



Some Theoretical and Practical Aspects of the Organization of the Community of Teachers (on the Example of Inquiry-Based Learning Implementation)

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Abstract: The paper aims to determine the stages and conditions of the creation of academic communities of university teachers for the introduction of innovative pedagogical technologies, using Inquiry-Based Learning (IBL), to highlight the experience of creating such a community at the Borys Grinchenko Kyiv University (BGKU). Researchers have analyzed the organization of professional communities, the impact of their activities on the quality of education and improving the professional level of teachers. The paper contains the research of the practical aspects of the creation and organization of the work of an educational community of teachers, a set of theoretical (analysis and synthesis of Ukrainian and foreign scientific, pedagogical, methodological sources on research issues) and empirical (primary and repeated questioning of teachers of higher education institutions and teachers of secondary education institutions) were the methods used, as well as an analysis of the results obtained. The article demonstrates the impact of teachers' network functioning on teachers' professional activities and implementing IBL in mathematics teaching. It is revealed how participation in the community influences the use of innovative pedagogical methods of teaching mathematics. Teachers from BGKU and other universities were involved in the survey, which had a total of 72

respondents. The survey results were comprehensively analyzed and presented their graph interpretation. This article describes of some theoretical and practical aspects of the development of academic communities of university teachers for the introduction of innovative pedagogical technologies, using IBL at the educational institutions, where the staff work, research and collectively take steps to improve the learning process and research. It is revealed how participation in the community influences the use of innovative pedagogical methods in the teaching of mathematics.

Key words: Community; educational communities; community features; community components; organizing the work of communities; Inquiry-Based Learning (IBL); Erasmus+ PLATINUM.

INTRODUCTION

International studies show that one of the factors behind the progress of educational reforms depends on the individual and the collective capacity of teachers to contribute to improving the educational process. Two different comprehensive studies of the factors affecting student learning have come to the same conclusion: the most important variable in student achievement is the quality of the learning which they daily receive (Marzano, 2003; Hattie, 2012). In order for students to learn better, it is necessary to ensure the quality of teaching. This challenge is particularly acute given that the higher educational system in traditional teacher culture does not consider each discipline as an independent unit where autonomous subcontractors work - teachers are responsible for what happens within their individual subjects. In this culture of isolation, the teacher becomes the center of the individual improvement of his / her competencies and knowledge. Higher educational institutions, as a rule, develop and approve plans for teacher training, involve them in conferences, offer incentive mechanisms to master educational courses, seminars, and more. And now, with the transformation of education, this practice continues, despite convincing evidence that it has little effect on the quality of teaching as it is formal. In addition, in our opinion, the basic thesis of organizing and implementing the traditional approach to upgrading the skills of an individual teacher is erroneous. The intense focus on individuals reduces the conditions and limitations of the educational systems in which they operate.

A direct influence on improving teaching is the constant exchange of the pedagogical experience, a discussion of problems, learning the best practices of their colleagues, their implementation and further discussion in the community of those who are specialists in a particular subject area. Therefore, the implementation

of such practices is critical. Educational communities provide the opportunity for continuing professional development and improvement.

Scholars note that learning communities are delivering positive results for both teaching staff and students. When teachers are part of a professional learning community, it reduces their isolation, increases their commitment to the mission and goals of the institution, creates a shared responsibility for the overall development of students, creates a powerful refresher process that enables the sharing of best teaching practices and enhances understanding of the content of the educational content and the role of the teacher.

The purpose of the article is to determine the stages and conditions of the creation of academic communities of university teachers for the introduction of innovative pedagogical technologies, using IBL, to highlight the experience of creating such a community at the Borys Grinchenko Kyiv University.

BACKGROUND OF RESEARCH

Networking is one of the main modes of collaboration in professional communities. A lot of experts have stressed new trends and the direction of developments of the relationship between individuals and the creation of communities in / via the Internet. In particular, Issa, Kommers, (2013) in their research noted that „In the 21st century a new technology was introduced to facilitate communication, collaboration, and interaction between individuals and businesses. This technology is called Social Networking; this technology is now part of Internet commodities like email, browsing and blogging” (Issa, & Kommers, 2013, p. 5). In the authors’ research (Smyrnova-Trybulska & Žebrok, 2015) and (Smyrnova-Trybulska 2017), some examples of the designing of Internet communities and research networks were analyzed and described. Moreover, the collaboration and self-training network, and its aims are focused upon. Two cases are provided as examples – the Internet platform “Improvement in the Net” and the international research network IRNet (Smyrnova-Trybulska & Žebrok, 2015).

