

DAPHNE COHEN-BRENNER

Higher Studies of Israel

THE LEARNING COMMUNITY'S PROGRAM - A FRESH APPROACH TO THE SINGLE TEACHER

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Promoting physics studies depends highly on the teacher's instruction quality. This paper re-examines the influence of participation in a learning community on the teacher's professional development. As an outcome, improving his students' physics learning abilities, in light of theories on the process of change, is obtained thanks to the teacher participating the progra

Daphne Cohen Brenner is a physics teacher and district instructor in Israel, leading a professional learning community. The article is based on the Ph.D. thesis written at AMU University in the framework of doctoral studies in education.

Key words: professional development, physics learning/teaching, professional learning communities

The physics teacher is a “lone wolf” who has to work alone and not as part of a group, with an average of fewer than 20 students per class, in many high schools in Israel. Many physics teachers, therefore, have no one to consult with, and from whom to receive feedback and improve.

Physics considered a complicated scientific subject, difficult to learn and difficult to teach. Innovative and attractive teaching methods required, increasing the number of students who choose this subject. In many cases, these are requirements that the work environment in the schools finds it difficult to fulfill. Some of the reasons are that most schools have a low number of physics teachers, and sometimes only one teacher, and they must cope with many challenges that characterize teaching physics. Special knowledge needed to learn this complicated scientific subject in an interesting and challenging

manner that inspires enthusiasm. It is necessary to be able helping student's experience significant learning that leads to successes. Current knowledge in the sciences teaching is necessary to create the relevance of the subject, encourage students to choose physics and understand the difficulties that the students experience. For this purpose, regional learning centers called 'Professional Physics Learning Community near the Home' established around the country. Thus, the teachers can learn and develop in a center close to their residential area and lone wolves can acquire constructive group skills.

The aims of the 'Learning Communities' Program is the professional development of physics teachers. Communities enable the single teacher to share experience and resources with peers, know and experience 'learner focused' teaching, and promote in a collaborative manner good teaching based on evidence from the classes.¹ This program also equips the teacher with a wide range of teaching approaches, a rich repertoire of activities, deepening of knowledge in physics and physics teaching. Thus the scientific education system can promote by fostering excellence in teaching.

Background

As part of my profession as a physics teacher for over twenty years and an instructor (teacher-leader) of a 'professional learning community', I was exposed to intriguing and unique phenomena and determined to research the community life. On an initial analysis; I found influences of the participation in the community on all the involved factors:

- Teachers of the community.
- Teachers that lead the community teachers.
- Students who constitute the final target audience.

The questions, therefore, appear: What is the physics community, from the perspective of teachers? What are the activity characteristics of the physics teachers in Israel in a learning community? As part of my Ph.D. research, and to answer these questions I conducted a theoretical study, examining the life of physics teacher's community which I lead. I observed, interviewed and questioned them about the following subjects:

- Is every teacher a lone wolf or do they behave as a group?
- Do they share knowledge, learning materials, teaching approaches?
- Are they revealing feelings; feel protected to tell about failures, prepared to accept advice?
- How do physics teachers perceive the learning communities?

¹ S. Levy, *Professional Development of Physics Teachers in Professional Learning Communities*, Rehovot 2017.

- What are the benefit and effectiveness they gain by belonging to the community?
- Which contents from the community do they convey to the physics students and what activities do they adopt in the classroom?
- Following their studies in the community do they believe the learning and scientific thinking of their students improved?

Research Presentation

In this article, I will present the theoretical part of my research. Start with introducing the program of professional learning communities and then, focus on the community of physics teachers and its importance. Seek to prove the rationale for teacher's professional development, through the community, based on the theoretical findings of the study. It is according to an analysis of promoting learning studies which lead the assumption that student achievement and understanding depends mainly on the quality of instruction.

Studies on physics' teaching and professional development, all lead to the conclusion that the research population, physics teachers, can benefit significantly by being part of a professional community. Community teachers expose to a variety of innovative teaching methods that improve student performance and understanding. Moreover, illustrative tools such as those taught in the community can improve both the quality of learning and the number of students choosing to study physics. Before examining the factors that influence the success of the community, the importance of the present research and physics teaching profession should address. In addition, we should examine the rationale and significance of teachers' professional development in physics.

