Teacher Professional Development, In-School Training and STEM

Eleni A. Papadopoulou
PhD Candidate, Applied Mathematics Laboratory, Department of Physics, School of Science, Democritus University of Thrace, Greece

Vasillis Tsiantos
Professor, Applied Mathematics Laboratory, Department of Physics, School of Science, Democritus University of Thrace, Greece

Evmorfia Manouilidou
Elementary teacher, Directorate of primary education in Kavala, Greece

Abstract

Professional development has central value at the professional life of teachers, a fact that is sealed by the institutionalization of compulsory in-school training in Elementary schools. Equally important is STEM education, appearing in both new curricula and skills workshops. Teachers therefore find themselves on the receiving end of intense reform initiatives. This work aims to record the factors that enhance the participation of teachers in in-school trainings and to describe the relationship of professional development to in-school training and STEM, as expressed by the teachers themselves. This is a focused case study of 11 teachers of a primary school in Greece. Our findings focus on each participant professional profile, his/her experience of attending in-school education, the characteristics of in-school education, the perceived relation of in-school training and professional development, as well as in-school education and STEM education.

Keywords: STEM, professional development, in-school training, teachers.


Introduction

Teachers’ professional development is a perpetual issue in the education debate, often linked to training, in the sense that it is enhanced through training actions (Evans, 2010). These actions are considered broader than university studies, they extend until retirement, in the context of either formal, non-formal or informal education, while they are categorized variously, based on criteria (Papanoum, 2010). Among these various typologies of trainings, the criterion of whether they are carried out intra-school, i.e. if they are addressed to the teachers of a school or inter-school, i.e. to
individual teachers from an external organization, is noticeable (Papanoum & Liakopoulou, 2014).

In particular, the recently instituted, in-school training provides for seminars outside of teaching hours, with a total duration of at least 15 hours per school year, under the responsibility of the principal (Law 4823/2021, article 95). The content arises in accordance with the school unit’s, teacher’s and student’s needs. Therefore, current topics, such as student relations, bullying or innovative, such as Didactics, educational robotics and/or STEM are included in the contents of in-school trainings. Especially for STEM education, interest is growing, which is partly attributed to its integration into the new Curriculum of both Primary and Secondary Education.

Although teachers’ participation is optional, it is taken into account in their individual evaluation (Law 4823/2021, article 96). Despite the fact that there are not a few predictors of success and effectiveness of intra-school educational initiatives, this participation is considered unquestionably of key importance. The purpose of this study is to record factors that tend to enhance the participation of teachers in in-school training and to describe the relationship of professional development with in-school training and STEM, as they express it.

Theoretical Framework

Professional Development and In-School Training

The concept of professional development is identified with teachers' learning, i.e. the ways they learn and the ways they apply the acquired knowledge in educational practice to support student learning (Postholm, 2012). This is a concept broader than training, as it includes all those knowledge, skills, practices at the level of education, which acts as a reinforcement for developing professional identity. In addition, it includes motivational development processes of internal drive (motivation) in relation to specific aspects of work or even intellectual development (Evans, 2010). The process is divided into phases (Matsangouras, 2005; Papanoum, 2005). Especially, the categorization into 6 phases, 1.adaptation (1-3 years of teaching), 2.integration (4-6 years of teaching), 3.experimentation (7-11 years of teaching), 4.professional judgment (12-19 years teaching), 5.professional maturity (20-30 years of teaching), 6.psychological distancing (31-35 years), captures the professional path, connecting it with professional development (Matsangouras, 2005). In addition, it is characterized as "lifelong", as it is carried out during active professional life (Papanoum, 2010) with the consequent changes that result, being transformed into the professional identity of teachers (Photopoulou, 2013), ultimately contributing to the formation of their professional situation. Therefore, the term "professional development" proves to be individual-centered but also multidimensional, given that it includes a multitude of components, the process, the content, the factors that interact, the factors that promote it, the extended duration, the phases, the expected benefits.

At the same time, the institution of in-school training, which marks its beginnings in 1988 as "in-service training" (Papakonstantinou & Anastasiou, 2013), is proven to be complex. Taking into account that it is implemented at the level of a school unit and not centrally by the Education Department, it is a decentralized form of training. The starting point of each training is the investigation of the training needs, the topic of which can be decided either by a decision of the teachers' association or by a decision of the director (Law 3848/2010), while the organization is carried out under the
responsibility of the management of the school unit. Universities, schools, school counsellors operate as educational institutions. When the educational project is characterized by the active participation of teachers, who are mobilized to develop professionally, it not only supports and improves the educational work but empowers them professionally and personally (Papanoum, 2005), while schools are transformed into places of application of new knowledge and innovative actions.