Other authors have analyzed various social network sites in the context of modeling the new business-customer relationship and stressed that “the presence of the corporate sector in Social Network Sites (SNSs) presents a successful method of building proficient relationships with customers that are more compliant with the new facets of consumers’ profile and behavior” (Isaías, Pifano, & Miranda, 2012, p. 248). Italian experts researched the matter of the validation of non-formal and informal learning using Internet communities and described “the case study of the community of practice (CoP) ‘WEBM.org’, ... analyse and discuss the impact of this normative lack about the validation of non-formal and informal learning in Italy” (Leone, Guazzaroni, Carletti, & Leo, 2010, p.111).

Other researchers focus on the internationalisation of a new kind of collaboration. They reflected that: “In recent decades there has been an enormous growth of scientific collaboration across national borders. The number of internationally co-authored scientific articles has grown at an average of 14% per year. Networking is now an important means of enhancing scientific quality. ‘The spread of generic (as Twitter, Facebook, or Google+) or specialized (as LinkedIn or Viadeo) social networks allows sharing opinions on different aspects of life every day’ (Colace et al. 2013, p. 37)”. (Smyrnova-Trubulska, Morze, & Kuzminska, 2019, p.71). As well as, “Web based communities are not only rich in the sense of large and expressive; they are especially rich in terms of socially aware and even vital for deriving trends in political apprehension and consumer behavior as well. Not only the interaction between people is crucial; more and more it is people’s interaction with content through ‘liking’, ‘favoring’, ‘+1-ing’, ‘upvoting’ and ‘sharing’. It is possible to observe a rising or falling trend and predict the rest of the lifespan. However: “is it also possible to capture the causes underlying trend?” (Kommers, & Simmerling, 2015). “A systematic review of research that uses social network analysis (SNA) to investigate virtual communities of practice (vCoPs)” was presented in the research of Shazia (2019).

The scholarly and professional communication is only a small component of a larger Research Lifecycle. It is important to use scholarly communication tools (Open Access for Researchers 1: Scholarly Communications, 2015) to expand access to the results obtained and to organize networking among participants of international teams of researchers (Smyrnova-Trubulska, Morze, & Kuzminska, 2019, p.72).

The highest ranking Communication tools identified include: Social networks (e.g. FB, Twitter, Instagram); Blogs; Skype; Writing.com; Mind Miester (mind maps); Scribblar; Google Classroom; Trello; Google presentation; You Tube; Adobe Connect; Red Pen; Evernote; PaperRater (Morze, Makhachashvili, & Smyrnova-Trubulska, 2016, p. 360). An e-learning training course, the “Development of educational, scientific collaboration and project management with IC tools in universities” covers the actual issues of the organization of cooperation in education, assessment, and application and IC tools in scientific communication, collaboration, development of scientific projects, and research. (Smyrnova-Trubulska, Morze, & Kuzminska, 2019, p.79)

According to an expert model assessment – the top ranking communicative tool falls into the *social media* category (23,21 points). The *social network* engines are designed to store, share, promote, reference and review academic output. The network type interface is designed to facilitate students’ and researchers’ personal collaboration, navigation through the thematic span of academic output, and upload it into the public domain. The major purposes of this collaboration tool include: store; share; interact / network; review; disseminate; upgrade; rate; learn; charter a comprehensive, customized reference stock of one’s research and/or education interests. (Morze, Makhachashvili, & Smyrnova-Trubulska, 2016, p. 362)

The formation and functioning of a community is of particular importance during the COVID-19 pandemic. The document devoted to education during the COVID 19 pandemic highlights the necessity "to promote the solidarity and understanding between the educational community members, this should be cultivated in the mid-term and long term" (UNESCO COVID-19, 2020).

Research Design and methodology

Increasing challenges in the educational system related to educational trends, granting independence to the Higher Educational Institution (HEI), increasing requirements for assessing the quality of education, the emergence of new requirements for socialization and professional and general competencies of students, led to the urgency of the use of internal resources of education systems to solve current educational problems process. One such internal resource we see as an association of professional experts motivated to discuss and look for solutions to make changes in the educational process, taking into account the subject, territorial, and target specificity. Such teams, groups of specialists of the pedagogical environment are called educational communities.

The term "community" is interpreted as a group of people who, for whatever reason, feel belong to one another and have common aspirations, goals, structures (Tönnies, 1887).

