 2002), where teachers’ professional networks today are also extended into social media (e.g., Liljekvist et al., 2017). Social network sites, such as Facebook, allow teachers to form groups or contribute and share content via a non-bureaucratic, peer-to-peer approach to professional development. Hence, the evolution of social media has prompted inquiry into how teachers construct their own professional development.

When Rutherford (2010) studied how a group of teachers from Ontario used Facebook to share knowledge, she concluded that “Facebook provides teachers with an opportunity to engage in informal professional development that is participant driven, practical, collaborative” (p. 60). By taking Shulman’s (1987) knowledge-based framework as a point of departure, she illustrates how the teachers had agency over their own professional development. Rutherford (2010) shows that the teachers discussed issues in relation to their practice, and that the content of the discussions had...
potential to improve their teaching. Now, some years later, we know that teachers frequently use various forums, such as websites, personal blogs, Twitter, and Facebook, as resources for networking, sharing knowledge, giving and receiving advice, sharing and discussing curricular material, etc. (e.g., Bergviken Rensfeldt et al., 2018; Bissessar, 2014; Manca & Ranieri, 2014; Murugaiah et al., 2012). This illuminates the evolving role of teachers as both users and designers of teaching resources (Liljekvist, 2016; Pepin et al., 2013; Ruthven, 2016). Therefore, in this study we focus on content and structure in the teacher-teacher interaction in the self-organized groups.

Several studies show that teachers use social media to go beyond their school community in order to develop professional knowledge (e.g., Bissessar, 2014; Macià & García, 2016; Tour, 2017). Teachers use it as a learning space (e.g., Patahuddin & Logan, 2015), and a space for giving and receiving social support (e.g., Rashid et al., 2016). In her study of a Trinidadian Facebook group with 4 895 teacher members, Bissessar (2014) described how the group promoted professional development by providing curricular resources as well as a “place” for mentoring, social support, and collaboration. Patahuddin and Logan (2015) studied how several Facebook groups in Indonesia served as a community of practice, with a specific focus on how a math task was commented on and “liked”. They demonstrate how the community used and developed the task, illustrating the development of a shared repertoire. Rashid et al. (2016) learned from studying teachers interacting in Facebook groups that this engagement provided social support, helping the teachers reflect on their practice and cope with the day-to-day challenges at their schools. Lantz-Andersson et al. (2017) described how teachers’ discussions in one self-organized Facebook group may lead to professional development. Social network sites, such as Facebook, can hence be viewed as “places” where professional development occurs (Goodyear et al., 2014; Gunawardena et al., 2009). Taken together, this means that teachers’ formal and informal professional development in their local schools is intertwined with the nationwide online communities in which they participate.

Earlier studies have shown that teachers, to a large extent, participate in online communities both while working as well as during their free time (see, e.g., Bergviken Rensfeldt et al., 2018; van Bommel & Liljekvist, 2016). This raises the question of what benefits teachers receive from their engagement. The aim in this study is therefore to examine self-organized groups as resources for professional development by focusing on the knowledge shared, the activity level and the type of activity.

According to Little (2002), exploring the significance of teachers’ professional communities, also in informal settings, directs attention to three considerations: (1) the representations of practice (e.g., how school practices become known and shared in the context of daily work); (2) the practice orientation (e.g., whether or not the teacher community improves teaching, and how this interaction advances or impedes teacher learning); and (3) the interaction norms (e.g., how participation and interaction are organized, and how this organization supports teacher learning and practice reform). These characteristics were also considered in a review of research into professional learning communities (PLCs) by Stoll et al. (2006). They found that shared values and vision, collective responsibility, reflective professional inquiry, and collaboration are important features of PLCs, as is the promotion of group and individual learning. This is a matter of going beyond communities of practice (Lave & Wenger, 1991), in which participants engage in a culture of practice, incrementally grasping and making sense of practice and gradually creating a PLC (Stoll et al., 2006) in which peers jointly develop their work. Stoll and Louis (2007) considered who PLC members are, asking whether they are just the teachers in the local school. They discuss membership in relation to the knowledge base needed to meet the challenges of teaching. At a systemic level, for example, they note the need to extend PLCs between and beyond schools to access more knowledge.

