

The value of academics' formal and informal interaction in developing life science education

Katajavuori N, Virtanen V, Ruohoniemi M, Muukkonen H, Toom A.

Abstract

Concerns have been expressed that the engagement shown by committed individuals is not fully utilised by their organisations while there is insufficient knowledge of which conditions facilitate teaching collaboration and lead to improvements in university education.

Portfolios of 43 life science academics applying to enter to the University of Helsinki Teachers' Academy were analysed through content analysis. Five categories of interactive or collaborative practices emerged from the data: 1) *Interacting with peers for personal development*, 2) *Sharing good teaching practices*, 3) *Teaching together*, 4) *Producing educational artefacts*, 5) *Developing education systematically*. The practices occurred in both formal and informal settings, and both settings were present in all categories. In contrast with the formal practices, the informal practices were described in an enthusiastic way. The engagement shown by the scholarly teachers was mostly realized in informal settings. There is probably unrealized potential in the scholarly teachers' teaching-related practices through which they could contribute to the development of teaching in academia. Formal communities related to teaching should be developed to promote deeper collaboration and to foster the participants' feeling of personal commitment and ownership.

Keywords Informal and formal practices, Community of practice; Scholarship of teaching; Life sciences; University

Introduction

The educational sector is being confronted with increasing pressure to foster collaboration: teachers need to be proficient collaborators in order to perform their job successfully (Vangrieken, Dochy, Raes, & Kyndt, 2015). The tendency towards integrated or joint curricula pushes teachers towards further interaction, collaboration and co-teaching (e.g., Cavalieri, 2009; Malik & Malik, 2011). Collaboration and teamwork have also been stated as being the main professional resources as well as concrete strategies for improving the quality of services in working life communities. They provide the key resource to learn and develop

professionally, and thus, collaborative practices also need to be valued during higher education (Faresjö, Wilhelmsson, Pelling, Dahlgren, & Hammar, 2007; Tynjälä, 2008). The importance of interprofessional teamwork has been highlighted and furthermore it has been called on for research about organisational culture, co-operation and teamwork in (Körner, Wirtz, Bengel, & Göritz, 2015; Tynjälä, 2008; Sawyer, 2007).

Scholarly university teachers are experts in their own field, they can integrate their discipline in broader multidisciplinary contexts, apply it practically as well as have competence to teach by utilising the most suitable methods of their discipline to support student learning (Boyer, 1990). It is especially natural for scholarly teachers to co-operate with their students and colleagues – they exchange their experiences and actively contribute to the development of teaching and learning and make their work public (la Lopa, 2015; Shulman, 1993; Trigwell, Martin, Benjamin, & Prosser, 2000; Pyörälä, Hirsto, Toom, Myyry, & Lindblom-Ylänne, 2015). Scholarly teachers make teaching and learning open not only to discussion but also to scrutiny and continuous peer review (Shulman, 1993), which also makes it possible to improve one's teaching practices. The model of the scholarship of teaching described by Trigwell, et al. (2000) also highlights collaboration but points out that there is variation in the extent to which the teacher can engage in scholarly contributions with others and in the quality of their communication.

The importance of collaboration exists in the opportunity to change educational practices: through discussions with colleagues who share the same context, it is possible for teachers to try to influence and change the institutional culture. If successful, this can lead to long-term development for an institution (Roxå, Olsson, Mårtensson, 2008). On the other hand, a highly localized network may reduce innovation and creativity (see Pataraiia, Falconer, Margaryan,

Littlejohn, & Fincher, 2014). Both expert and novice teachers may have large networks through which they communicate about their teaching practice, but the networks of experienced expert teachers are more diverse (Van Waes, Van den Bossche, Moolenaar, De Maeyer, Van Petegem, 2015). Thus, it would be important to gain understanding of scholarly teachers' interactive practices because these teachers' diverse and wide networks could foster the development of education and the prevailing working culture in the institution.

