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Technology environment that accelerates sharing and professional development for mathematics teachers
The case of "RAMZOR"

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Prof. Atara Shriki
Prof. Nitsa Movshotiz-Hadar

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for National Policy Research

An internal report following
a conference presentation

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Executive Summary

The multi-phase Study described in this paper is a part of an R&D project aimed at examining the development and the implementation of a digital environment named RAMZOR for constituting opportunities for professional collaboration among mathematics teachers and supporting their efforts to plan and realize their complex daily tasks. The results of the study indicate that by providing a suitable framework for teacher collaboration and sharing of knowledge, a digital environment such as RAMZOR has the power to facilitate the development of mathematical and didactic knowledge of teachers who document their plans ahead or share their experience retrospectively, as well as of those teachers who are inspired by their colleagues' documentation and adopt them. The study also indicates the potential of RAMZOR to serve as the pillar of the mathematics teachers' community of practice. The examination of this potential and the conditions necessary to make RAMZOR an environment that nurtures an independent and sustainable national community of mathematics teachers is the focus of our on-going research.

1. Theoretical Background

1.1 Introduction

"Ramzor to the North" project was launched in August 2014, in preparation for the opening of the school year 2014/15, to address the shortage in the Northern District who of mathematics teachers have the appropriate knowledge to teach mathematics at the 5-unit level. The shortage of teachers has caused, among other things, that in 2013, only about 7.6% of the students in the district obtained a high school matriculation certificate that includes mathematics at 5-unit (the highest possible) level. The policymakers of the district decided to increase the percentage of graduates who would be ready to take the high school matriculation in mathematics at the 5-unit level. To realize this policy, it was necessary to increase the teachers' capability to take on the challenge, thereby enabling schools to open additional classrooms for students who wish to study mathematics at the 5-unit level, and to reduce the size of existing classes, thus providing students with more personalized teaching. Increasing the teacher's capability involved strengthening the mathematical and didactic knowledge of teachers who have a willingness to teach mathematics at the 5-unit level, but have not yet experienced it, and do not have the necessary mathematical background. The educational system has a wide range of models designed to support the professional development of teachers in the mathematical and didactical aspects. However, experience indicates that intervention programs implemented in schools by external parties have a temporary effect, which gradually fades out soon after the external factor ends its intervention. Conversely, moves designed to form an autonomous and independent professional community may contribute to the development of a professional community of teachers who consistently strive to improve teaching to achieve teaching goals.

The rapidly increasing use of web media such as Wikipedia, social networks like Facebook, and databases with search engines such as Google, inspired us to consider the idea of constructing a suitable web-platform for preserving, accumulating, and continuously improving mathematics teachers' practical knowledge through applying collaborative efforts in designing lesson plans (LPs), periodic or thematic teaching programs, evaluation items and assessment tests.

We took upon the challenge and developed a collaboration-facilitating computer environment which we named RAMZOR. This name means "a stoplight" in Hebrew, as metaphorically, this site is supposed to serve the ordinary mathematics teacher so that s/he can do the following daily: STOP to explore and consider other colleagues' ideas; PREPARE for teaching a specific class; and GO to the classroom, implement and possibly reflect upon the implementation of the plan, or share it with others (Movshovitz-Hadar, 2018). In what follows, we describe RAMZOR, its rationale and features, and the attentive process of its design. We also provide findings from evaluation studies and formative assessment ones that accompanied the development and refinement of RAMZOR throughout its employment by mathematics teachers.

1.2 Background for the construction of RAMZOR

Barber and Mourshed (2007) phrased an appropriate motto for our study: "the quality of an educational system cannot exceed the quality of its teachers" (ibid p. 11).