**STEM Trainings and Professional Development**

Educational actions in STEM methodology are emerging as a demand at the European level, considering that among the means to encourage STEM studies and careers of active students, the professional development of teachers is included (Caprile et al., 2015). Upgrading the work of teachers and their professional development is pursued through a variety of means, as firstly, member states integrate science education into strategic planning, secondly, they offer lifelong learning educational programs, while thirdly, initiatives to create cooperation networks (Caprile et al., 2015). Integration in strategic planning serves to draw up action frameworks, in order to launch actions to achieve time-bound goals, which are related to professional development. Continuing education programs are of course aimed at active teachers but are officially offered in formal education. Finally, collaborative networks, industry, research studies can strongly support professional development either through exposure to applied research or through the provision of additional resources.

Initiatives have been developed at European level, such as the STELLA (Science Teaching in a Lifelong Learning Approach) project, which supports educational authorities, school leaders and science teachers to adopt innovative practices in science education from pre-school to secondary education. Its main objective is to upgrade the quality of natural science teaching in all European schools, so that young people, especially women, can pursue scientific studies and professions. The GRID (Growing Interest in the Development of Teaching Science) project is funded under the EU’s Socrates programme, aiming to create a network for the exchange of good practice in science teaching in Europe, while making more than 500 science education initiatives accessible online its database.

In conclusion, the way in which different types of initiatives and programs are implemented varies between Member States. Some countries have adopted national strategies, while others favor the establishment of specific national/regional or local centres to improve the quality of STEM teaching. All the aforementioned initiatives are based on teacher participation, which is proving to be of utmost importance. Clearly, the literature has brought to the fore the findings of studies on the role of training in professional development, but there are particular dimensions such as factors that can make it difficult, prevent the activity of teachers or, on the contrary, strengthen their participation in the new light of the institution of in-school training. Therefore, this study delves into the professional development in STEM subjects and the role of in-school training in this, of primary education teachers. Literature review

In a study by Park et al. (2016) who examined teachers’ perceptions and practices of STEAM education in South Korea, found that the majority of experienced Korean teachers held a positive view of the role of STEAM education. At the same time, Korean teachers highlighted various implementation challenges, such as finding time to do STEAM lessons, increased workload, and lack of administrative and financial support.
Thi To Khuyen et al. (2020) investigating 186 Vietnamese teachers' perceptions of continuing STEM professional development in terms of STEM education, STEM skills, and difficulties in implementing STEM lessons, concluded that most teachers had positive views of STEM education. Novice teachers had more positive views of STEM education, better understanding of the concept of STEM education, and rated STEM skills as more valuable while not identifying statistically significant differences in implementation difficulties between teacher teaching experience groups.

By studying the perceptions and STEM design practices of 26 secondary education teachers, Nipyrakis (2023) proposes the creation of personalized teacher professional development programs, where teacher training will be tailored based on the special characteristics and needs, not only at their level of specialty, but also at personal level, through personalized support from trainers and mentors. Nevertheless the incorporation of STEM design activities for teacher during STEM professional development programs, is strongly suggested.

Delving into the views and beliefs of 220 teachers about the STEM method, it appears that they recognize the value of the method, its advantages for the progress of the students, however, they are reluctant to apply it, as the lack of training, the pressure of time and the syllabus are inhibiting factors, despite the differences regarding the implementation of actions, depending on age, gender, teaching experience, location of the school (Amenda, 2022).

Focusing on the bibliographic research studies from 2017-2021, the factors considered to be decisive for the successful implementation of STEM education in an educational system have been recorded. A success factor is primarily considered an integrated design of the education system, which will integrate STEM in the entire range of educational levels, followed by the support of teachers, the existence of appropriate means, technologies and materials (Jaralis, 2023).

Analysing and collecting data about STEM education and STEM programs to detect the contributing factors to success, the answers of 248 teachers to a five-point Likert-type questionnaire, revealed basic conditions. Among them the support, the very perception of educators who take part in these programs, the means and resources available to organizers, the appropriate and modern technological equipment and the interconnection of the departments, are considered as key conditions for success of STEM programs (Pantouli, 2020).