Various committees or teams have traditionally been contexts for collaboration in universities where they have been established to run academic and administrative affairs. These communities are formal and have been set up for a certain task; their members are often selected according to formal position and using certain criteria for a specific period. This is divergent to informal practices, through which people sharing similar interests informally communicate with each other to solve a problem or create something, meet regularly for that purpose, and learn from each other (e.g., Blanton & Stylianou, 2009; Bouchamma & Michaud, 2011; Wenger & Snyder, 2000). One key element in learning and scholarship is having some form of artefact or product (like plans, reports or proposals) which is shared and developed collaboratively (Lakkala, Toom, Ilomäki, & Muukkonen, 2015; Paavola & Hakkarainen, 2005; Shulman, 1993). Learning is not only individual knowledge acquisition or adoption of existing social and professional practices; but also creation of new knowledge and practices in collaboration with others through the development of shared knowledge objects (Paavola & Hakkarainen, 2005). However, it is not self-evident that academics themselves or their home institutions recognise the value of this kind of collaborative practice. Concerns have been raised that the engagement shown by committed individuals is not fully utilised by the organisations and there is unrealized potential (Kothari, Boyko, Conklin, Stolee, & Sibbald, 2015; Mårtensson, Roxå, & Olsson, 2011; Vaessen, van den

Beemt, & de Laat, 2014). There is insufficient knowledge of the conditions which facilitate collaboration and lead to concrete improvements in organisations (Decuyper, Dochy, & Den Bossche, 2010). One important factor of how teachers' networks and collaboration in informal and formal settings are utilized in organisation for its best is the leadership management of the institution (McGowan, Goode, & Manley, 2016; Spillane, Hunt, & Healey, 2004).

Thus, there is a clear need to explore collaborative practices in teaching in a university context. Experienced and scholarly teachers' collaborative practices should especially be explored because they are more versatile and wider than those of non-experienced teachers (Van Waes, et al. 2015), and thus, would widen our understanding of the phenomena.

The aim of the study is first to investigate the dimensions of interaction that scholarly teachers in the life sciences introduce in the portfolios that they compiled for demonstrating their scholarship of teaching, and second, to explore the teachers' descriptions of their communal practices and shared products. Our research questions are the following:

- What interactive or collaborative practices do scholarly teachers in the life sciences describe?
- What are the shared objects of collaborative practices?

Material and Methods

Context of the study: Teachers' Academy

In 2012, the University of Helsinki founded the Teachers' Academy as a reward system for teaching. By founding the academy and awarding scholarly teachers, the University aims to

increase the appreciation of teaching and enhance the quality of teaching and learning throughout the academic community. The main application format was a portfolio (maximum length about five pages), in which the applicants were to describe, analyse and justify their expertise and excellence in teaching, in line with the following criteria: (1) Continuous development of expertise of teaching and supervision; (2) Teaching and supervision practices that enhance students' learning; (3) Expertise in using and developing the teaching materials and (4) Participation in the collaborative development of teaching. However, the applicants had freedom of individual expression and could construct the portfolio using their own preferences.

Data and participants

The data consisted of portfolios of 43 university teachers of the life and health sciences from medicine (n=17) pharmacy (n=8), veterinary medicine (n=6), agriculture and forestry (n=8), and biosciences (n=4). The data were collected in 2012 as a part of the application procedure to the Teachers' Academy of the total 136 applicants. When applying to the Academy, the participants voluntarily agreed to participate in the research and allowed the use of their application materials for research purposes. The permission procedures were handled at the University of Helsinki.

Seven full professors, 24 university lecturers (equivalent to assistant or associate professors), and 12 other academic staff, such as clinical instructors, were included. The amount of teaching experience among the participants varied considerably: 32 (74%) had over 10 years' experience (up to 43 years), 7 (16%) had 6–10 years' experience and 4 (10%) had 3–5 years' experience. Of the participants, 33% (n=14) were male and 67% (n=29) female. Their ages varied from 36 to 66 years. In general, the portfolios were diverse and their style varied from

reports strictly following the given headings to deeply integrated reflective narratives. In total, 215 portfolio pages were analysed.

Analysis

An inductive qualitative content analysis was used to analyse the data (Miles & Huberman, 1984). The analysis included three complementary phases to incorporate the negotiation of the meaning of the portfolio segments, clarification of classification, and peer agreement. The first three authors were responsible for the analysis.

First, all text segments in which the applicants described practice or shared action related to education, with any parties other than students, were identified. These units of analysis (n= 278) varied in length from one sentence to 152 words. A preliminary classification of the analysis units was divided into two settings: formal and informal. The formal setting included interactions governed by an official organization, such as a department, that were essential for its operation (e.g., mandatory committees) or the practice was determined or controlled by the organization (e.g., development of a new programme). The practices that were considered to be informal were those that teachers had voluntarily created themselves and considered to be under their own control, regardless of the formality of the context.