The Importance of Research

It is important to study the influence of participation in physics teacher's community for innovating, refreshing and improving the educational activity. Research studies on professional learning communities bring to the awareness the importance of the teachers' professional development and the change in thinking and ways of teaching as an impetus for improving their students' learning.

Establish knowledge on a learning community provides insights on a possible way for teachers' professional development that will lead at the end of the process, to improve learning and understanding of the student in the

class. The analysis of the community life and its dynamics can serve as a tool for the future planning of learning professional communities. This research will focus on physics teachers group who learn in a professional teachers' community. It is important to identify factors and components that influence professional development and growth of high school teachers in a common professional framework.

Discussion of this subject may contribute a better understanding of the physics teachers' communities so it might be applied in other courses and in middle school teaching. Study on teacher's community illuminates ways to create relevant programs that support teachers, primarily in scientific subjects, where the single teacher without professional colleagues, is a 'lone wolf'. It is important to examine the influence of the community on the teachers, to reveal topics relevant to education in general and to the growth of professional staff in particular, as well to acquire insights from developing a dialogue between members of the community.

Teaching and Learning Physics Today, in the High School

Physics lessons, considered lessons led by diagrams and complicated equations written on the board, have changed.² Today the teacher requires having expertise in making the physics knowledge accessible in a relevant, interesting, and experiential manner that awakens curiosity, for creation physical cognition.³ To adjust physics' learning to the goals, necessary to cultivate unique teaching approaches. Physics teachers need to expose to innovative teaching methods, to practice and experience them, in a supportive learning environment. Although the goal is physics students, the required work is change of the perception of the physics teachers, from the understanding that the teachers are the spearhead. If we change their outlook, then the change will more effectively penetrate into the classroom and to the students⁴.

To provide the teacher with instruments for coping with these tasks, professional learning communities were created. Many physics teachers expo-

² S.Y. Erinsho, *How do students perceive the difficulty of physics in secondary school? An exploratory study in Nigeria*, International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), 2013, 3(3), p. 1510-1515]

³ A. Van Heuvelen, *Learning to think like a physicist: A review of research-based instructional strategies*, American Journal of Physics, 1991, 59(10), p. 891-897.

⁴ E. Sassi, M. Michelini, *Physics Teachers' Education (PTE): Problems and Challenges*. [in:] *Frontiers of Fundamental Physics and Physics Education Research*, Springer International Publishing, 2014, p. 41-55.

sed in the communities to innovative and experiential teaching methods that enable stimulus and growth to their students. The research will examine the interest and understanding topics in physics study by a teacher who professionalize in the communities. For this purpose, it required understanding the distinctive characteristics of physics students.

Students who choose to study physics, identified as an exclusive group since they consciously choose high targets, will put forth a considerable effort, determined, are ready to persevere, and strive to succeed.⁵ The physics classes are generally small and the students who learn there are a handful of the most talented students in the school. Many students choose physics since they intend to study scientific or technological subjects at the university. Hence, they must establish their knowledge qualitatively and quantitatively in the fundamental areas of physics.⁶

In the framework of the studies of physics, the students supposed to recognize scientific models, examine their development, understand through them unusual phenomena, and engage in aspects of theory and experimentation and the reciprocal relations between them.⁷ They must know fundamental concepts in the main physics areas, get a general picture of the broad relations between the different branches of physics and learn a little about the reciprocal relations with other sciences–technology, humanities, morality, and society. Aside from the required knowledge, the studies are supposed to develop skills of thinking and learning.⁸ Of what uttered, we can understand that the required skills to students of physics, also demand special teaching methods by teachers trained specifically to do so.⁹ This cause was one crucial factor in founding the professional communities in Israel.