**Research Methodology**

For the conduct of this research, the qualitative method was considered more appropriate, as it provides a natural flow and to a large extent, it encourages the reflection on the subjects of the research and it facilitates the main goal, which is to record, analyse and understand the experiences of the subjects (Camic et al., 2003).

**Statement of the Purpose**

The purpose of this study is to infiltrate at the opinions of elementary school teachers about in-school training, professional development and STEM education. In particular, it was investigated how they define in-school education, their possible experiences and how they perceive its characteristics. The mapping of the relationship of in-school training, professional development and stem education according to the new curricula, was also attempted. Finally, the possible problems, difficulties and
suggestions that the teachers themselves had both in the preparation and monitoring of intra-school programs were discussed.

**Description of the Sample**

The sample was 11 teachers, female and male citizens of Greece, from one of the multitudinous elementary schools at the regional unit of Kavala. The selection was based on judgment sampling that is a non-probability method but is considered of the best technique in matching the sample to fulfil the aim and objectives of the research (Bourgeault et al., 2010). The selection was also carried out according to their consent regarding the objectives of the research. They were approached at their place of work without disrupting their schedule, on certain days and time after consultation with them. They were also informed about the confidentiality of their personal information and interviews in accordance to the code of ethics. The interviews were recorded and the spoken words were transcribed into written text so that it can be analysed more systematically.

**Research Technique**

The applied technique was the semi structured interview so that there is flexibility in the way and the order of the questions (open-ended). A detailed interview protocol, covering the main interview questions, was composed. The intention was to produce as rich research material as possible, giving the teachers who participated in the research the opportunity to talk freely about their perceptions, thoughts or experiences on the subject.

**Thematic Axes and Research Questions**

1) Professional profile of participants
2) Experience of participating at in-school training
3) Characteristics of in-school training
4) In-school training and professional development
5) In-school education and STEM education.

These axes also determined the specific research questions, which were formulated as follows:

- How is the implementation of in-school training programs in the schools that have served is described, regarding the frequency, the organization, the duration, the obstacles and the theme?
- Is in school training and professional development connected? How is that connection interpreted?
- How does each teacher perceive the application of STEM education and in how many programs have they participated?

**Findings**

According to the results of the present research on in-school training, the first thematic axis groups four categories of questions which aim to explore the experience and opinions of teachers, either from a personal point of view or from the literature, on the concept of in-school training, the advantages for the teacher and the school unit, the implementation or not of in-school trainings as well as the reasons that led to the implementation or not of in-school trainings.
Most teachers identify the concept of in-school training as a necessary condition for their professional development. In the words of one interviewee "it is very important because the situations, the ways change from year to year" (Interviewee No2). According to what an interviewee said "In-school training is important when it is done within the context of the school, with the cooperation of the school's teachers or with the help of an external partner" (Interviewee No3). In addition, another interviewee argued "Within the context of the school, I think it is something very necessary, because we have to evolve according to the flow of the students" (Interviewee No1). In the words of another "I imagine, I haven't come in contact with in-school training but I imagine you're being informed about things, learning something new." (Interviewee No9). Someone else said "It is a process that must be done in order for the teacher to enrich his knowledge." (Interviewee No11).

Regarding the advantages it brings for both the teacher and the school unit, an interviewee answered "Of course, the advantages are many. The teacher enriches his knowledge, gets information, learns new things, skills and all this information he learns." and the knowledge he acquires will be put into practice in the classroom. (Interviewee No8). Someone else answered "It could be important." (Interviewee No7). According to what another interviewee mentioned "It offers new knowledge, it develops professionally and as a professional it has more knowledge it can handle some situations better. This helps a lot during the lesson to bring new ways of learning, new strategies. The teacher must change according to the needs of the children" (Interviewee No1). Another interviewee argued that "For the school unit. To have better teachers. When the school does in-school training, it also shows the school unit's interest in doing this." (Interviewee No2).