In the second analysis phase, the first and second author analysed the descriptions in more detail to capture the variation in the practices through these questions: 1) what was the context of practice (course, domain, department, faculty, university, national or international), 2) with whom did they act and 3) what was the shared objective and outcome of the collaborative practices? Five partly overlapping categories emerged: (1) Interacting with peers for personal development; (2) Sharing good teaching practices; (3) Teaching together; (4) Producing

educational artefacts and (5) Developing education systematically. During the analysis, the researchers discussed repeatedly the categorization and issues with the difficult portfolio segments. One analysis unit could include more than one form of interactive practice.

Then, all authors discussed the categorization, especially from the viewpoint of action and objective. Finally, the categorization of all units was repeated so that the second and third author (two-thirds of the data) or first and third author (one-third of the data) agreed about each analysis unit. In cases in which the two authors did not reach agreement about the category, the opinion of the third evaluator was asked. Thus, the categorization of each unit was agreed on by two authors or the category could not be defined and the unit had to be discharged from the data. The data analysis done and confirmed by two researchers followed the principles of investigator triangulation (Denzin, 2010).

Results

The teachers described a variety of interactive or collaborative, education-related practices embedded in their academic activities that they had selected for demonstrating their scholarship of teaching. The variation in interaction forms covered all levels from discussion with a next-door peer to international teaching co-operation; consequently, the context of the practices varied from local courses to international arenas. Local contexts most commonly mentioned in the teachers' descriptions of education-related practices included an individual's course, discipline, division, major or programme. The department or faculty was the context of most of the formal practices. A wider context, such as a teacher's own or other national university, as well as the international academic society were reported especially as a setting for congresses, seminars, publications or teaching co-operation.

All the interactive, education-related practices that the teachers described were realized either in formal or informal settings, meaning that the practice was determined or controlled by the organization or the teachers themselves had voluntarily created the practice. Table 1 shows that both formal and informal settings were identified in each category.

[Table 1 near here]

The variation in the interactive or collaborative practices is presented here by describing the features of the five categories. Representative examples of the text segments from the portfolios are presented. More in-depth analysis showed that the setting was not stable but sometimes the interactive practices initially launched in an informal setting later became formal.

Interacting with peers for personal development

The teachers expressed a willingness to have informal interaction and co-operation with their colleagues in order to gain new insights, ideas and support for their own work and to receive support from peers. Thus, dialogue with peers seemed to be quite important in fostering their learning and widening the horizons of their thinking. This form of interaction did not typically produce any explicit benefit or product, but rather new initiatives, ideas and development projects arose later. These practices were mainly manifested in the teachers' immediate settings at the workplace:

In addition, I get new ideas throughout the year from discussions with colleagues, training sessions, pedagogical articles and international websites. In the same way, I constantly collect ideas to develop my skills at supervision. (108, informal)

Individual participants also found opportunities for their learning on formal boards and

committees, as shown by the following excerpt: ‘I have also had an opportunity to develop my expertise in teaching and supervision as an ordinary member of the teaching skills assessment committee.’ (275, formal).

One tool reported concerning personal development was peer feedback. Practices for acquiring feedback varied. Some participants reported that giving peer feedback had been organized by formal pedagogical training, while others described how they used ‘all possible ways’ for acquiring feedback and novel views to teaching. Thus, they adopted innovations into their own teaching:

I also practise a lot of peer assessment with colleagues (and could practise even more!) and sometimes teacher trainees visit my courses to observe my teaching, which gives me important feedback... On courses with multiple teachers (e.g., on field courses) I organize teachers’ meetings where we give peer feedback on each other’s teaching. (69, informal)

Occasionally, the teachers’ personal networks and investment of their time and effort initiated a wider development process. In these episodes, the participants described the history of how an idea, originally evolving from their personal enthusiastic interest in the topic, became a formal practice of the disciplinary community:

I started a small-scale practice of monthly teachers’ meetings, at which initially only I, one teaching nurse and the new teacher were present. The purpose of the forum was to supervise the young colleague in matters related to teaching. Gradually the meeting expanded and nowadays all clinical teachers and professors and occasionally also head doctors and teaching nurses participate in it. The minutes of the meetings are recorded. (218, informal > formal)

A personal contact or informal co-operation at the course level could have major consequences, such as shared international projects between universities.

Sharing good teaching practices

When reporting interactive practices, the teachers most often described either sharing good teaching-related practices or learning from others including discussions with colleagues along the department's corridors as well as presentations given at workshops and seminars in national or international associations. Networking, forwarding educational papers and international teacher exchanges were also mentioned. Hence, the teachers' descriptions demonstrated a variety of ways in which good teaching-related practices were shared both within the local discipline community and the broader academic community. Here the object of the shared practices tended to be concrete: actions, course structure, content knowledge, course material, pedagogical models or solutions, or individual experiences of development work. It seemed that the benefit of sharing good practices was mainly the development of teaching methods or practices in formal and informal settings.