Professional Development

The professional development of experienced teachers, like new teachers, has made up a challenge to the educational system from its beginning.¹⁰ Referring to the development and effective programs training for the science teachers, several main characteristics found that should discuss, including focus

⁵ S.Y. Erinosh, *How do students perceive the difficulty*, p. 1510-1515.

⁶ E. Sassi, M. Michelini, *Physics Teachers' Education (PTE)*, p. 41-55.

⁷ A. Van Heuvelen, *Learning to think like a physicist*, p. 891-897.

⁸ E. Sassi, M. Michelini, *Physics Teachers' Education (PTE)*, p. 41-55.

⁹ S.Y. Erinosh, *How do students perceive the difficulty*, p. 1510-1515.

¹⁰ N. Michaeli, O. Sommer (Eds.), *Activity report by the steering committee chaired by Prof. Miriam Ben-Peretz and Prof. Lee Shulman: Leading Teachers as Agents of Improvement in the Education System*, Jerusalem 2014.

on the specific scientific material during the training,¹¹ active involvement of the teachers during it,¹² and adjustment of the training to the policy and practices customary in the school.¹³ The training must characterize by innovation, must focus on the study materials that will interest and challenge the teachers, enable experience in inquiry learning, present different models of such learning, and take into consideration the feeling of physical and emotional welfare.¹⁴

In addition, on in-service training of the teachers, for professional development in the areas of science and mathematics, necessary to emphasize long-term in-service training and guidance courses,¹⁵ which will also include reference both to the disciplinary content and to the pedagogical perception of the teachers, with an opportunity to the teachers to research, discuss, examine, and experience themselves what they should teach.¹⁶ As a part of the same significant and continuous training, necessary to develop a supportive and stable community and to support the teachers in the field over time. This is especially significant when there are new teachers who should promote in a continuous manner and the teachers should be seen as partners in the planning and making of pedagogical decisions.¹⁷

It should be summarized that the supra-goal of the training and development of the teachers is the achievements of the students who are being educated—cognitive, emotional and value-oriented achievements.¹⁸ The fulfillment of the abilities and the skills of the teacher as a professional will provide a solution to the needs of the students as individuals and to the needs of the system in its commitments to products towards the public of its clients. The entire process leads to these products, and it is its test.¹⁹

¹¹ B.S. Eylon, E. Bagno, *Professional development of physics teachers through long-term in-service programs: The Israeli experience*, [in:] *The Changing Role of Physics Departments in Modern Universities*, New York 1997, p. 299-326.

¹² C. Harrison et al., *Evidence-based professional development of science teachers in two countries*, *International Journal of Science Education*, 2008, 30(05), p. 577-591.

¹³ W. McLaughlin, J.E. Talbert, *Professional communities and the work of high school teaching*, Chicago 2001.

¹⁴ J.W. Little, *Locating learning in teachers' communities of practice: Opening up problems of analysis in records of everyday work*, *Teaching and Teacher Education*, 2002, 18(8), p. 917-946.

¹⁵ B.S. Eylon, E. Bagno, *Professional development of physics teachers*, p. 299-326; C. Harrison et al., *Evidence-based professional development of science teachers*, p. 577-591.

¹⁶ N. Michaeli, O. Sommer (Eds.), *Activity report by the steering committee chaired by Prof. Miriam Ben-Peretz and Prof. Lee Shulman*; J.W. Little, *Locating learning in teachers' communities of practice*, p. 917-946.

¹⁷ H.J. Kim et al., *Using wiki in a scientist-teacher professional learning community: Impact on teacher perception changes*, *Journal of Science Education and Technology*, 2012, 21(4), p. 440-452; J.W. Little, *Locating learning in teachers' communities of practice*, p. 917-946.

¹⁸ W. McLaughlin, J.E. Talbert, *Professional communities and the work of high school teaching*.

¹⁹ S. Avdor, R. Rheingold, D. Kfir, *Continuity of training and professional development of teachers in Israel: Rhetoric versus routine vague*, *Dapim*, 2010, 49, p. 148-165. (Hebrew).