It has become well known that teaching is an extremely complex profession. Teachers need to possess a wide range of skills and various types of knowledge, e.g., pedagogical knowledge that relates to teaching materials and methods, knowledge about students' learning, the capability of analyzing reflectively their actions and their impact, and much more (Shriki & Lavy, 2012). But above all, they should be able to integrate these skills and knowledge and employ them when they prepare their LPs and other teaching materials. In fact, the daily design of LPs is at the heart of teachers' professional work. However, in most cases (at least in our country) teachers prepare their LPs "in mind" and the preparation of detailed LPs is considered to be an "unnecessary burden" required only in pre-service teacher education. Even after teaching a certain lesson, the LP is not recorded and, at best, notes are written in the textbook for future reference. As a result, at the individual level, drawing conclusions is limited, and at the professional community level, there is a lack of sharing practical knowledge with colleagues (Movshovitz-Hadar, Shriki & Zohar, 2014). This stands in contrast to the recognized benefits of sharing knowledge through joint lesson planning: "we discovered the magic of effective joint lesson planning… The expectation of teachers is not only that they should develop and employ effective practices in the classroom, but that they should share them throughout the whole system. Best practice therefore quickly becomes standard practice, adding to the pedagogy" (Mourshed et al., 2010, p. 77)

Indeed, as evident from the McKinsey report (Barber & Mourshed, 2007), one of the main factors that contribute to the success of any reform is nurturing teacher cooperation and the next generation of system leaders to ensure long-term continuity in achieving reform goals. To that end, teachers must be treated as trusted professional partners, and need to be given the tools and responsibility to lead change (OECD, 2011). Acknowledging that the "professional wisdom" lies, first and foremost, at the hands of the teachers, who are the ones carrying out the task of teaching, we believe that they are the ones who ought to develop and improve the teaching and learning materials, preferably in a cooperative manner.

The idea underlying the design of RAMZOR as a digital platform that facilitates collaboration among teachers anytime, anywhere, was to provide teachers with a communal environment that would enable them to preserve their resources, share and discuss their practical knowledge and daily experience, develop and jointly improve materials for teaching and learning, and more. In other words, the ultimate goal of RAMZOR is to support the development of mathematics teachers' community of practice (TCoP).

1.3 Professional learning communities (PLC) and community of practice (CoP)

The two notions, PLC and CoP, share similarities as well as differences in the context of the models they are based on (Blankenship & Ruona, 2007; Vangrieken, Meredith, Packer, & Kyndt, 2017). This is particularly true for issues related to membership, leadership, organizational culture, and knowledge sharing. While the PLC models draw from learning organization theory, CoP draws from situated cognition, social learning theory, or knowledge management theory. Thus, whereas PLC models address team or group learning focusing

mainly on students' needs and increasing students' achievement, CoP models address the need for alignment to the organization strategy and they are focused mainly on the improvement of practice. In addition, PLC models highlight the role of an external leader while the CoP models favor leadership from within the community. Nonetheless, both models provide a theoretical framework for a study towards a better understanding of ways to facilitate teachers' learning and collaboration processes as well as their specific effect on teachers' practice and students' learning.

According to Wenger (1998), for a community to be recognized as a CoP, three conditions must be met: (i) a common domain of interest; (ii) members who are engaged in joint activities and discussions, assist each other, share information, and nurture relationships that enable them to learn from one other, although they do not necessarily work together regularly; (iii) members of a CoP are practitioners who develop a shared repository of resources and ways of addressing frequent problems, thereby are engaged in the process of mutual learning. In general, national communities of mathematics teachers, conform to Wegner's first two characteristics: they share an interest in mathematics, its teaching, and learning, many of them meet in professional conferences, read professional journals, and share a professional language enabling them to learn from one another. However, the third characteristic, to a large extent, is still missing in many national communities of mathematics teachers, and the one in Israel in particular. Although a vast majority of them teach mathematics regularly, only a small number of mathematics teachers develop their own repertoire of resources and fewer share them with the entire community (Shriki & Movshovitz-Hadar, 2011).

While conceiving RAMZOR, we intended to develop a dedicated "home address" for the entire professional community of mathematics teachers in Israel, viewing the nurturing of TCoP as promoting the share of knowledge thus supporting the improvement of teachers' practice.