The subject being taught is at the very core of teachers’ work (e.g., Kansanen & Meri, 1999; Shulman, 1987). Subject-specific topics in an online teacher community may therefore indicate a higher potential for professional development, and the subject-specific theme of some of the teacher self-organized Facebook groups make them particularly interesting to study. This study addresses the following questions: What parts of the subject-specific teaching practice are made visible in Facebook
interactions? What do teachers want to accomplish when posting in a Facebook group? How can teachers’ interactional patterns permit or preclude knowledge sharing?

The present study examines six large Facebook groups (>2,000 members each) formed and maintained by teachers with themes connected to mathematics or Swedish-language education. These subjects are taught in all grades, so a substantial part of the teacher population in Sweden is likely to be engaged in these groups. Participation in such Facebook groups is a local phenomenon. However, participation in online communities is a global phenomenon: teachers worldwide are using social media as a professional development resource (see, e.g., Bissessar, 2014; Patahuddin & Logan, 2015; Ranieri et al., 2012; Tour, 2017). Hence, the study is relevant for the international field of educational research. By investigating the teachers’ interactions on social network sites, it is possible to inform the field regarding teachers’ self-organized professional development.

Analytical Framework

In studying social media as a place for teachers’ professional development, we investigated Facebook groups formed and maintained by teachers. In doing so, we wanted to identify signs of a professional approach (Talbert, 2010) in these communities. There is a lack of in-depth studies of interactional patterns in Facebook groups (Tran & Ngo, 2018). Due to Facebook’s construction with posts and comments, language (in a broad sense) is used to initiate exchanges in all conversations, for giving and demanding information, goods, and services. Tran and Ngo’s study demonstrates that the framework of systemic functional grammar (see, e.g., Halliday & Matthiessen, 2013) can be used for analysing data collected in social media. In this study we analyse the interaction of these groups within the framework of systemic functional grammar in order to understand how practices become known and shared. This analytical step made it possible to focus on how the teacher-groups “produce or support instructional improvement” (Little, 2002, p. 918). Although language is interpreted in a broad sense, our study does not take into account possible technical or textual affordances of Facebook per se and the influence on participation.

According to Little (2002), an analytical task when studying teacher communities is to “show how teachers, in and through their interactions with one another and with the material environment, convey and construct particular representations of practice” (p. 934). Drawing on Little, analysing teachers’ interactions in Facebook groups provides knowledge about which aspects of teaching that are made visible. When analysing the practices represented, and to reveal knowledge known and shared by teachers as a community, we have used Shulman’s (1987) framework. This allowed us to categorize teachers’ professional knowledge both in a general way and in relation to subject-specific teaching. It is important for the framework to be global to permit examination of two subject-specific educational traditions – those of Mathematics and Swedish – that may or may not differ. In the sections below, we explain how these two theories form the analytical framework.

Speech Functions as Enacting Interpersonal Relations

We use language to create relationships with and to interact with other people. Obviously, in social media, language (in different modalities) is used for the same reasons. Halliday and Hasan (1989) described the meta functions of language, that is, its ideational, interpersonal, and textual functions. The ideational function is a matter of expressing how one sees the world and how one interprets this experience. The interpersonal function concerns how the text creates a relationship between speaker and listener. Finally, the textual function concerns aspects that make language a relevant communication tool, organizing discourse to create flow and cohesion. As this study deals with relation-making processes, we concentrate on the interpersonal function. In a conversation, the speaker not only

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1There are 40,000 math teachers in Sweden. One of the self-organized groups in mathematics in this study have 17,000 members.
plays an initiating role in exchanging information, but also requires something of the listener. “Typically, therefore”, Halliday and Matthiessen (2013, p. 135) conclude, “an ‘act’ of speaking is something that might more appropriately be called an interact: it is an exchange, in which giving implies receiving and demanding implies giving a response” (bold in original).

In the semantic system of speech function, anyone can initiate either a giving or a demanding exchange in the conversation. That is, we can give or ask for information and we can offer someone something or ask someone to do something. These four primary speech functions statement, question, offer, and command (see, e.g., Halliday & Matthiessen, 2013) were mapped on the posts in a group. It is therefore possible to analyse what the author wanted to accomplish when posting in the group by asking what speech function was used. For instance, when asking a question, one does not merely want to ask, the goal is to receive an answer – thus one wants to accomplish an answer.