The practices for sharing knowledge and skills in informal settings originated from an individual interest and willingness to help or educate others. The teachers seemed to be eager to share their own experiences with their colleagues:

I have demonstrated my e-learning courses in Denmark at the [XX] workshop for Nordic and Baltic participants and at a seminar on blended learning for [national] university teachers. (13, informal)

However, teachers also reported sharing their expertise in such formal settings as meetings of formal boards and committees or in co-operation between universities. The activity seemed to originate from individual enthusiasm to develop a certain practice in an academic community:

Faculty-wide workshops are an excellent way of promoting ideas. In such groups I have been able to introduce the supervision practices I have developed in my own department to be adopted by the entire faculty. (65, formal)

Adopting good practices was less commonly mentioned but did occur, especially in informal settings, such as congresses and various other networks:

I have a broad teaching-related network across the faculty (we share useful reading titles or online resources). When in need of specific professional advice, I actively use expertise in the university, such as an e-learning support network. I actively use the library resources in pedagogy and ordered a couple of new titles for it. (234, informal)

Teaching together

The teachers often described specifically how they had joint teaching-related practices with their peers. The teaching networks in these cases consisted mostly of departmental colleagues, but occasionally peers from other faculties or from other universities were involved. Nearly all the practices were informal. The shared object in these practices was most commonly a subject course or part of it and the collaborative practices included planning, teaching and assessing learning. Often the teachers described the development of particular teaching practices, such as e-learning or feedback strategies, whereas developing assessment or supervision were less often described. In addition, updating the content of the course was nearly always mentioned; therefore, the networks were mostly highly discipline-specific:

I started a practice of cooperative evaluation of assignments based on explicit criteria and with the cross-checking for consistency (now used in several courses). All the organic courses mentioned above have been a team project in which I've been most active. (232, informal)

Occasionally, the teachers' teaching networks included peers from outside their discipline. One teacher described how language studies were integrated into the subject course and another teacher reported integration of information literacy skills in cooperation with the science library. There were also examples of courses that had been initiated by a single teacher and had grown to broad, more formal international networks:

I was the initiator of the first two courses. . . These special courses were a success story with altogether more than 40 international students. Teachers came from Australia, Brazil, Sweden, South Africa and Uruguay. The courses have involved so far more than 50 teachers. Cooperation has taken place at the departmental level and lately also at the faculty level with [xx] and [xx] disciplines and at the university level using [xx] context. My impression is that [XX] has been a great innovation in teaching and an extremely powerful vehicle to promote collegiality from the departmental to the international level. (23, informal > formal)

Collaborative teaching-related practices were also recognized as occurring in formal settings, although not as frequently as in informal settings (Table 1). In these cases, the teachers described collaboration in developing joint programs or courses.

Producing educational artefacts

The interactive practices that the teachers described included numerous activities aimed at visible products such as textbooks, educational research papers, teaching materials, or formal reports. These activities rarely originated in such formal settings as boards and committees, but instead occurred actively in various informal settings (Table 1). Concerning outcomes such as textbooks or e-learning material, the collaboration typically took place in discipline-specific networks, including colleagues from departments to outside academia, and the participants usually highlighted their own role as initiators:

I have often had a key role in planning and working with the material, but I do nothing alone; [I am always] in close collaboration with professors and other colleagues according to the principles of process writing. Finally, my Swedish-speaking colleague translates the final document into Swedish! (176, informal)

Most participants also reported that they had studied their own teaching or student learning in a disciplinary context. Contrary to the descriptions concerning such outcomes as textbooks in which the participant's role was commonly explicitly described, in those concerning educational research outcomes, the participant's exact role tended to remain unclear.