Professional communities have a deep history. In Europe, medieval workshops were transformed into different forms of associations. In Ukraine, social communities more often existed on ethnic, demographic and territorial grounds, but professional ones were also represented in the form of manufactories, merchant guilds, and union of lawyers, an association of hunters, and more. The main purpose of such communities is the professional communication of colleagues and associates, during which the constant exchange of knowledge between participants ensures their personal and professional improvement (Verbets, Subot, & Khristyuk 2009). Such associations can also be called a social community - a set of people united by relatively stable social bonds, a relationship that has common characteristics that give it unique identity (Vilkova, 2016).

Sociology is a question of professional communities. Merton defines the professional community as an organization of practitioners, recognized as professionally competent, who have united for the common interest and public good (Merton, 1982). Durkheim states that the idea of professional communities (groups, corporations) is based on solidarity, intellectual and moral homogeneity and naturally arises from the pursuit of one profession (Durkheim, 1990). That is, professional communities must be created in order to fulfill specialized competencies for the benefit of society at large and of relevance to their individual members.

Educational communities allow for the member to develop both personally and professionally. The learning provided by the community depends on the subject matter and objectives of the community itself. Joining a community means first and foremost access to that community's resources. These resources can be both tangible and intangible (Tönnies & Loomis, 2021). Many members of the professional community learn on a collective level, updating their tools, resources, processes and goals in accordance with the collective mind of the participants, which corresponds to the definition of community of practice given by Wenger in 1998. He interprets the concept of a "community of practice" as a group of people who come together around common problems and interests to share knowledge and learn from each other (Wenger, 1998). Participants' ability to influence community development can increase their social value and value in society (Ala-Mutka, & Punie, 2009).

Contemporary writer Michael Fullan, who studies change in education, suggests that "teachers' ability to cope with, learn from, and help students learn will be critical to the future development of society." This means that co-operation and the teaching of teachers, their responsiveness to the needs of a changing society, their ability to communicate, sharing their knowledge and experience to solve problems together, is one of the most important issues in educational policy and practice (Fullan, 2012).

Research shows that the creation and functioning of communities is important for the educational process, as teachers are able to discuss and disseminate how they evaluate their educational activities, show samples of their teaching practice, improve their professional knowledge and skills, share new information and scientific sources of knowledge, which allow for the impact of innovative sources of knowledge, on their pedagogical activity, making management decisions and building a curriculum under certain conditions and changes in the results obtained in connection with changing pedagogical approaches, methods and techniques. They initiate and implement innovative educational projects, which, in turn, serve as tools to ensure the quality of education and, at the same time, the professional competence of teachers.

The term "educational community" is just beginning to integrate into the vocabulary of Ukrainian education. In Ukraine, it is more commonly associated with the virtual space, while foreign studies do not narrow the concept to the web interface. Some educators view the educational community as a dissemination of community-based classroom practices, using both community and human resources. Others identify, under the educational community, the involvement of specialists in educational institutions to improve the curriculum and educational tasks for students. For others, this means that students, faculty, and administrators teach each other through different forms and technologies.

For a clearer understanding of this concept, we define the components of communities (Figure 1).

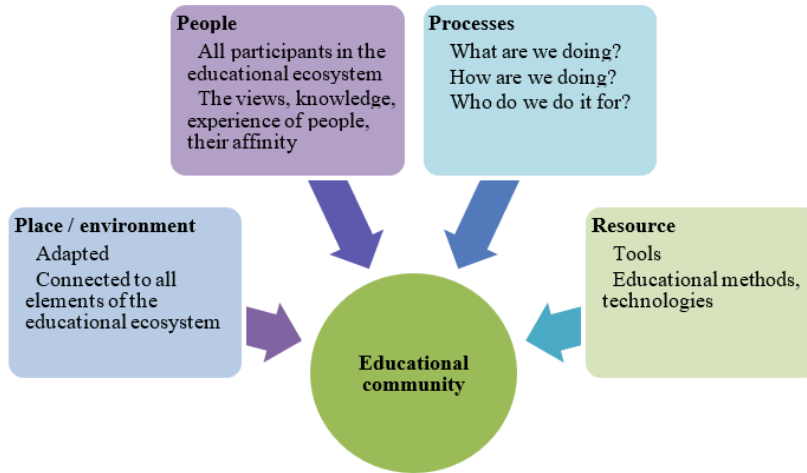


Figure 1: The components of communities

Source: Own work based on Pollard (2012)

The reasons why teachers are brought into the community include the following opportunities:

- solving topical problems in communities, when every professional not only finds the necessary solutions, but also gets the opportunity to apply them "here and now" in their pedagogical and colleagues' activities;

- implementation of ideas of a practical orientation and expediency – with communities aimed at the implementation of applied and in-demand development, which "pushes" to unite the stakeholders;

- innovative nature of the activity, which has great potential for professional self-realization, self-development and effective training;

- the attractiveness of working in a team that gathers professionals of a rather high level (in this case, the process of project work is required);

- the availability of a common bank of information resources, the emergence of new opportunities for open access to innovative developments;

- the ability to enhance the status of each community member and others (Solomatin, 2015).