When a post contained more than one speech function, it was multi-coded. For example, a post may contain a question (“How do you support students who …?”) and an offer (“Look at our blog to see how we are working with this group of students …”). In the sample, nine of 553 posts were multi-coded. Furthermore, the speech function in the post could be congruent, that is, the authors could use the grammar of questions when posing questions, the grammar of statement when claiming something, and the grammar of requesting when encouraging group members to undertake specific actions (see, e.g., Holmberg & Karlsson, 2006). A speech function can be realized in alternative ways as well. For example, one can use declarative grammar when posing a question, or rather, seeking an answer (Holmberg, 2011). In our empirical material, this could be expressed like “I am going to work with … and need some suggestions on good student tasks.” To analyse speech functions realized in alternative ways, Holmberg (2011) suggested analysing the responses. In the Facebook groups, we had access to both posts and comments and could therefore validate the speech functions in relation to their responses. That is, in the example above, the post was formulated as a statement, but as the responses are answers, the actual speech function is a question.

The speech function is, to some extent, contextualized by the post’s author. For instance, the author can present background to the question asked (“We have read [book title] in my year-five class. The students loved it. Now I want another book that can build their love of reading. Do you have any suggestions?”). We have chosen not to categorize the contextualization as a separate speech function, as the analysis centres on what the author wants to accomplish by posting a particular post. In the above example, the author received suggestions of 15 book titles, meaning that, in this case, we could confirm that the speech function was a question.

In moving from the author to the reader, the four primary speech functions are matched by a set of responses. The reader can choose whether or not to give a desired response. For example, though the desired response to a question is an answer, the reader of a question can also neglect to answer. In the terminology of functional grammar, the response to a statement is either an acknowledgement or a contradiction, the response to a question is either an answer or a disclai-

2In Swedish, the imperative is used for requests; offers, however, have no typical realization in grammar.
Disclosing the Shared Professional Knowledge

In the well-known framework of teachers' professional knowledge, Shulman (1987) outlines seven categories that he suggests constitute the teacher's understanding needed to promote comprehensive student learning. This knowledge-base framework incorporates teacher awareness of various educational aspects, such as content, pedagogy, and organization:

- content knowledge [CK];
- general pedagogical knowledge, with special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter [PK];
- curriculum knowledge, with particular grasp of the materials and programmes that serve as “tools of the trade” for teachers [CuK];
- pedagogical content knowledge, that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding [PCK];
- knowledge of learners and their characteristics [KoL];
- knowledge of educational contexts, ranging from the workings of the group or classroom, the governance and financing of school districts, to the character of communities and cultures [KEC]; and
- knowledge of educational ends, purposes, and values, and their philosophical and historical grounds [KEE]. (Shulman, 1987, p. 8; for clarity, we added the acronyms)

Although these seven categories are broad, together they serve as a way to visualize the shared professional knowledge in the six Facebook groups. However, we learnt from our empirical material that three of the categories (i.e., curriculum knowledge, CuK; pedagogical content knowledge, PCK; and knowledge of learners, KoL) occur simultaneously in posts. For example, if we again examine the post, “We have read [book title] in my year-five class. The students loved it. Now I want another book that can build their love of reading. Do you have any suggestions?” we can see that the context outlined here is important in order to understand what professional knowledge is required. “Year-five” signals the knowledge of learners, and the specification of the book title signals the kind of curriculum knowledge required. Furthermore, asking for suggestions of books that can “build their love of reading” is categorized as asking the group for pedagogical content knowledge. Since the Shulman categories CuK, PCK, and KoL appeared simultaneously in multiple posts, it was more close to the empirical material to use a composite of these three categories (PCK+) encompassing the categories instead of multi-coding such posts (van Bommel et al., 2020).

Posts categorized as CK show interaction regarding the subject itself, and do not contain explicit references to pedagogical matters. On the other hand, posts containing general questions, offers, etcetera, regarding general pedagogics, such as how to use digital tools in a classroom setting not directed to a subject are categorized as PK.