Educational research was evident in the portfolios, mainly as references to pedagogical publications. The teachers seldom explained more specifically how the research was initiated or carried out; neither did they clarify their own impact on the research process. The community in these activities consisted not only of colleagues from their discipline, but also of scholars from the field of university pedagogy; sometimes the activity originated in formal settings:

I am part of the faculty's working group and we executed an inquiry into the teachers of the faculty on their perceptions of [xx] teaching and its importance. This inquiry will be reported at [xx] meeting. . . . We will also write an article on it for an international journal. (42, formal)

Developing education systematically

The teachers' descriptions of their scholarly expertise also included examples in which they reported teaching-related activities concerning practices or products that were to be adopted somehow systematically, in a particular academic organization or a certain part of it, or according to specific rules. These included interaction and collaborative practices in planning, designing, decision making and constructing instructions or guidelines. The shared objects here were associated with a variety of development processes, including curriculum reform, core content analysis, student feedback systems, development of degree programs and establishment of national and international networks for teaching at the postgraduate level. The context varied from the faculty or university level to the national or even international level. These longitudinal developmental projects and practices were most often led by a formal committee, board or a steering group set by the organization. Only rarely did teachers report systematic development projects in informal settings. In these cases, they showed strong personal investment or interest in the process, or they emphasized their own role as an initiator of the project. These projects were conducted in collaboration with their peers in their own domains or disciplines:

During the realization of the Bologna process, I formed a departmental and a 'discipline' division working group to develop the new curricula. Thus, today we have increased interaction between subjects, streamlined schedules and an excellent framework for studies in our 'discipline'. (124, informal)

The participation in formal bodies, set by organizations, was described at varying levels of ownership. The activity, especially at the faculty committees and boards, was commonly considered to be a responsibility or pure membership, or the work done by the organizational body was described briefly. Occasionally, the teachers assessed their own roles in the specific group, as the following excerpt shows:

I had a 3-year period as a member of the faculty board, elected by teachers, researchers and other staff. Before, I was a member of the ethics committee.... I feel that I did a good job at these and I especially put a lot of effort into curriculum development during the Bologna process. (136, formal)

However, some teachers' descriptions showed that the participants themselves had been active initiators of the development processes in formal settings. These descriptions differed from the others in that the participants reflected on their senses of ownership of the activities, whereas the others mainly described membership or activity. The shared objects were similar in both groups, such as routine tasks for running the responsibilities of the body, or development processes to work out a systematically adapted practice in the organization. Thus, even though the networks included were formal, set by an organization, the participant in this 'ownership group' was in an active role, in which his or her own input and feeling of responsibility and ownership was emphasized:

I was also responsible for establishing national and international networks for teaching at the postgraduate level. Overall, I feel that I succeeded in my task as I helped create a functional training programme for the students and maintained good communication with the partners involved. (25, formal)

Some participants clearly had actively searched for opportunities to influence matters that they found important:

It is possible to have authority on matters related to one's own activities by working as part of various administrative organs. I have sometimes actively applied, sometimes been asked to work as a member in study administration and in different working groups. In these groups, I have been able to influence matters that I have found important in teaching, administration and planning of teaching.

(106, formal)

Discussion

The first aim of this study was to explore interactive or collaborative practices described by scholarly teachers. Our results showed that the scholars were members of various active communities and both formal and informal institutional settings enabled a rich variety of interactive and collaborative teaching-related practices (Table 1). The variety of these practices was displayed in the five qualitative different categories that emerged from the data, namely, 1) *Interacting with peers for personal development*, 2) *Sharing good teaching practices*, 3) *Teaching together*, 4) *Producing educational artefacts*, and 5) *Developing education systematically*. Most of the practices described by the teachers were informal, meaning that the teachers' own interest and personal networks were triggers for the development of the practice (cf. Pyörälä et al., 2015). Furthermore, teachers emphasized their own role in it. Our study also showed that teachers were eager to co-operate in informal settings while in these situations, they also developed teaching-related practices in an enthusiastic manner, not only locally but also at the international level. However, these practices mainly stayed local and were seldom applied to an established practice. Our findings support previous research regarding concerns about the utilization of development done in informal settings (Mårtensson, et al. 2011; Vaessen, et al. 2014; Kothari, et al. 2015), and in line with Pataraiia, et al. (2014) our results indicate that the academics' personal teaching-related networks are strongly discipline-specific and localized

Regarding the second research question about the shared objects in collaborative practices, teachers described the actual objects on which they worked collaboratively. These were teaching in a course together, and publishing material such as pedagogical papers and

textbooks together with other academics. The systematic development commonly focused on shared objects and formal practices for some relevant, often externally determined purpose. Hence, our five categories (Table 1) reflect the three metaphors of learning characterising learning as knowledge acquisition, learning as participation in a social community, and learning as knowledge creation (Sfard, 1998; Paavola & Hakkarainen, 2005). In the Category 1 the personal development was focused in accordance to metaphor, according to which learning is seen as knowledge acquisition of individual learners. Dialogue with peers that fostered teachers' learning and the teaching-related practices in social interaction resembled closely the metaphor of a dialogical approach on learning (Sfard, 1998; Paavola & Hakkarainen, 2005), and it was characteristic for the Category 2, whereas Categories 3-5 included descriptions of the actual objects on which the teachers worked collaboratively. That resembled the knowledge creation metaphor, according to which learning is also creation of new knowledge and practices in collaboration with others through the development of shared knowledge objects (Paavola & Hakkarainen, 2005). The significance of collaboration would be important to recognise in the faculties, where teachers could be encouraged and guided to teach together and to have a course as teams. One way to guide this collaboration is to construct larger and multidisciplinary study modules to curricula in line with the current needs of working life, and where teachers naturally co-operate in terms of their expertise.