2. RAMZOR a digital environment

RAMZOR digital environment for teachers (https://RAMZOR.sni.technion.ac.il) was developed by “Omnisol Information Systems LTD.” It was originated as a “structured Wiki” platform – a Wiki that manages structured objects. Some of its capabilities are similar to “MediaWiki”, which include a dedicated text editor, discussion page, versions control, personal user pages alerts and more, while its “structured” capabilities include advanced search competencies, monitoring and permissions management. RAMZOR allows collaborative development and improvement of teaching and learning materials of various types and encourages professional interaction among teachers.

Writing the details is done on pre-determined Word file templates (for LP, Thematic or periodic program, assessment items or evaluation tests) which are preceded by several descriptive details. For instance, the preceding details for a Lesson Plan (LP) are: the title of the lesson; prior knowledge required; students' grade and study level; behavioral objectives of the lesson; anticipated difficulties and how to manage them; and more. The LP template includes a detailed reference to each part of the lesson, the time allotted to them, the flow of the lesson in the form of teacher-student dialogue, and more. In addition, auxiliary materials can be attached, such as student worksheets, assignments for homework and links to relevant applets. RAMZOR also enables users' comments to each entry, feedback and elaboration on it. Each teacher has

his/her personal area and can, to respect privacy, choose who to share the materials with, from keeping a draft for personal viewing to the sharing with the entire community.

2.1 RAMZOR: three preliminary design studies

In designing RAMZOR, we implemented a multi-phase study process that included three preliminary studies aimed at examining the contribution of collaborative writing of teaching materials to the professional development of mathematics teachers as well as evaluating the suitability of RAMZOR's features to teachers' needs (Segal, Shriki, Movshovitz-Hadar, 2016).

2.1.1 Preliminary study 1 - My favorite mathematics LP

This study focused on teachers' willingness to share their LPs with colleagues. Via an e-mail, we approached about 400 middle and high school mathematics teachers, asking them to send their favorite LP, written according to specific guidelines provided in advance. They were asked to approve uploading their LPs to a designated open web site. The teachers were told that among the senders, there would be a lottery with monetary prizes. Four rounds of raffles took place in 6 months intervals. Only 10-15 LPs were sent to each round. This first step left us not only disappointed but with many open questions related to teachers' responsiveness and motivation to share their LPs with their colleagues.

2.1.2 Preliminary study 2 - Joint lesson planning on MediaWiki system.

Eleven graduate students experienced high school mathematics teachers, participated in a semester-long activity in which they collaboratively designed LPs on a MediaWiki system. At the time this experiment was carried out, MediaWiki seemed to us as the best available platform for facilitating collaborative group work aimed at developing a dynamic repository of LPs and discussing educational ideas. Results of a study that followed the teachers' experience (Shriki & Movshovitz-Hadar, 2011) indicated that the process of joint lesson planning supported the development of the participants as a small TCoP that interact daily, discuss ideas, and share LPs and other professional resources. The results also pointed at many concerns of the participants, categorized as social and technical ones.

These results led us to recognize the need for teachers to arrive at agreed-upon social norms for managing a shared repository of learning and teaching resources as a necessary preliminary condition for nurturing teacher cooperation. We also realized that the technical concerns related to MediaWiki make it an inappropriate platform for accumulating, preserving, and improving mathematical LPs. To develop a more appropriate environment, we approached Omnisol Information Systems Company and started the development of RAMZOR digital environment mentioned above.

2.1.3 Preliminary study 3 - A 3-day summer school for joint lesson planning.

With the insight gained from study 2, we organized a 3-day summer school for two consecutive years in which two groups of selected teachers designed LPs (individually or in pairs/small groups), provided feedback to peers' LPs (orally or in writing), improved their LPs after receiving