In the question if they have taken part in in-school trainings in schools they have served or are currently serving, an interviewee said "My experience is very little. Once in schools where I served as a substitute, it was offered by the mentor of the school unit and it was about e-twinning." (Interviewee No1). Someone else commented "Only online. Very little. Three or four times. Not this year." (Interviewee No2). Someone else mentioned "No trainings were carried out due to the reluctance of colleagues. There were people who wanted to do training but some colleagues were reluctant." (Interviewee No4). According to what an interviewee mentioned "They have to do with first aid and Erasmus programs." (Interviewee No11). Regarding the implementation of extra-curricular programs, an interviewee mentioned "A problem is also the time of attendance. Everyone has activities, obligations. Of course, it doesn't have to be all colleagues. It is also a certain time. A little flexibility could help." (Interviewee No7). Another added "Yes there were barriers. It is difficult to coordinate so many people in a program outside of teaching hours, the number, sometimes fewer people would be needed for better training and certainly the topics many times may not concern all teachers." (Interviewee No3).

The next thematic axis refers to the characteristic elements of in-school training, the main topics that schools choose to train teachers and to meet their needs, problems and obstacles they may have encountered during their implementation, which persons they would suggest as trainers, if they would use some colleagues with increased qualifications in the trainer's position, what is their opinion about the leaders (Directors, School Counselors and school coordinators) for their training and if the Parents' Association could also be involved as well as persons from the university community. Regarding the dominant themes of in-school trainings one interviewee said "It could be an open umbrella of action themes that colleagues do, that they want
to share for colleagues to use in other situations, like in workshops." (Interviewee No7). Another said "The topics are mostly about Recycling, ICT, Skills, Environment, problem management, first aid." (Interviewee No8). Similarly someone else said "They have to do with first aid and Erasmus programs." (Interviewee No1). Also, another replied "I would say domestic violence, school violence and bullying. Those are the three main ones for me." (Interviewee No6).

Regarding whether problems or obstacles arose before or during the implementation of programs, one interviewee said "The first and main obstacle is always financial, the second is always the attendance because all the contributors need to be able to participate in these programs." (Interviewee No6). Someone else said "No there was no obstacle." (Interviewee No. 10). To the response of another "I think the most important was time, meaning there was no time to develop details." (Interviewee No3).

Regarding whether they would suggest more qualified colleagues as trainers, one interviewee described "Absolutely. In addition to the leaders who will clearly speak of experience, there are also teachers who are not only teachers at the graduate level but have developed, so it would be very reasonable to do training. That is, a teacher who has done cross-cultural training, to do training about students with an immigrant background. Correspondingly with special education." (Interviewee No1). Someone else commented "I can't say anyone in particular. Maybe someone who has it with the technical means. Some who know how to present New Technologies. Has experience" (Interviewee No3). According to someone else's words "I don't know what everyone could contribute." (Interviewee No7).

Along with what is their opinion about the training that school principals, school counsellors, or school coordinators can offer, one interviewee expressed "No, principals are not suitable. Appropriate persons are psychologists, speech therapists, occupational therapists, in my opinion." (Interviewee No9). In the words of another interviewee "Of course." (Interviewee No10). Another expressed this view "I have a neutral attitude. I don't have much knowledge of school coordinators." (Interviewee No1). Another said "I think if they have the right expertise, it would be good. But with specialization (Interviewee No2). Regarding the involvement of persons from the university community or the Association of Parents, an interviewee had the following opinion "No involvement of parents without a specific object. Yes, to university students." (Interviewee No3). In the words of another "I feel a little sceptical. Neither in favor of parents, nor in favor of university students." (Interviewee No4). According to another judgment "The involvement of parents and teachers would be a huge step for these programs." (Interviewee No5).

The fourth thematic axis is divided into four sub-categories which refer to how the teacher during his teaching career perceives his professional development, whether he seeks to develop professionally or not, whether he considers it to be a process that is achieved individually or collectively and whether the attending intramural programs is for him an important reason, so that he can mature professionally. From the perspective of an interviewee "Every day we have to evolve." (Interviewee No3). According to the version of another "There should be trainings, seminars. To strive for what he has no knowledge of. How will he incorporate some things into the lesson. To learn something that you can use." (Interviewee No2). In the words of another "Any teacher should strive for self-improvement year after year. A degree that I got twenty years ago cannot be the only qualification that I can have. We have to keep up with our times and evolve." (Interviewee No4). In this regard, another interviewee answered "Professional development is not necessary, but it is not a bad thing either."
I have no professional development. I stayed in basic training. I wasn’t given the chance to do anything more." (Interviewee No7).