When the posts contain interaction regarding classroom management (e.g., grouping students, time on tasks, mentor talks) or organization (e.g., how to organize test, at the local as well as at

Table 1. Examples of professional knowledge requested within the Facebook groups.

| Category | Example |
|----------|---------|
| PCK+     | We have read [book title] in my year-five class. The students loved it. Now I want another book that can build their love of reading. Do you have any suggestions? |
| CK       | I'm a bit frustrated with the word [schyst] … SAOL [i.e., a dictionary] only mentions ["juste", "sjyst", and "schyst"]. Not with double “s”, which seems to be the most accepted alternative among people, including the new commercial from [a company] … What is it that really applies? |
| PK       | I need help create a blog for my students where they are going to publish texts and assignments, blogging, etc. … I want it open to just my students – it should not be able to be read by outsiders. [name of a blog service]? Other suggestions? Anything I should consider? |
| KEC      | How do you organize other tongue education for your L2 learners? |
| KEE      | On the national test, part C, one of my students wrote about the pros and cons of grades, but did not come to a conclusion. Can this assignment still be approved? |

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the national level), the posts are categorized as KEC. Posts containing interaction regarding the school as an institution, beliefs about the school subject, and assessment and assessment criteria were categorized as KEE.

To illustrate the analysed data, a representative example of each category is presented in Table 1.

**Method**

In this section, we describe the analytical procedure and discuss methodological issues. First, however, we will address some ethical issues, and then briefly describe our data collection in the social media setting.

**Ethics**

Since the project seeks to examine the main part of the teacher population, the school subjects Swedish and mathematics were chosen. On Facebook, Swedish teachers have organized several groups in these two subject areas. The groups differ in their specific aims and topics and in their numbers of members. Group size is crucial when considering the ethical issues related to research into social media. Only groups with over 2,000 participants were considered at this stage. This was justified by the argument that in such large groups, the members will likely behave as if they were in a public place, that is, the members will probably consider their activity in the group as public rather than personal activity (Knobel, 2003; Roberts, 2015). The study was approved by the Regional Ethical Review Board.

**Data and Procedure**

The data were collected from six large Facebook groups. We strategically selected three groups, each with more than 2,000 members, in each school subject mathematics and Swedish. The groups were labelled MA1–3 and SW1–3. The groups should have been formed and maintained by teachers, that is, self-organized and not initiated by schools, the Ministry of Education, etc. Every member has a connection to the education field, since the administrator of the group checks the member’s affiliation to a school when entering the group. Through membership one can post and comment.

Another prerequisite for our selection was an ongoing activity in the group throughout 2015. Within this year, we identified all posts in each group, and analysed the activity level during the year, weeks and days:

(i) Globally the posts are spread over the year with some peaks, clearly corresponding to the school calendar. There is a peak in the weeks before the summer holidays. A similar peak is visible in the two weeks before the Christmas holidays. Likewise, the activity is low during the Easter, summer and Christmas holidays. Before school starts, at the end of the holidays, the activity in the groups goes up again and remains relatively stable.

(ii) Locally, we see that Mondays–Thursdays score the highest number of posts (around 70%, just over 17% per day). Fridays and Sundays score a bit lower (12% per day) and the lowest activity appears on Saturdays (around 7% of the posts).

(iii) On a micro level the data show what time of day teachers post their statuses. Around 35% of the posts are made during working hours, and just over 65% of the posts are made outside working hours. The groups have an activity of around 20% during weekends and holidays. (van Bommel & Liljekvist, 2016, p. 5)

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3For ethical reasons, the examples are adapted.
The activity pattern was similar in the groups; hence we could make a stratified random sample based on time of year (i.e., spring term, autumn term, and holidays). This method makes it possible to draw conclusions of the interaction in the groups as a whole (see, e.g., Samuels et al., 2016). We aimed to gather 100 posts (and the following interaction) from each group. Stratified random selection resulted in 570 posts. After the initial analysis, the technical data loss was 3% (e.g., posts offering only links to websites no longer functioning). This resulted in a data corpus of 553 posts comprising interactions in terms of comments and likes as well as documents of various modalities (e.g., text, images, and video; see Table 2). For a detailed description of the sampling procedure, see, van Bommel et al. (2018).