feedback, and reflected upon the entire process. Data was gained through questionnaires, interviews, transcripts of small groups discussion and whole group ones, and content analysis of the LPs and feedbacks (Movshovitz-Hadar et al., 2014). Our findings indicated that ongoing processes of collaboration and sharing are rare in schools. According to the teachers, this situation is a result of several causes, among them: (1) Heavy workload that leaves no time for interaction; (2) Mathematics teachers' tendency not to consult their colleagues for fear of being perceived as having insufficient mathematical knowledge; (3) In small schools there is often only one mathematics teacher for certain grades/levels of teaching, and therefore has no colleague to consult with; (4) A lack of awareness to the benefits of cooperating and sharing knowledge. The LPs were written using the early version of RAMZOR digital environment. This enabled participants to relate to the LPs and enabled us to witness shortcomings of the digital environment, thus, to extend our R&D efforts towards improving the suitability of RAMZOR as a tool for managing professional knowledge. The teachers' reflections indicated that they had developed an awareness of their personal gains from writing LPs and receiving peers' feedback. The teachers also pointed out that writing LPs and sharing knowledge strengthened their self-efficacy and contributed to empowering them as members of the TCoP, and in particular, as expressed by one of the participants "the fact that academia finally understands that teachers are the ones who possess the professional knowledge, and the ones who can be trusted to chart the way, has increased our professional stature".

In summary, two main observations were reached through the three preliminary studies, based on which we kept developing the digital environment: (i) Although teachers recognize the benefit of being exposed to other teachers' materials, they do not rush into the opportunity to share their own LPs, unless they are put in a framework that makes them do it; (ii) Once provided with a digital environment that enables lesson planning, teachers become aware of the major role of planning their lessons in details, in terms of the effectiveness of teaching, improvement of the teaching quality, and deepening of learning.

As typical to R&D projects, we put less emphasis on developing, testing, and advancing theory (OECD, 2004). Rather, our focal points are concerned with the design of a long-term effort, situated in the real-life school settings, which involves a larger sample of mathematics teachers using RAMZOR for planning their work and sharing their experiences.

3. RAMZOR in practice: The main study

Following the aforementioned preliminary studies, during 2014-2017, we conducted a three-year intervention in 20 high schools. In the background, there was a sharp decline between the years 2006-2014 in the number of students taking matriculation exams in mathematics at the highest possible level (called in Israel – 5-units), which resulted, among other things, from a severe shortage of teachers willing to teach mathematics at this high level. There was a need to support the development of a professional and independent CoP of mathematics teachers who teach mathematics at the 5-units level.

3.1 The intervention was based upon three central pillars

3.1.1 Mentoring

An experienced mathematics teacher ("the mentor") was responsible for one or two teachers from the same school ("the mentee"). Altogether there were 20 mentors and 24 mentees from 20 high schools. The mentoring included: mutual observations in classes, preparation of teaching programs (periodic or thematic), and designing LPs and evaluation items. The mentors shared their mathematical and didactic knowledge that is sufficient for 5-unit level teaching and support the mentees' self-confidence while teaching mathematics at the 5-unit level. Each one of the mentees will receive close mentoring from their mentor during their experience in teaching the 5-unit level of mathematics at the 10th grade (in the year 2014/2015), 11th -grade (in 2015/2016), and 12th grade 12(in 2016/2017).

The research literature provides an extensive discussion of the advantages of the mentoring model, in particular of school mentoring (e.g., Kadji-Beilran, Zachariou, Liarakou & Flogaitis, 2014);

3.1.2 Utilizing RAMZOR

Teachers' unique knowledge includes, among others translating the material found in the textbooks into lesson plans and their daily practice in an interesting and challenging way in a particular classroom. The lesson plans describe the teacher's personal interpretation of the curriculum and / or textbooks in affinity for a particular class, or in other words, lesson plans (Lps) are at the heart of the teacher's professional work. The documentation of Lps and evaluation items can help preserve existing professional (mathematical, pedagogical, and practical) knowledge with a collaborative effort, and can contribute to the development of an autonomous and sustainability professional community of teachers as well as community discourse. In other words, collaborative writing of teaching and learning materials is a process that leads to the pooling of knowledge and may address problems that not every individual in the community can solve satisfactorily on his own.

The mentors and mentees were engaged in collaborative writing of LPs, in RAMZOR a digital environment, as well as teaching programs and evaluation items for various topics included in the curriculum. Teachers implemented the LPs in their classes as well as those written by their peers, provided feedback, and wrote "parallel" versions adapted to their classes;

3.1.3 Professional development workshops for mentors and mentees

During each of the three years of the project, there were periodic online and face-to-face meetings with the project staff. The online sessions were held separately for the mentors and the mentees, while the face-to-face meetings were for both the mentors and mentees. The workshop content deal with the various aspects of mathematics teaching at the 5-unit level, integrating technological tools through teaching, helping teachers to develop students' perception of mathematics as a dynamic and evolving field that has implications for all fields of science and technology. In addition, the mentors addressed issues related to mentoring skills.