Regarding the pursuit of their professional development, an interviewee stated the following: "Yes. Through seminars, university structures, qualitative research, as you are doing now, I believe that it is one of the greatest academic elements that we have in our hands that we should take advantage of as educators and in general I believe, so I try through it with interactions with colleagues to get other opinions and other views." (Interviewee No1). According to another perception "Yes about how I will make the lesson better. Not about how to get a higher position. Mainly with know-how. Application usage and ideas. How will you make this use." (Interviewee No2). According to another "I have a 2nd degree, a master's degree, e-twinning seminars. Every year I do a seminar. Enriching my lesson. I recently learned how to make a video. I learned to use Kahoot. How can I make my lesson better." (Interviewee No5).

Regarding their opinion on whether professional development is a process that can be achieved collectively or individually, an interviewee answered "The result may be individual, but to get there one must have a collective attitude." (Interviewee No1). In the words of another "It takes place collectively." (Interviewee No11). According to another position "Collectively, because if you do something alone, the scope you are looking for is quite limited, while if you are with other people together, your horizons open up more." (Interviewee No3). Another opinion "I think collectively. Because when many people learn together, you have some help if you didn't understand it well. Maybe someone has understood it better and you can lean on them." (Interviewee No2).

To the question whether their professional development is intertwined with attending intramural programs, an interviewee answered "It's a double-edged sword. The way they are done no, but the way I would like them to be done yes." (Interviewee No9). Another replied as follows "Not necessarily." (Interviewee No2). Someone else characteristically said "Not necessarily. Of course, I have not ruled it out for the future. But now it is not my purpose to do all this." (Interviewee No5).

In relation to whether they have improved or are improving personally or professionally through in-school training programs, one interviewee characteristically said "Clearly. In many areas. In terms of information about computers, digital skills and all this will help the development to apply them in the classroom." (Interviewee No8). Another said "From what I've watched I personally don't think I've improved. I already knew most of it. Some cannot be applied based on the number of children I have. However, I have learned more things on a theoretical level. I can use this as a trigger to look for things that I could apply more practically." (Interviewee No3). Another said "Professional enhancement yes." (Interviewee No10).

The fifth thematic axis consists of eight sub-questions related to in-school education and STEM. The participants were asked to answer if they know what STEM is, if it is needed in education, if teachers apply it and if they would recommend it to colleagues or not. They also argued about what is the potential impact on the 4cs. If they apply STEM education it in the classroom and how often and if not why, if they feel ready to offer STEM education, where does their knowledge come from, if in-school STEM training has ever taken place and how would they describe the relationship between professional development and STEM education. According to what one interviewee told us about his STEM knowledge "No, I don't apply it. I can't apply it. I have understood it superficially. However, it has to do with the involvement of the students. Everything is done by the children." (Interviewee No2). As another stated "No. It is
not clear in my mind what STEM is." (Interviewee No5). Another said characteristically "It is needed but it is certain that it is something that will achieve more in the future." (Interviewee No6). As another interviewee put it "I don't apply it. I would like to learn more things to apply it in the classroom." (Interviewee No7). Someone else answered: "From what I've seen and from the programs that are available, I think it's something very simple. It's not something difficult. Someone who has dealt with physics, mathematics, can do something like this, otherwise I consider it something very simple that we can all do." (Interviewee No9). Someone else said "It's bricks, Legos, puzzle toys." (Interviewee No11).

Regarding the impact that STEM education can have on the 4cs (critical thinking, collaboration, communication, creativity but also on personality) one interviewee said "I don't know." (Interviewee No4). Another emphasized "I believe that it helps them to better understand the world, to combine things with each other. It takes more critical thinking. To see the problems of everyday life and they escape a little from memorization, from reading the book. It's a little in the everyday skills that we experience." (Interviewee No3). Another submitted "Yes of course." (Interviewee No9). Another interviewee stated "I have not directly dealt with this type of learning, however from the little information I have I believe that it would greatly help the student interaction in the classrooms and would acquire a new learning community in each lesson, which would particularly develop students' interest. It would be reasonable to include it." (Interviewee No1).