The posts were categorized using the analytical framework developed from speech functions (Halliday & Matthiessen, 2013) and the knowledge-base framework (Shulman, 1987). Coding reproducibility was ensured via a multi-step process, though this was not straightforward when using the knowledge-base framework (Shulman, 1987).

A sample of posts was first coded by the authors using Shulman’s descriptors, generating initial codes. Then followed a research seminar discussing the coding in order to review it. At this point, we noticed that the categories PCK, KoL, and CuK occurred simultaneously in the material. Instead of multi-coding each instance, we used a composite of these categories (PCK+) in our further analysis, since we wanted to focus on the content of interaction (i.e., the representation of practice) rather than on describing how teachers talk about the relations between PCK, KoL and CuK. By doing so we adopt the framework to the Scandinavian/German educational tradition where the relation between the teaching, studying and learning activities in the classroom “the didactic relation” (e.g., Kansanen & Meri, 1999) is considered the professional knowledge base.

All the material (553 posts) was then analysed, again followed by a research seminar. At this step of the analysis, we found that we did not agree on about 200 of the posts. This was a major problem, so we needed to rethink how to interpret the categories. The problem was two-fold: (1) we had difficulties coding posts about the school subject that was not our own specialization, and (2) we had difficulties deciding what to focus on in the posts, as they could be quite lengthy. We solved the first problem by letting the subject-area experts among the authors have the deciding vote. We solved the second problem by centring our attention on the analytical question: What (professional) knowledge is asked for/offered in the post? The analysis then continued in plenum during two research seminars.

Furthermore, the comments on the posts were analysed to confirm the coding of speech functions, as the response validates the speech function (see, e.g., Holmberg, 2011). Finally, the categories were stabilized by scrutinizing all posts in each category, to ensure that all posts coded in each category were consistently coded. However, we found that 23 posts were multi coded within the knowledge bases and nine posts within the speech functions, since one post can cover several themes. This procedure, in which we recorded every step in the sampling, coding, and categorization, made it possible to backtrack, retrace, and correct errors made in the coding process.

| Group | Posts (N) | Comments (n) | Likes (n) | Images (n) | Links (n) | Documents (n) | Comments/post (n/N) |
|-------|-----------|--------------|-----------|-----------|-----------|--------------|---------------------|
| SV1   | 83        | 623          | 1279 (708) | 4         | 71        | 3            | 7.5                 |
| SV2   | 107       | 917          | 1666 (1191)| 9         | 91        | 6            | 8.6                 |
| SV3   | 96        | 276          | 534 (173)  | 11        | 45        | 1            | 2.9                 |
| MA1   | 98        | 644          | 2132 (666)| 18        | 61        | 5            | 6.6                 |
| MA2   | 84        | 851          | 1299 (984)| 33        | 105       | 4            | 10.1                |
| MA3   | 85        | 267          | 629 (208)  | 26        | 63        | 4            | 3.1                 |
| Total | 553       | 3,578        | 7,539 (3,930)| 101      | 436       | 23           | 6.5                 |

*Notes*

- “Likes” were counted in responses to posts (n) and in the ensuing thread of interaction (m).
Results

Interactional Patterns Revealed by Speech Functions

Each post was analysed with a focus on the interpersonal function, which concerns the relationship-making process. The four speech functions, that is, statement, question, offer, and command (Halliday & Matthiessen, 2013; Holmberg & Karlsson, 2006), convey what the author wants to accomplish when posting in the group. In total, 550 instances of these speech functions were found in the data corpus of 553 posts. This result indicates that the vast majority of posts contain questions or offers (87.8% of the total). In one group (SW3), questions and offers were equally distributed. Four groups displayed the same pattern, with more questions than offers (see Table 3). One group (MA3) differed in that this pattern was reversed, that is, there were more offers than questions. Only 14.3% of the posts in MA3 contained questions, versus 48.3–53.3% in the other five groups.