Wenger identifies 5 stages in the development of the community of practice (Wenger, 1998), such as *Potential*, *Coalescing*, *Active*, *Dispersed*, *Memorable*.

One of the main conditions for the creation and functioning of the educational community is the common goal of its members. A community of teachers was created to institute inquiry-based learning in the study of mathematics in high school with the help of digital tools. The main stages of the creation of a community of teachers at the Borys Grinchenko Kyiv University for IBL implementation were:

- Organizing an organizational meeting with teachers.
- Develop a community-building strategy.
- Preparation of an IBL survey questionnaire.
- Conducting a survey.
- Conducting IBL seminars.
- Identification of the main features of the professional community.
- Creating a community of mathematicians.
- Creating a site for the math community and a wiki page.
- Creating a Facebook page for the community.
- Facebook page support, creation and support of the respective site page.

The capacity-building phase began with an organizational meeting where community members identified directions, relevant activities, and tools for the community to function and expand.

The initial survey of community participants involved identifying respondents with their seniority, the disciplines they teach, the educational institution where they work, their needs and problems in teaching mathematics.

During the community reunion phase, workshops, training courses and workshops were held to address the following issues:

–The concept of "community", including the features of the functioning of the community and its function.

–STEM education and innovative methods - Project-Based Learning (PrBL), Problem-Based Learning (PBL), IBL. Similarities and differences of the methods PrBL, PBL, IBL.

- Research questions. Criteria inquiry questions.
- IBL stages and study cycles. Model 5E of IBL implementation.
- Examples of mathematical research environments in GoLabz.

The stage of activity in the created community involves the creation and discussion of training cases, exchange of experience in implementing IBL, holding open classes, developing templates for research problems, creating a database of mathematical modeling problems. Currently, community teachers have been actively working at this stage. This made it possible to investigate the impact of community functioning on teachers' professional activities and the process of implementing IBL in mathematics teaching.

During the research of practical aspects of the creation and organization of the work of the educational community of teachers, a set of theoretical (analysis and synthesis of Ukrainian and foreign scientific, pedagogical, methodological sources on research issues) and empirical (primary and repeated questioning of teachers of higher educational institutions and teachers of secondary educational institutions) methods were used, as well as analysis of the results obtained. The research was carried out within the framework of the international project, "Partnership for learning and teaching in university mathematics (PLATINUM)", programme Erasmus+ KA203 – Strategic partnerships for higher education, 2018-1-NO01-KA203-038887.

Teachers from Borys Grinchenko Kyiv University and other universities are involved in the survey, in which 72 respondents took part. All participants in the survey were active participants in all activities, were involved as participants in trainings, meetings for discussion, provided fitbacks, and shared their own experiences throughout the existence of the community.

RESULTS OF THE RESEARCH

One of the goals of the study was to find out if community involvement had an impact on the use of innovative pedagogical mathematics teaching methods. The survey results of the educational community showed that the percentage of teachers who started using the project method (30.6% at the beginning of the community, 50% at the stage of community activity), research (33.3% and 66.7) and a research-cognitive approach (41.7% and 83.3% respectively) increased significantly (Figure 2).