According to our study, systematic and longitudinal development processes which the participants described existed mainly in formal setting (Table 1). In accordance, we argue that many of the practices developed in informal settings, regardless of how valuable they were, are likely to disappear along with the individual teacher. Thus, it would be important to foster the possibilities for informal collaborative practices in the faculties because in that way the good practices may spread among teachers. Based on previous research, life science teachers often experience isolation in teaching and development processes and would significantly benefit from peer support and interactive practices (Halinen, Ruohoniemi, Katajavuori, & Virtanen, 2013). Thus, raising awareness of the informal local platforms within institutions where practices can be presented or otherwise made public would be relevant for teachers. The formal boards could supervise teaching practices towards atmosphere favouring peer support and co-operation by valuing these practices and allocating resources for them. Furthermore, pedagogical training is a good means for supporting the teachers to describe their practices and justify their choices by research that makes them more confident (Roxå et al., 2008) and provides a platform for peer feedback as noted in the present study.

Atmosphere, which encourages teachers towards collaborative practices could be beneficial especially for early-career academics. Cox (2013) has reported that early-career academics' participation in faculty learning community activities and training programmes had a positive impact on their interest in the teaching processes and fostered an interest in the scholarship of teaching and learning. The participants also felt more integrated to the university community (Cox, 2013). Thus, the significance of local collaborative practices are important and especially scholarly teachers, like explored in this study, may have a marked role in supervising novice teachers, fostering interest and engagement in teaching within the whole academic community. Teachers' own agency in terms of initiating the developments plays an important role in the relevance and implementation of the developments as well as teachers' commitment to them.

When describing the interactive teaching-related practices in the informal settings, the scholars often enacted the idea of collaborative knowledge creation (e.g., Paavola & Hakkarainen, 2005) in an enthusiastic way and emphasized their own role in it. In comparison, when demonstrating their scholarship in teaching in formal settings, the teachers mostly described their input as a membership in carrying out a task. They rarely described the activities or expressed enthusiasm for them. Furthermore, in formal settings teachers mostly described their input as membership in carrying out a predefined task, with no or limited description of the activities or enthusiasm for them. It is possible, that in formal settings teachers may experience a lack of agency to influence matters that are important to them. Further, it is possible that the current cultural atmosphere in formal boards was felt to be inappropriate for collaborative and limit teachers' willingness to raise novel ideas, as suggested by previous research (Roxå, et al. 2008). The teachers are not always voluntary members of formal boards, and the activities are often externally regulated to certain extent. For this reason, the participation is easily viewed as a given task that is of merit, but it still remains distant from true individual interests.

However, our results indicate that the characteristics of informal communities of practices, namely a stage for interested people to meet regularly for a specific purpose, learn from each other and create something together (e.g. Blanton & Stylianou, 2009; Wenger & Snyder, 2000), can also be achieved in formal settings. There were participants who also expressed interest and enthusiasm in their descriptions of activities in formal settings; these descriptions reflected their active role and sense of ownership of the processes. This ownership was also

recognized in descriptions of when a practice initiated by an innovative teacher or a community of teachers and was later adopted to wider use and became formal. It seemed that in cases where an informal practice became formal, the individual teacher's good practice and the aims of the educational leadership coincided in a fruitful way. Our findings are in line with previous research (Clavert et al.,2018) according to which lack of supportive formal leadership may terminate the informal pedagogical development activities created by scholarly teachers.

This study raises the question what development processes could be achieved in the faculties, if the potential effort and willingness to collaborate among teachers, which was seen in the informal communities and given in the descriptions in the text in this study, could be applied to formal boards. It would be important to reflect on the prevailing practices in educational development processes especially in formal settings and teachers' role in these processes. We suggest that fostering dialogue and teachers' sense of participation also in formal settings should be taken into account in the faculties. Thus, it would be interesting to explore in more detail how teachers feel their participation in formal boards and in case they feel less enthusiastic to be part of these boards, what are the reasons for that.