Regarding the challenges faced by STEM education in its implementation such as a) lack of administrative and financial support b) difficulties in finding time to prepare STEM courses c) increased workload and d) difficulties in using new technologies one interviewee told us "It's all these together. " (Interviewee No9). Someone else opined that "If a STEM school starts, not all students can get used to it very quickly. It's the funding. The materials you must have. When you are well trained, to start you must have all the materials." (Interviewee No2). In the sub-question if they have ever implemented STEM lessons in the classroom one interviewee admitted "Of course. Bricks. Daily. In the class. All Day. In Environmental Studies." (Interviewee No9). Another told us "I think it's something very simple. Something with robotics. With simple Lego bricks. No I didn't apply it. I had a great class, it was realistic and we emphasize on other skills." (Interviewee No9). Another replied "Of course. Bricks, constructions. Environmental Studies and Mathematics" (Interviewee No10). Someone else told us "No I don't apply it. I need training." (Interviewee No7).

On the issue of readiness to provide STEM education one interviewee answered: "I don't have the necessary knowledge." (Interviewee No1) Someone else confirmed that "There is no readiness." (Interviewee No2). Another said "I have the will, but no education." (Interviewee No3). In relation to where their STEM knowledge comes from, one interviewee stated "Knowledge comes from seminars, from self-education. The opportunity was not given. It doesn't play a key role. There were programs for children to make plans, such as flexible zone or project. They are on the same footing. The motto is: Motivate the child to do it itself. We encourage children. Robotics didn't exist then." (Interviewee No2). Another expressed: "From seminars, information from websites. Self-education. There was no training." (Interviewee No4). Regarding the development of a STEM program in their service schools, one interviewee answered: "No." (Interviewee No2). Another put it as follow "Training no." (Interviewee No4). Another emphasized: "Never." (Interviewee No10). Regarding the connection that may exist between professional development and STEM education, one interviewee
responded "I am not in a position to answer that question." (Interviewee No7). Another said "I don't know how to answer something about STEM really." (Interviewee No5). In the words of another "I think that STEM education basically it teaches us this thing. That we must constantly evolve and follow the developments that come in society, in technology, in engineering, in any field. So if these exist and we don't follow them, it's like we're staying behind" (Interviewee No3). Someone else replied "Evolution." (Interviewee No1).

Results

Attempt was made to investigate the views of the teachers, specifically of one, of the populous elementary schools of Kavala, regarding in-school training and training in STEM education. In-school training presents a particularity in relation to general training and this concerns both the objectives it is called to implement and the means it requires for its operation. The development of this research was done through five thematic axes, through which effort was undertook to comprehensively approach teachers' views on in-school training. This approach firstly concerned the professional profile of the participants, then their experience of participating in in-school training programs as well as how they perceive its characteristics, followed by professional development in relation to in-school training and finally in-school training and STEM education.

1\textsuperscript{st} Thematic Axis: Professional Profile

During their professional career, teachers proceed through various phases of development starting from that of the novice newly appointed and ending with the phase of the experienced and established professional. Each of these phases incorporates its own needs and priorities, therefore, the educational needs, their priorities and their concerns are not the same. The majority of the participants through the professional maturity phase, disposing many years of teaching experience (Table 1) (Matsangouras, 2005).

<table>
<thead>
<tr>
<th>Phase of professional development</th>
<th>Years of experience</th>
<th>Number of participants</th>
<th>Academic degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>integration</td>
<td>4-6 years</td>
<td>1</td>
<td>basic</td>
</tr>
<tr>
<td>experimentation</td>
<td>7-11</td>
<td>1</td>
<td>master &amp; 2nd degree</td>
</tr>
<tr>
<td>professional judgment</td>
<td>12-19</td>
<td>3</td>
<td>basic</td>
</tr>
<tr>
<td>professional maturity</td>
<td>20-30</td>
<td>6</td>
<td>basic</td>
</tr>
</tbody>
</table>

2\textsuperscript{nd} Thematic Axis: Experience of Participating in In-School Training Programs

This thematic axis grouped four categories of questions that were oriented at investigating teachers' opinions on the concept of in-school training. The first category concerned the participants' perceptions of the definition of in-school training either from their own experience or from the literature. The teachers collectively mentioned in-school training as the set of actions carried out in a school unit either by colleagues or in collaboration with an external partner, aiming at enriching their knowledge and acquiring new knowledge. The entire sample population shared the same opinion. The second category concerned the importance of in-school training and its advantages for both teacher and the school unit. In this category, nine teachers agreed on the
importance of in-school training and two teachers argued that the way it is currently structured, it hasn’t any benefit. Regarding its advantages, the opinion of nine out of eleven summarized at its usefulness and importance, because enriches existing knowledge with information, skills, new knowledge that can all be put into practice in the classroom. Regarding whether they have attended training programs in the school units that have been found, nine out of eleven attended, from one to four times. Two teachers attended online through the webex platform, one of them during the coronavirus, and the other, a few months ago. The topics were mostly about e-twinning, first aid seminars and domestic violence. Finally, ninety percent of the reasons that led them to develop programs were for personal enlightenment.