Teacher's Communities

The professional development of teachers obligates to create frameworks of continuous professional support over time and serve as a 'home' to which the teachers will come regularly and where they will meet current knowledge.²⁰ They will attempt in the framework of this 'home' experiential processes of teaching-learning, with translating educational ideas into learning activities that will perform in actuality at school.²¹ In this 'home', the teaching staff works together, as one professional community that forms the main link for promoting the learning and enables teachers to develop continually.

A professional community of teachers is a group of teachers with shared aims, which focus on professional issues and invites learning, activity, and work in teams.²² Learning in groups enables sharing of ideas, problems, and solutions, through the investigation of the learning processes in scientific methods and enables reflective dialogue on the practices of teaching and learning of the students.

According to McLaughlin and Talbert,²³ the professional community is a unique social unit in which the teachers will act as a team of peers learning, creating, developing, and promoting educational initiatives through reciprocal cultivation when the final product directs to the students' learning. There is a relation between the quality of teaching and the students' learning. If a teacher wants to improve his teaching, it is recommended for him to learn in a professional community.²⁴

Teachers learning process in the community grows out of the approach that professional development constitutes an ongoing continuum of learning,²⁵ which begins in the stage of the training for teaching and lasts over the teacher's entire life. Hence, necessary to develop initiatives to create learning communities throughout the continuum of the teacher's development, when in every stage of the framework, the goals, the form, and content of the learning communities will adjust to the stage in which the teacher is on over the axis of his development.²⁶

²⁰ E. Gilad, *Continuing professional development of teachers at district teacher centers: In-service training courses and coaching as a whole*, Maof Vemaasse, 2001, 7, p. 79-96. (Hebrew).

²¹ Ibidem, p. 79-96; J.W. Little, *Locating learning in teachers' communities of practice*, p. 917-946.

²² H.J. Kim et al., *Using wiki in a scientist-teacher professional learning community*, p. 440-452.

²³ W. McLaughlin, J.E. Talbert, *Professional communities and the work of high school teaching*.

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²⁵ S. Avdor, R. Rheingold, D. Kfir, *Continuity of training and professional development of teachers in Israel*, p.148-165. (Hebrew).

²⁶ E. Gilad, *Continuing professional development of teachers at district teacher centers*, p. 79-96. (Hebrew).

Physics Teacher's Communities

For the purpose of professional development of teachers, Supervision of the Physics teaching in the Ministry of Education in Israel and the National Center for Physics Teachers operate a unique framework of 'Regional Learning Communities' in which the teachers learn and develop.²⁷ Once every two weeks, throughout the entire school year, the teachers meet for about four hours, during which they attempt innovative research-based teaching strategies, which address learning difficulties.²⁸ Using diagnostic questionnaires, the teachers become aware of the learning difficulties of students in diverse content topics.²⁹

In addition, they bring evidence from their classes of the findings of the questionnaires they distributed to their students and trying to find ways of treatment to cope with the students' difficulties.³⁰ In these communities the teachers update with the innovations in teaching physics, enrich the professional knowledge, attempt new teaching methods focused on the learning of their students, share professional ideas, and develop teaching materials suited to their students.³¹

A teacher who instructs the community, called in the professional jargon a teacher-leader.³² Two teacher-leaders guide a group of about twenty teachers who meet in the region of their residence. The meeting takes place at the school, in the physics laboratory.³³

Instruction of teachers in the regional communities performs in the fan method, in which a teacher teaches a teacher. A supra-instructor guides the teacher-leader, who coaches teachers.³⁴ Experienced physics teachers receive their community leading practice in the Science Teaching Department, at the Weizmann Institute in Israel.³⁵ These leading teachers instruct a regional community, in which many teachers are members. Every teacher in the commu-

²⁷ B.S. Eylon, E. Bagno, *Professional development of physics teachers*, p. 299-326.

²⁸ E. Gilad, *Continuing professional development of teachers at district teacher centers*, p. 79-96. (Hebrew); S. Levy, *Professional Development of Physics Teachers*.