To examine the interactional patterns and exchanges of the teachers posting in these groups, the responses to each post were analysed. Table 4 presents the distribution of the response patterns. The results show that 85.3% of all posts get responses. Most responses are in line with the expected response pattern, that is, what the teachers wanted to accomplish when posting in the groups. For example, 83.9% of the questions raised get answers and only 2.2% of the offers are completely rejected, getting only discretionary responses. In general, very few posts get only discretionary responses (1.6% of the total). Some of the posts, however, get both expected and discretionary responses. The statements stand out in this regard, with seven of 17 posts getting both types of responses. These seven posts may indicate ongoing discussions, since their contents were both acknowledged and contradicted. In this respect, statements differ from the other three speech functions.

Known and Shared Knowledge

When analysing the kinds of knowledge bases (see, Shulman, 1987) the posts contain, the results indicate the practice known and shared. In Little’s (2002) terms: the interactions convey and construct certain representations of practice showing which aspects of teaching practice are made visible (p. 934). We first present the results of analysing posts in which the author uses the speech function “question”, which highlights the knowledge requested (see Table 5). Then we present the results for posts in which the author uses the speech function “offer” (see Table 6), highlighting the knowledge available for others to use.

Table 3. The distribution of speech functions in each group.

| Speech function | SV1 n = 87 | SV2 n = 110 | SV3 n = 95 | MA1 n = 90 | MA2 n = 84 | MA3 n = 84 | % of total |
|-----------------|------------|------------|------------|------------|------------|------------|------------|
| Statement       | 10.3(9)    | 3.6(4)     | 3.2(3)     | 5.6(5)     | 10.7(9)    | 9.5(8)     | 6.9(38)    |
| Question        | 48.3(42)   | 51.8(57)   | 48.4(46)   | 53.3(48)   | 52.4(44)   | 14.3(12)   | 45.3(249)  |
| Offer           | 37.9(33)   | 37.3(41)   | 47.4(45)   | 37.8(34)   | 29.8(25)   | 66.7(56)   | 42.5(234)  |
| Command         | 3.4(3)     | 7.3(8)     | 1.1(1)     | 3.3(3)     | 7.1(6)     | 9.5(8)     | 5.3(29)    |
| Total           | 100(99)    | 100(110)   | 100(95)    | 100(90)    | 100(84)    | 100(84)    | 100(550)   |

Table 4. Responses to the speech functions.

| Speech function | Expected response | Discretionary response | Both expected and discretionary responses | No response |
|-----------------|-------------------|------------------------|-------------------------------------------|-------------|
| Statement       | 17                | 3                      | 7                                         | 11          |
| Question        | 209               | 1                      | –                                         | 39          |
| Offer           | 206               | 5                      | 8                                         | 15          |
| Command         | 12                | 0                      | 1                                         | 16          |
| Total           | 444               | 9                      | 16                                        | 81          |
Table 5. Knowledge requested in the posts.

| Knowledge base | SV1 | SV2 | SV3 | MA1 | MA2 | MA3 |
|----------------|-----|-----|-----|-----|-----|-----|
| PCK+           | 24  | 34  | 31  | 33  | 23  | 6   |
| CK             | 2   | 5   | 1   | 2   | 6   | 4   |
| PK             | 2   | 2   | 5   | 2   | 8   | 0   |
| KEC            | 7   | 12  | 3   | 4   | 5   | 2   |
| KEE            | 2   | 2   | 1   | 3   | 2   | 3   |
| Total          | 37  | 55  | 41  | 44  | 44  | 15  |
| Unrelated      | 6   | 7   | 5   | 7   | 5   | 0   |

Table 6. Knowledge offered in the posts.

| Knowledge base | SV1 | SV2 | SV3 | MA1 | MA2 | MA3 |
|----------------|-----|-----|-----|-----|-----|-----|
| PCK+           | 14  | 17  | 33  | 22  | 12  | 16  |
| CK             | 2   | 0   | 0   | 0   | 2   | 11  |
| PK             | 4   | 2   | 8   | 4   | 2   | 2   |
| KEC            | 1   | 2   | 0   | 1   | 0   | 1   |
| KEE            | 8   | 8   | 1   | 3   | 3   | 4   |
| Total          | 29  | 29  | 42  | 30  | 19  | 34  |
| Unrelated      | 8   | 11  | 2   | 3   | 5   | 21  |

Table 5 shows that most questions deal with PCK+, that is, issues regarding subject-specific teaching and learning. This overall pattern is similar in all groups. However, few questions are raised in MA3 (see Table 5), so the pattern is not as distinct as in the other groups. The table also shows that in group SW2, a higher proportion of questions regarding knowledge of educational context (KEC) are asked (12 in total).