3rd Thematic Axis: Characteristics of In-School Training

The third thematic axis refers to the characteristics of in-school training. To the question of what they consider to be the most prevalent topics of in-school training, the main topics were covered by recycling, Erasmus or e-twinning programs and domestic or school violence. Asked about the obstacles they encountered in the implementation of programs, six teachers, answered that they had absolutely no obstacles, three interviewees considered the out of working hours participation, one suggested that the topics might not concern everyone and one teacher highlighted the reluctance of colleagues as a stifling factor. He characteristically emphasized: "They were not carried out because of the reluctance of colleagues. There were people who wanted to do training and some colleagues were reluctant."

Then when asked if they would suggest colleagues with increased qualifications as trainers, they all answered positively, placing great emphasis on the expertise that some colleagues may have, so they can train them. However their opinion about school counsellors, school coordinators and school managers was disunited as only five teachers answered that they would have no problem being trained by this group, one was neutral and one categorically expressed negatively. To the question of how they would judge the involvement of the association of parents as well as individuals from the wider university community in the implementation of in-school trainings, they were placed positively especially for the academic staff. They were halved about the involvement of parents, expressing on one hand the necessity on the other the possibility of abusement of the acquired rights.

4th Thematic Axis: In-School Training and Professional Development

In this axis the sample answered five categories of questions. First they answered how they perceive the meaning of their professional development during their career. The entire population of the sample answered that there is a correlation between professional development and career path. Then, in the second question, they were asked to answer whether they pursue their professional development and in what ways. Nine out of ten answered that they seek their professional development through seminars, watching programs, online training. All eleven teachers considered professional development to be a mixture of both individual and collective effort. In fact, one emphasized that something is done by yourself, the scope remains small. When asked if they believe that their professional development can be achieved through intramural programs only half replied positively. On the contrary, regarding their opinion of whether they have improved personally or professionally through the development of in-school trainings the vast majority, nine out of eleven, replied positively.
5th Thematic Axis: In-School Training and STEM Education

In the fifth thematic axis, teachers answered questions that combine in-school training and STEM education. Eight out of ten teachers were unfamiliar with STEM education. In response to the second question all teachers agreed that STEM education will have an impact on 21st century skills, on the 4 cs (critical thinking, communication, collaboration, creativity). Regarding the adversities/challenges facing STEM, the participants agreed that all four factors: lack of administrative and financial support, difficulties in finding time to prepare STEM courses, increased workload and difficulties in using new media and equipment are suppressive factors for STEM education. Regarding the implementation of STEM lessons in the classroom only thirty percent are active. Everyone’s knowledge comes from self-education and the Internet. They have not had basic STEM training. There has been no in-school training on STEM education, all teachers responded unanimously. Finally, when asked how they would describe the relationship between professional development and STEM education, nine out of eleven responded that there is a connection.

Conclusion

The present study was conducted at the 12th grade Primary School of Amygdalonas with the aim of identifying teachers’ perceptions of both the concept of in-school training and STEM education according to the new curricula. The responses of the Interviewees to the first thematic axis showed us that these are teachers with a high work profile, which is demonstrated not only by the experience they have due to years of service, but also by their participation in Erasmus, e-twinning programs. There were also three teachers with postgraduate studies and one with a second degree.