²⁹ B.S. Eylon, E. Bagno, *Research-design model for professional development of teachers: Designing lessons with physics education research*, *Physical Review Special Topics-Physics Education Research*, 2006, 2(2); H. Berger, B. S. Eylon, E. Bagno, *Professional development of physics teachers*, p. 399-409.

³⁰ H. Berger, B. S. Eylon, E. Bagno, *Professional development of physics teachers*, p. 399-409.

³¹ *Ibidem*, p. 299-326; S. Levy, *Professional Development of Physics Teachers in Professional Learning Communities*, Rehovot 2017.

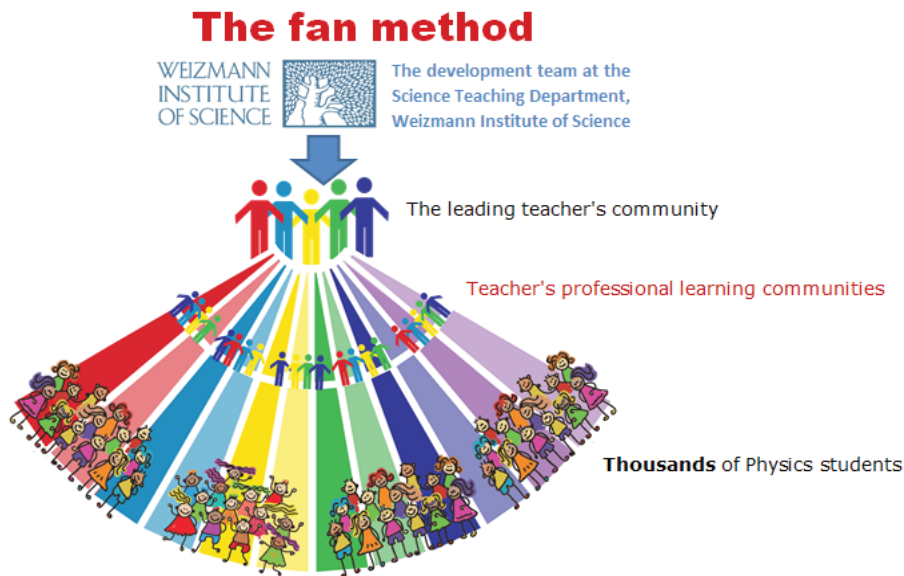
³² N. Michaeli, O. Sommer (Eds.), *Activity report by the steering committee chaired by Prof. Miriam Ben-Peretz and Prof. Lee Shulman*.

³³ M. Hans, B. Eylon, E. Bagno, *Towards an online community of physics teachers*, Rehovot 2013.

³⁴ *Ibidem*.

³⁵ B.S. Eylon, E. Bagno, *Professional development of physics teachers*, p. 299-326.

nity assumes upon himself the knowledge he acquired and conveys it to his students.³⁶ In this way, in essence, a broad coverage of the knowledge creates and conveys to thousands of students.³⁷



Summary

The solitude of physics teachers and the theories presented above led to the idea of communities. Experienced physics teachers, set up a community of physics teachers around them, to develop together and improve classroom teaching. It is interesting to examine this subject through practical research. The main aim of the physics teacher's community is to help teachers support the learning of more students in high schools physics' programs. The teachers who participate in the communities, share with one another innovative and creative ideas as well as give and receive professional support from peer teachers.³⁸ The tools from the community's framework, direct everybody towards a shared goal, to broaden the ranks of the students who choose, remain and succeed in the physics program studies.³⁹

³⁶ M. Hans, B. Eylon, E. Bagno, *Towards an online community of physics teachers*.

³⁷ N. Michaeli, O. Sommer (Eds.), *Activity report by the steering committee chaired by Prof. Miriam Ben-Peretz and Prof. Lee Shulman*; E. Gilad, *Continuing professional development of teachers at district teacher centers*, p. 79-96. (Hebrew).

³⁸ C. Harrison et al., *Evidence-based professional development of science teachers*, p. 577-591.

³⁹ M. Hans, B. Eylon, E. Bagno, *Towards an online community of physics teachers*.

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