Not all questions raised request professional knowledge from the reader/respondent, according to Shulman’s (1987) framework. Such “unrelated” posts represent 12.0% (30) of 249 question posts. An example of a representative question categorized as unrelated is: “I’ll be taking a course on multilingualism. Does anyone have [book title] for sale?” That such questions are categorized as unrelated does not mean that they are irrelevant to teachers in these groups, only that they are not related to the knowledge-base framework.

Table 6 presents the results regarding the knowledge offered in the posts. The main type of shared knowledge concerns subject-specific teaching and learning (PCK+). Accordingly, the results for knowledge offered are similar to those for knowledge requested. In both SW1 and SW2, slightly more knowledge of educational ends (KEE) is offered, whereas in MA3 the amount of content knowledge (CK) offered is somewhat higher. MA3 also distinguishes itself from the other groups in the number of posts unrelated to Shulman’s framework (38.2% of the total). Many of these posts contain mathematical jokes or humorous video clips.

**Summary**

The interaction that is the foundation of the Facebook groups is centred on asking for and sharing knowledge of subject-specific teaching and learning (PCK+). Most posts get responses, and the responses are of the expected kind. The groups are therefore mainly used as forums for making subject-specific pedagogy known and shared, but, broadly speaking, not as forums for discussion. However, there are some differences among the groups, with one group, MA3, being more centred on offers and commands.

The results also indicate that the content varies, in terms of Shulman’s knowledge base (Shulman, 1987). For instance, more content knowledge (CK) is offered in MA3 and more knowledge of educational context (KEC) in SW2. This implies that both the orientation towards practice and the norms of interaction differ between the groups.
Discussion and Conclusions

In this study, we have focused on the professional approach to collaboration and professional development. More specifically, we have looked at what teachers want to accomplish when engaging in self-organized groups on Facebook, and which parts of the teaching practice become visible.

Stoll and Louis (2007) state that it is an empirical question whether the characteristics of groups of teachers working together are indeed those of a PLC. Since teachers’ professional community is extended to social media (e.g., Macià & García, 2016; Tour, 2016), we aimed at empirically investigating teachers’ interaction in self-organized groups, addressing subject-specific teaching and learning, in order to understand how the groups are used as resources for professional development. We will discuss how these self-organized Facebook groups display the same characteristics as teachers working together in PLCs.

Our results confirm the findings of earlier studies (e.g., Bissessar, 2014; Lantz-Andersson et al., 2017; Patahuddin & Logan, 2015; Ranieri et al., 2012; Tour, 2017) in that the studied teachers are using Facebook as a resource for sharing knowledge and curricular material, giving advice, and getting support on issues of importance to their teaching. Due to the overwhelming number of offers and questions initiated in the posts, we would liken activity in these Facebook groups to staff room interactions both asking for and sharing knowledge of subject-specific teaching and learning. However, given the methods used, we cannot have any claims regarding if, and to what extent, learning actually took place.

The teachers’ interaction is oriented towards practice and expresses a desire to enhance students’ learning; therefore, as Little (2002) illustrates in her studies of within-school teacher communities, the issues raised are closely tied to the teachers’ everyday professional lives. The subject-specific themes of the groups seem to structure the interaction towards the PCK+, which could be described as the centre of teachers’ knowledge base, or more specifically, the “didactic relation” between the teaching-studying-learning activities (Kansanen & Meri, 1999). In forthcoming studies, we plan to inquire into posts and comments to reveal the individual themes within this PCK+ category.