In the second thematic axis on the subject of the experience of participating in in-school trainings, although the participants consider that in-school training is important and many advantages derive from it, nevertheless in the school unit where some have served as permanent teachers for many years, eight of the eleven teachers - two substitutes - have attended minimal in-school trainings. The implementation of in-school trainings for some, does not encounter obstacles, but some typically report that the main factors for their non-implementation are due to: a) lack of time on the part of teachers, because they take place outside working hours and most of them are unable to attend them due to obligations, b) the topics of the trainings which may not concern all teachers and c) the reluctance of some teachers. With regard to their subject, the teachers reported that the most prevalent topics in intra-school training refer to intra-school-domestic violence, recycling, class conflict management, interpersonal relationships, emotions, first aid, European programs. Their participation in in-school trainings is meager and limited only to first aid seminars and e-twinning seminars. Training from colleagues is for them a very good starting point for training. They believe that colleagues who have excellent pedagogical and scientific training can educate them equally with external scientific collaborators. It is noteworthy that half of the sample population had a negative or neutral attitude towards training from senior managers, school counsellors and school coordinators. On the contrary, the involvement of persons from the academic community found them in agreement if they have a specific subject, while the involvement of parents is considered by others to be important, necessary and by others that they should not intervene in the school area for in-school training because they would acquire rights that might misuse in the future.
Regarding the field of their professional development, they consider that during their educational course nine out of eleven seek to develop and know new methods, strategies through attending seminars, programs that will help them manage their class. In their view, this is a process that is continuous and can be achieved collectively. They may be using everyday things that were considered extraordinary twenty years ago. At this moment, however, they should be meaningless to the students. For this reason every teacher should keep up with the new flow of educational things. He must daily through their practical application see which ones are useful, which ones need modification and which ones to ignore. It is a never-ending process. Knowledge must be shared. It is better to train with many people together and exchange knowledge. That is why it is also called in-school training. It is held daily within the school. Some teachers agreed that in-school trainings contribute to their professional development, while some others felt that it is not necessary to attend them because they can also develop by attending seminars or trainings at will and preference. Some teachers emphasized that they definitely use new technologies and develop ICT skills through in-school training.

Regarding STEM education only three out of eleven Interviewees apply it in their classroom and one of them almost on a daily basis. They see STEM education as something too simple, the bricks, the Legos, the puzzles. They apply it to Mathematics and the Study of the Environment. The research shows that while teachers are willing to teach STEM, the appropriate equipment is not available. Even if there is training, they don’t feel be able to proceed in practice without the appropriate technological tools. But there were underlined other complications that make STEM learning difficult, such as lack of time, workload, poor internet connection. It is true for everyone that STEM will help bring out the 4cs as well as develop students’ personality. They believe that with STEM education, teaching becomes student-centered, students become more involved, because they have are given the opportunity to seek, find, create. And that's what STEM is. To motivate the child to do it on his own. Teachers as a whole are not yet ready to provide STEM education as they have not had basic training in it and their knowledge comes from self-education.

**Limitations**

The study is subject to some limitations. The information obtained comes from the 12th grade Primary School of Kavala and is not representative of the general educational population as a whole. Our sample was ninety percent female-dominated, as the teaching profession is predominantly female.

**Recommendations**

The present research could become a starter point for the planning of in-school training at the 12th grade Amygdaleonas Primary School, schools at the same region, located in the Prefecture of Kavala and under the Regional Unit of Eastern Macedonia and Thrace. Regarding future assessments, it is crucial to list some indicative proposals, which stem from the occupation with this research subject:

- Conducting research in the schools of the Prefecture of Kavala in order to research the provision of in-school training and STEM education.
The Ministry of Education, seeing the percentages of in-school trainings that take place in Greece, should review the request that in-school trainings be carried out within the teaching hours, so that there is no further workload outside official duties.

The trainings could be done by colleagues who have excellent pedagogical and scientific training from each school unit after the end of the teaching hours, in cases of teachers who are unable to attend an afternoon session.

More emphasis on STEM education through developing seminars and informing teachers about STEM programs.

The thematology of in-school trainings should be consistent with the needs and challenges of the school unit and be organized taking into account all recruits.

Trainers should have communicability and be knowledgeable about the subject so that theory can be transmitted into praxis.

Financial support for schools to purchase STEM education equipment.

Cooperation of schools with the university community for preparing programs for better training of teachers.

Comparison of European research with research in Greece for the adoption of new methods and practices of in-school training and STEM education.

It would be gratifying to carry out investigations in and in other parts of Greece, in order to establish whether in-school training is taking place and in which regions of the country. The research could be extended abroad to see comparatively what is happening in the rest of Europe.

**Conflict of Interests**

No conflict of interest.

**References**

Αμέντα, Σ. (2022). Στάσεις και πεποιθήσεις εκπαιδευτικών σχετικά με τη μέθοδο STEM. https://doi.org/10/25208


Παπακωνσταντίνου, Γ., & Αναστασίου, Σ. (2013). Αρχές Διαχείρισης Ανθρώπινου Δυναμικού (Gutenberg).