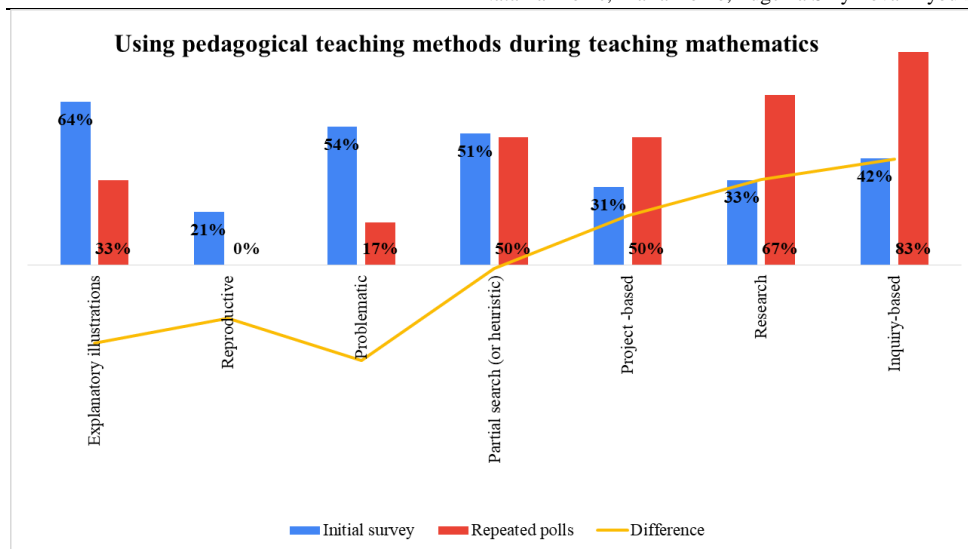


Figure 2: Changes in the use of innovative pedagogical methods in teaching mathematics. Source: Own work

It is interesting that there are changes in the forms of work that community members with students have begun to apply. At the beginning of the joint activity, the teachers most often used the group form of work (70.78%) and the individual (70.78%). After the exchange of experience and participation in workshops, the group form of work of students became the priority (83.3%). The percentage of use of individual forms of work decreased by 20.8%. (Figure 3).

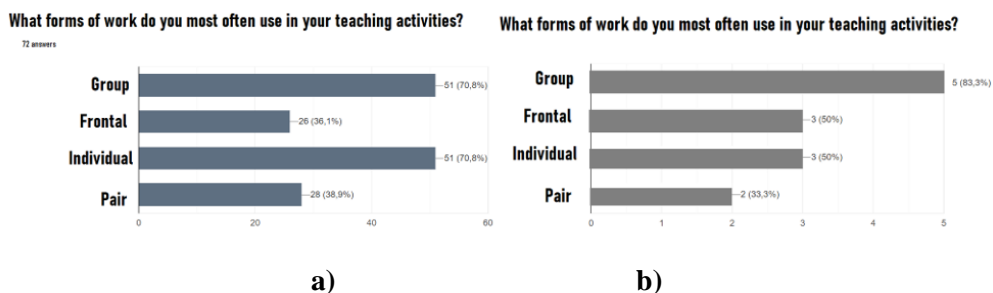


Figure 3: Changes in the use of forms of work in teaching mathematics by teachers before (a) and after (b) participation in the workshop

Source: Own work

All study participants acknowledged that sharing experiences in the community encourages them to organize student learning in pairs, or in small groups (Figure 4).

Does it encourage you to organize students (or students) in pairs, in small groups, after sharing experience in the community?



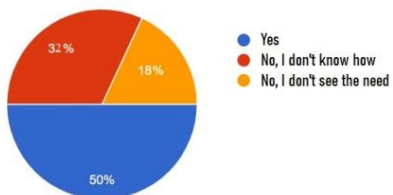
Figure 4: The result of the survey on the organization of work in groups

Source: Own work

One of the technologies that were being developed during the community meetings was the flipped learning technology. The result of sharing experiences and identifying the features of the organization of this approach in the study of mathematics has led to an increase in the percentage of teachers (at the beginning of community work - 50%, at the stage of community activity - 66.7%), who began to use the "flipped classroom learning" method in their own professional activity. (Figure 5)

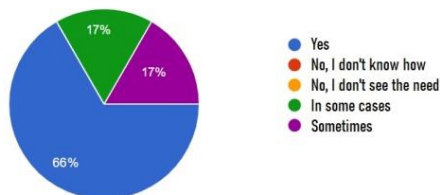
Do you use technology "flipped classroom"?

72 answers



a)

Do you use technology "flipped classroom"?



b)

Figure 5: Changes in the use of "flipped classroom" technology in mathematics teaching by teachers before (a) and after (b) workshop

Source: Own work

Participants in the educational community have defined their role in applying IBL. The primary and secondary polls showed a difference in priorities. The participants ranked the role of the teacher from 1 to 7, where 1 is absolutely not important, and 7 is extremely important. As the result shows, teachers are interested in engaging with Model 5E (Bybee, Taylor, Gardner, Van Scotter, Powell, Westbrook, & Landes, 2006), that is, students' motivation for research and cognitive activity, while planning itself has become less important, demonstrating the willingness of teachers and their students to use the open inquiry in IBL (Banchi, & Bell, 2008). (Figure 6)