At the end of the 2014/2015 and 2015/2016 school years, all the teachers (mentors and mentees) participated in summer school workshops.

3.2 Research questions

The study that accompanied the 3-year intervention project addressed several research questions. In this paper, we focus on the following two of them: What is the contribution of collaborative writing of teaching materials using RAMZOR: (i) To the personal, professional development of the participants (mentors and mentees)? (ii) To the development of participants' involvement as members of a mathematics-TCoP?

3.3 Research instruments

Four main research instruments were used to gather information: (i) A monthly formative assessment questionnaire; (ii) Recording of the online and face-to-face meetings; (iii) An examination of the LPs, teaching programs, and evaluation materials written in the RAMZOR; (iv) Semi-structured interviews.

3.4 Data analysis

A qualitative research paradigm was employed. First, the data were analyzed through a process of open and axial coding to identify the main categories and sub-categories (Corbin & Strauss, 2008). In the second stage, a triangulation process was implemented, comparing the categories obtained from each research tool (Miles & Huberman, 1994). The third phase of the analysis consisted of reviewing the findings obtained at the first and second stages while focusing on data related to the participants' professional development and the development of mathematics-TCoP.

3.5 Results

Due to space limitations, we focus on partial findings that relate to the contribution of using RAMZOR to the teachers' mathematical and didactic knowledge, as indicators of professional development, as well as to their sense of belonging to TCoP. In the questionnaires distributed at the end of each year, the participants were asked to express their consent with the statements: "Reviewing and employing other teachers' LPs contributed to my mathematical knowledge" and "Reviewing and employing other teachers' LPs contributed to my didactic knowledge." Table 1 presents the distribution of the degree of teachers' agreement with the statements on a five-level Likert-type scale, both for mentors and mentees, at the end of the third year of the project.

Table 1: Distribution of mentors' and mentee's degree of agreement with the statements: Reviewing and employing other teachers' LPs contributed to my: mathematical knowledge (Stat. A); didactic knowledge (Stat. B), in percentage

Teachers	Degree of Agreement									
	A very large extent		A large extent		A medium extent		A little extent		Not at all	
	Stat. A	Stat. B	Stat. A	Stat. B	Stat. A	Stat. B	Stat. A	Stat. B	Stat. A	Stat. B
Mentees (N=24)	22	22	64	71	14	7				
Mentors (N=20)		25	54	44	46	31				

The data in Table 1 indicate that both the mentors and the mentees perceive the reviewing and employment of other teachers' LPs as contributing to their mathematical/didactic knowledge at least to a medium extent. In addition, the mentees perceive this contribution as more meaningful than the mentors. Recall that for the mentees, it was the first experience in teaching high-level mathematics. Therefore, one could expect that reviewing and practicing the detailed LPs in RAMZOR that were written collaboratively by mentors and mentees will be more beneficial to the mentees, in terms of mathematical and didactic knowledge, than for the mentors. The following are several typical quotations from the participants' entries (translated from Hebrew). As for mathematical aspects, participants wrote: "There were LPs that exposed me to new ways of proving theorems that involve geometry locus. For example, I learned that homothetic transformation enables the preservation of the loci features" (a mentee); "In one of the LPs, there was a clear visual explanation for the meaning of the integral formula. It opened my eyes, and I realized that I understood (and taught) it technically" (a mentee); "The very fact that I had to write an LP about conic sections made me delve into the little details I was not sure about in the case of the hyperbola. When you teach, you can sometimes "smooth things out", but not when you know your colleagues will read and use it" (a mentor). As for didactic aspects, participants wrote: "I applied the LP on similar triangles with the problem-posing approach, and students' problems actually help me to understand how students understand the topic and process information" (a mentee); "I tried the LP on presenting the solution of distance word problems graphically, and I realized that it helped many students understand the verbal formulation and identify the connections between the givens" (a mentee); "I understood how a thoughtful integration of technology can respond to students' difficulties. I applied the LP where there was an applet demonstrating the relationship between the tangent slope and the derivative of a given function, and since then I look for LPs in RAMZOR that integrate technology" (a mentor); "My mentee found an LP in trigonometry with 3D applications. Together we analyzed this LP and thought it might help many students to see spatial information. We tried it in class, and for many students, it was kind of a breakthrough. They were finally managed to see things" (a mentor).