Limitations

Through the portfolios, the applicants had an opportunity to elaborate and cover their own chosen contents (Tisani, 2008) relevant for the application. Thus, the descriptions do not necessarily describe the interactive practices in reality, but rather, the results of this study represent the interactive practices as teachers themselves perceive and experience the situation. This is also important information in terms of developing teaching development practices in the life sciences.

The challenge of assessing the complex data from portfolios and establishing agreement over the units of analysis was solved by repeated rounds of negotiating on the meaning, clarifying the categorization and striving for explicit peer agreement. Our results cannot be considered

to reflect the majority of educational practices in the sciences at the university context, as the participants were applicants to the Teachers' Academy and therefore a self-selected sample. But still, they can be considered as relevant indications for educational developments within these fields. However, the challenges related to ways of transferring teachers' enthusiasm from informal to formal contexts and expanding the scope of educational development activities at the community level would likely have been even more pronounced if we had had a more heterogeneous sample of teacher portfolios. The fact that most participants had interpreted that participation in the collaborative development of teaching means formal activities may be a limitation of the present study and should also be considered when formulating future instructions for the application process.

Conclusions

There is much potential in the high-quality, teaching-related practices in which shared objects are developed in collaboration. This would mean guiding the communities towards the explanation and refinement of shared objects. We suggest that the potential of interactive practices and collaboration originating from informal settings should be recognised since these are often the platforms for new ideas and they often lead to developmental practices or different artefacts. The various ways to broaden and utilise these developments beyond the discipline-specific contexts should be facilitated. The scholarly teachers should also be made more aware of the formal practices within establishments so that they are able to find ways to inform the leadership and management of their practices more effectively. Future research should investigate whether interdisciplinary and cross-unit collaboration and development efforts proliferate. More research is also needed to determine how academic leadership and management could promote collaborative practices and the creative development of higher education.

Declaration of interest statement

The authors report no conflicts of interest in this work.

References

- Blanton, ML., & Stylianou, DA. (2009). Interpreting a community of practice perspective in discipline-specific professional development in higher education. *Innovative Higher Education*, 34, 79-92.
- Bouchamma, Y., & Michaud, C. (2011). Communities of practice with teaching supervisors: A discussion of community members' experiences. *Journal of Educational Change*, 12, 403-420.
- Cavalieri, J. (2009). Curriculum integration within the context of veterinary education. *Journal of Veterinary Medical Education*, 36 (4), 288-396.
- Clavert, M., Löfström, E., Niemi, H. & Nevgi, A. (2018) Change agency as a way of promoting pedagogical development in academic communities: a longitudinal study. *Teaching in Higher Education*, DOI: 10.1080/13562517.2018.1451321
- Decuyper, S., Dochy, F. & Den Bossche, PV. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organisations. *Education Research Review*, 5 (2010), 111–133.
- Denzin, NK. (2010). Moments, mixed methods and paradigm dialogs. *Qualitative Inquiry*, 16(6), 419-427.
- Faresjö, T., Wilhelmsson, M., Pelling, S., Dahlgren, LO., & Hammar, M. (2007). Does interprofessional education jeopardize medical skills? *Journal of Interprofessional Care*, (21), 573–576.
- Halinen, K., Ruohoniemi, M., Katajavuori, N., & Virtanen, V. (2013). Life science teachers' discourse on assessment: a valuable insight into the variable conceptions of assessment in higher education. *Journal of Biological Education*, 48 (1), 16-22.
- Jones, S., Lefoe, G., Harvey, M., & Ryland, K. (2012). Distributed leadership: a collaborative framework for academics, executives and professionals in higher education. *Journal of Higher Education Policy and Management*, 34 (1), 67–78.
- Kahn, P., Goodhew, P., Murphy, M., & Walsh, L. (2013). The Scholarship of Teaching and Learning as collaborative working: a case study in shared practice and collective purpose. *Higher Education Research & Development*, 32(6), 901-914.

Kothari, A., Boyko, JA., Conklin, J., Stolee, P., & Sibbald, SL. (2015). Communities of practice for supporting health systems change: a missed opportunity. *Health Research Policy and Systems*, 13:33.

Körner, M., Wirtz, MA., Bengel, J., & Göritz, AS. (2015). Relationship of organizational culture, teamwork and job satisfaction in interprofessional teams. *BMC Health Services Research*, 15:243 DOI 10.1186/s12913-015-0888-y

Lakkala, M., Toom, A., Ilomäki, L., & Muukkonen, H. (2015). Re-designing university courses to support collaborative knowledge creation practices. *Australian Journal of Education Technology*, 31(5), 521-536.

la Lopa, J. (2015). The Scholarship of Teaching. *Journal of Culinary Science & Technology*, 11(2), 183-202.