We note that the content of the questions and offers primarily concerns everyday matters, and that the posts categorized as “unrelated”, in relation to Shulman’s knowledge-base framework, are typical helpdesk questions. Questions raised generally get answers, and offers made are generally approved and accepted. Since very few posts get only discretionary responses (1.6% of the total), the results also indicate the existence of a community of trust. This is in line with the findings of Stoll et al’s. (2006) review of the factors and conditions influencing teachers’ professional development, and how processes work to mediate facilitation and collaboration. However, the method used here (i.e., stratified random sampling) reveals interactional patterns at the group level, but cannot explain how individual teachers act or develop over time.

Furthermore, these six Facebook groups are used in only a limited way as an arena for debating and discussing school policy matters. This is indicated by the small proportion of statements (38 of the 550 relevant posts), by the fact that only 10 (3 + 7, see Table 4) of these statements get responses that do not just confirm the content in question, and by the educational aspects focused on in the posts. Here, a focus on educational context and educational ends would have indicated an interest in such matters. The impressions gained from reading all posts and comments during the coding process reaffirm this conclusion. Lantz-Andersson et al. (2017) show instances of pedagogical discussions in their study of a large general-pedagogical group. Yet, our study shows that discussions and debates appear rather seldom. This result may be a consequence of the design of our studies: we study large groups. Therefore, one needs to consider that the interaction pattern may differ in smaller and closed groups. Again, the method used in this study (i.e., stratified random sample) implies that conclusions can be drawn regarding typical interaction patterns in large self-organized groups.

Drawing on Little (2002), and operationalize her framework using Shulman’s (1987) categories, made it possible to show how teachers’ interactions convey and construct the representation of practice. The interaction in the six Facebook groups is characterized by an awareness of pedagogical
content knowledge, learners, and the material and methods used in the classroom. In this respect, the norms of interaction in the two subjects, mathematics and Swedish, are alike. Only small differences were detected, with one group (SW2) raising more questions about educational context, two groups (SW1 and SW2) offering slightly more knowledge of educational ends, and one group (MA3) offering slightly more content knowledge. Only in one of the groups, MA3, do the norms of interaction to some extent support the sharing of mathematical jokes and humorous video clips. The groups promote subject-specific teacher knowledge rather than personal development. The teachers have organized groups for addressing everyday challenges in their teaching rather than a place to socialize. This differs from earlier studies that show more interaction on a personal and non-professional level (e.g., Bisssessar, 2014; Rashid et al., 2016).

The representations of practice in the two school subjects also display the same pattern in what teachers want to accomplish when posting in their groups: they request information from and offer information to colleagues, and illustrate and share practices. This is in line with our knowledge regarding PLCs in schools (cf. Little, 2002; Vescio et al., 2008). We can see examples in our study of how the teachers use the resources in the social media to develop their collective knowledge on pedagogical and subject-specific issues related to their every-day practice. However, these resources have evolved through self-organized groups within a commercial and digital frame. Bergviken Rensfeldt et al. (2018) problematize “the digital labor” that occur in social media in parallel to the professional development; an important aspect to bear in mind when exploring social media as a phenomenon. Still, the teachers themselves develop and maintain the groups, and steer what content, and what kinds of issues to raise. In this aspect, the groups in social media, such as Facebook, stand for a professional approach (Talbert, 2010) creating an environment of trust and risk-taking, and upholding a culture of sharing successes and strategies. These characteristics show a collective perspective of resources (Pepin et al., 2013) that support teachers in their work, and can be looked upon as a part of curriculum development and enactment that is evolving in collegial digital gatherings (Liljekvist, 2016; Liljekvist et al., 2017; Ruthven, 2016). We conclude that the willingness to respond and to share knowledge and teaching methods facilitates rather than impedes professional development, and that this is the main reason why teachers engage in these kinds of groups. The kind of professional development that Facebook interactions support merits further studies focusing on the conversations as such.

Acknowledgements

This work was supported by the Swedish Research Council (DNR2015:01979) and ROSE Research on Subject-Specific Education at Karlstad University. Magnus Kallin supported in the data collection and Jari Appelgren in the data analysis. We would like to thank Professor Per Holmberg and Professor Kenneth Ruthven for valuable input.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Swedish Research Council [DNR2015:01979] and ROSE Research on Subject-Specific Education at Karlstad University.

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