The participants were also asked to express their consent with the statement: "Sharing my lesson plans with other teachers contributed to my sense of belonging to the teacher community

of practice". Table 2 presents the distribution of the degree of teachers' agreement with the statement, both for mentors and mentees, at the end of the third year.

Table 2: Distribution of mentors' and mentee's degree of agreement with the statement: Sharing my lesson plans with other teachers contributed to my sense of belonging to teacher community of practice, in percentage

Teachers	Degree of Agreement				
	A very large extent	**A large extent**	**A medium extent**	**A little extent**	**Not at all**
Mentees (N=24)	**29**	**43**	**28**		
Mentors (N=20)	**31**	**38**	**23**	**8**	

As evident from Table 2, most of the mentors and the mentees reported that sharing LPs with their peers contributed to their sense of belonging to TCoP at least to a medium extent. The following are typical quotations from the participants' entries (translated from Hebrew): "*When I write a lesson plan in RAMZOR, I get constructive feedback from colleagues. It is really important because we don't have opportunities to share our ideas and products and get feedback on what we do. For me, this is the meaning of a community*" (a mentee); "*When I share my lesson plans, I feel that I am contributing not only to my mentee but to the entire community. It is like remaining your legacy. Otherwise, it would disappear. It really makes me happy and proud*" (a mentor).

the mentors' exposure to other mentors and mentees teaching materials available in the RAMZOR a digital environment, expanding their mathematical and pedagogical knowledge as mathematics teachers as well as mentors of mathematics teachers at 5-unit level. In addition to the mutual sharing of lesson plans, the mentors took an active part in photographing their lessons and publishing them in the software along with a detailed lesson plan. This phase was probably the beginning of the emergence of a 5-unit mathematics teacher community and an understanding of the value of sharing within the community that developed as the project progressed. The collaboration was reflected in the collaborative work of the mentors with mentors from other schools participating in the project on various teaching and instructional issues. The collaboration began to expand among all teachers participating in the project. The collaboration phase intensified greatly in the third year of the project, developing personal and professional relationships between the mentors and other community members, enjoyment and satisfaction from the collaborative work, community sharing. Sharing their instructional materials and identifying the added value of this mutual sharing promote the mentors' professional development as teachers at the 5-unit level, and as mentors of teachers who start their careers in teaching mathematics at the 5-unit.

From an mentees' perspective one of the significant things that emerged from sharing and implementing lesson plan was the insight that *"I am not alone. It is not only me who is facing existing difficulties in teaching math at level 5-unit, but there are other teachers who are facing a similar challenge and sharing it and these helps me"*; "*The collaborative work allows us to get*

to know the other mentees better and consolidates us, which makes our training together more meaningful". The mentees expressed a desire to become more familiar with the process their peers are going through*: "It is interesting to exposed to others mathematical and pedagogical ideas and also sharing when these ideas were successful or not, why, and what was the reason"*.

During the three years of the project and, more specifically, in the third year, the mentees identified the added value of sharing as a source for expanding their mathematical and didactic knowledge, as well as their sense of belonging to the community, with the teacher community exposed to their lesson plan. All of the mentees noted that the teacher community's sharing of their lesson plan with the "RAMZOR" contributed to their sense of belonging to the community. 71% largely agree or definitely agree, the rest moderately agree. In addition to the mentees' reporting of a sense of belonging to the community following mutual use of existing lesson plans in RAMZOR, approximately 79% of the mentees reported that mutual sharing of lesson plans contributed greatly to their self-confidence as mathematics teachers. The sharing process allowed teachers to be exposed to a rich repertoire of organized mathematical and didactic ideas based on teaching topics from the 5-unit level that do not exist in student textbooks or other sources: *"Lesson that I upload to the software from time to time receive feedback from peers and so far the responses have been mostly positive with constructive criticism."; " Getting a compliment from a teacher with my own experience will probably give me the confidence that I am progressing very well ";" When I feel that it is difficult for me to write a set of lessons, reading Lps at RAMZOR a digital environment solves my problem in most cases".*