Mafinejad, MK., Ahmady, S., Arabshahi, SKS., & Bigdeli, S. (2013). Effective Factors in the Design and Implementation of the Interprofessional Education from the Faculty Members' Perspective: A Qualitative Study. *Research and Development in Medical Education*, 2 (1), 25-30.

Malik, AS., & Malik, RH. (2011). Twelve tips for developing an integrated curriculum. *Medical Teacher*, 33: 99-104.

McGowan, B., Goode, D., & Manley, K. (2016). Facilitating the development of a shared purpose in a university department: the first stage towards developing a **culture** of shared governance. *International Practice Development Journal*, 6 (2), 1-9.
<https://doi.org/10.19043/ipdj.62.008>

McEvily, B., Soda, G., & Tortoriello, M. (2014). More formally: Rediscovering the missing link between Formal Organization and Informal Social Structure. *The Academy of Management Annals*, 8(1), 299–345.

Miles, MB., & Huberman, AM. (1984). *Qualitative data analysis: a sourcebook of new methods*. Beverly Hills: Sage.

Mårtensson, K., Roxå, T., & Olsson, T. (2011). Developing a quality culture through the Scholarship of Teaching and Learning. *Higher Education Research & Development* 30 (1), 51-62.

Paavola, S., & Hakkarainen, K. (2005). The knowledge creation metaphor—An emergent epistemological approach to learning. *Science & Education*, 14, 535-557.

Pataraiia, N., Falconer, I., Margaryan, A., Littlejohn, A., & Fincher, S. (2014). ‘Who do you talk to about your teaching?’: networking activities among university teachers. *Frontline Learning Research*, 5, 4-14.

Pyörälä, E., Hirsto, L., Toom, A., Myyry, L., & Lindblom-Ylänne, S. (2015). Significant networks and meaningful conversations observed in the first-round applicants for the Teachers' Academy at a research-intensive university. *International Journal of Academic Development*,

20 (2), 150-162.

Roxå, T., Olsson, T., & Mårtensson, K. (2008). Appropriate use of theory in the Scholarship of Teaching and Learning as a strategy for institutional development. *Arts & Humanities in Higher Education*, 7(3), 276-294.

Sawyer, R. K. (2007). *Group genius: The creative power of collaboration*. New York, NY: Basic Books.

Shulman, L. (1993). Teaching as community property. *Change* 25(6), p6. 2p.

Spillane, J., Hunt, B., & Healey, K. (2009). Managing and leading elementary schools: Attending to the formal and informal organisation. *International Studies in Educational Administration*, 37 (1), 5–28.

Tisani, N. (2008). Challenges in producing a portfolio for assessment: in search of underpinning educational theories. *Teaching in Higher Education* 13 (5), 549-557.

Toom, A., Kavén, O., & Pyhältö, K. (2017). Leadership in Researcher Communities – How Is It Organized and Does It Matter? Paper presented at the AERA Annual Meeting 2017, San Antonio, Texas, USA

Trigwell, K., Martin, E., Benjamin, J., & Prosser, M. (2000). Scholarship of teaching: a model. *Higher Education Research & Development*, 19(2), 155-168.

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review* 3, 130–154.

Vaessen, M., van den Beemt, A., & de Laat, M. (2014). Networked professional learning; relating the formal and informal. *Frontline Learning Research* 5: 56-71.

Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. *Education Research Review*, 15, 17-40.

Van Waes, S., Van den Bossche, P., Moolenaar, NM., De Maeyer, S., Van Petegem, P. (2015). Know-who? Linking faculty's networks to stages of instructional development. *Higher Education*, 70, 807-826.

Wenger, E., & Snyder, WM. (2000). Communities of practice: The organizational frontier. *Harvard Business Review*, January-February, 139-145.

Table 1. Categorization of 43 scholarly teachers' interactive practices and the initial setting of the practices

	Setting	
--	---------	--

Category	Formal (<i>f</i>)	Informal (<i>f</i>)	Total (<i>f</i>)
1. Interacting with peers for personal development	12	23	35
2. Sharing good teaching practices	14	68	82
3. Teaching together	13	65	78
4. Producing educational artefacts	4	41	45
5. Developing education systematically	67	8	75
Total (<i>f</i>)	110	205	315