The role of the teacher in the implementation of IBL

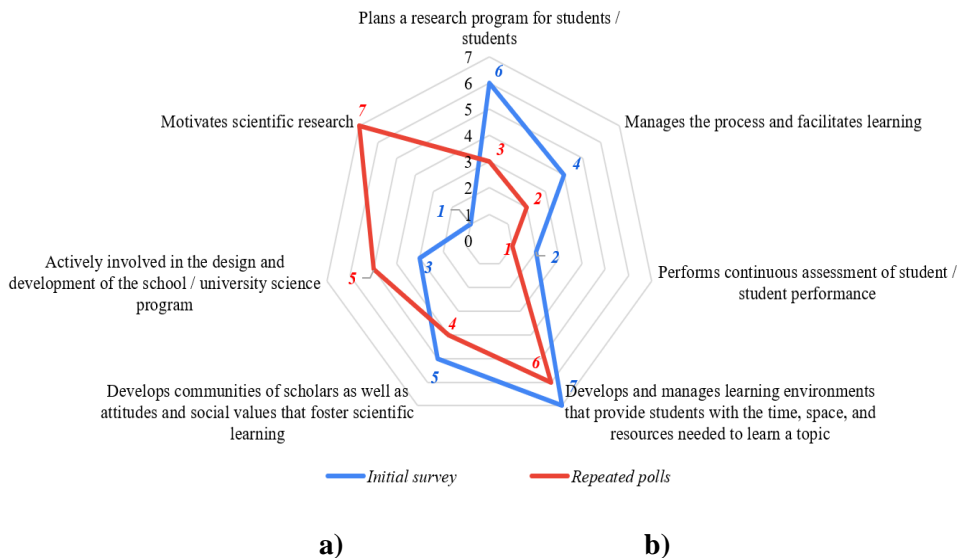
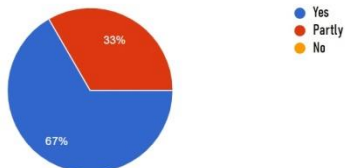


Figure 6: Changing the role of the teacher in the implementation of IBL by teachers before (a) and after (b) workshop

Source: Own work

Analyzing the role of the community in implementing IBL for mathematics teaching, teachers answered the question, “Did you learn anything new about IBL after sharing your experience in the community?”: 100% - Yes, many interesting cases and techniques. To the question “Has community work allowed you to share your experiences, research, and observations?”: Yes – 66.7%, Partly – 33.3%. (Figure 7.)

Has your community experience allowed you to share your experiences, research, and observations?



Did you learn anything new about IBL after sharing your experience in the community?

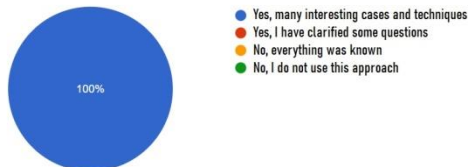


Figure 7: Results of analyzing the impact of community engagement

Source: Own work

DISCUSSION AND CONCLUSIONS

The experience of creating and participating in the teaching community of teachers of mathematics and information technology has confirmed the assumption that professional communities can enrich the process of the professional development of university professors due to a number of benefits of their functioning: a community of people interested in knowledge sharing is created; the designing of educational environments in which participants can share resources; the reduced time to search and use information; facilitating the process of the implementation of innovative technologies; conditions are created to ensure the quality of education; training courses are updated through the introduction of new cases; the university has the opportunity to expand international cooperation. Activities within the project "Partnership for learning and teaching in university mathematics (PLATINUM)", involves creating and maintaining professional communities not only in a single educational institution, but also the expansion of the community internationally, the introduction of innovative approaches and the latest information resources. The competent introduction and support of the Teacher Communities provides the opportunity to increase the professional level of the teacher, the level of student preparation, and is a powerful motivational tool for promoting the teaching and self-improvement of the teachers.

Future research is focused on exploring digital resources to meet community needs and develop proposals for ways to develop communities, as well as increasing the soft and key competencies of teachers and learners.

ACKNOWLEDGEMENTS

The research, the results of which are presented in the article, was conducted within the framework of the project, "Partnership for learning and teaching in

university mathematics (PLATINUM)", Program Erasmus + KA203 - Strategic partnerships for higher education, 2018-1-NO01-KA203-038887. This article reflects the views only of the author, and the European Commission cannot be held responsible for any use which may be made of the information contained therein.

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