4. Discussion and conclusions

The multi-phase study described in this paper indicates that spontaneous processes of sharing practical knowledge among teachers are not common. Lacking feedback on their work, many teachers feel a sense of isolation. Therefore, it seems that RAMZOR digital environment addresses a real need of teachers, as it provides a suitable environment for teacher collaboration. The results of the main study indicate that RAMZOR became a set-up for teacher collaboration and the sharing of knowledge. The fact that the repository includes detailed LPs and not merely anecdotal information facilitated the development of mathematical and didactic knowledge both of mentors and mentees, as composers as well as consumers of LPs.

From the mentor's point of view using "RAMZOR" environment for writing LPs, instructional programs, evaluation items, and writing comments to LPs existing in "RAMZOR", they had an impact on their classroom teaching and mentoring the mentees during the three years of the project. The mentors reported the contribution of detailed Lps to expand their mathematical and pedagogical knowledge, to effective lesson time planning, to better prepared for teaching with anticipated student difficulties, and to a more interesting lesson for students. In addition, working with the software enabled them to improve the mentoring process by assisting in writing relevant lesson plans to the mentees. As the project progressed, the mentors became more aware of the responsibility of the sharing process, which required the writing of planned, detailed and accurate teaching materials.

From the mentees' point of view using "RAMZOR" for writing lesson plans, instructional programs, and providing responses to existing lesson plans in this digital environment, there

was a significant impact on the preparation and planning process of their teaching in the classroom environment and on the quality of their teaching. From a mentee's perspective, working in RAMZOR has created a framework for writing, documenting and sharing the teaching materials they have written both in collaboration with the mentors (mainly in the first year of the project) and which wrote independently later. At the beginning of the project (school year 2014/2015, the software was a source for the mentees to find instructional materials containing mathematical and pedagogical ideas for writing relevant lesson plans. The mentees reported the contribution of working in "RAMZOR" for their professional development as beginning teachers at the 5-unit level.

In addition to the above, "RAMZOR" has a major contribution to the development of the teacher community for an independent and collaborative teacher community. The collaborative writing of teaching materials of the mentees with the mentors and mentees from other schools (during online and face to face meetings) and their documentation in the “RAMZOR” indicates that the mentees group had taken its first steps in transitioning from a professional learning community (PLCs), to a Community of Practical Communities (CoP). The group of participants worked collaboratively, sharing, documenting, and consuming collaborative instructional materials relevant to the teaching of 5-unit level mathematics.

The results of the study point out the potential of mathematics teachers’ collaborative work with RAMZOR to support the development of mathematics-TCoP. According to the definition of Wenger (1998), the teachers in this study had interest in a common domain: improving their mathematics teaching at the 5-unit level, they were engaged in joint activities and discussions, assisted each other, shared practical knowledge and learned from one another. All these were made possible due to the collaborative nature of RAMZOR environment. However, it should be noted that the work of the mentors and mentees was carried out as part of a project in which we, as the managers of the project, were involved in direct connection with the participants. Therefore, to examine the feasibility of TCoP development without our direct involvement while maintaining RAMZOR as the pillars of teachers' collaborative work, in September 2017, we started a new 3-year R&D project. Thirteen high schools in one of the largest cities in our country are taking part in this project. Two teachers from each school are working with the project team staff regularly, while at the same time, they work with their entire mathematics teachers school staff aiming at the establishment of a local school as well as an overall municipal independent and sustainable mathematics-TCoP. Our ultimate goal is to nurture such a national mathematics-TCoP, turning RAMZOR digital environment into an accessible fruitful repository for the benefit of all teachers. Further research is needed to examine the conditions necessary to achieve this goal.

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