Key Action 2 – Strategic Partnerships for school education

ELITe: Enhancing Learning in Teaching via e-inquiries

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Systemic opportunities and challenges for STEM teachers' competence development in Bulgaria

A report on the processes and outcomes of the ELITe's project Bulgarian Multiplier Event

by Nikolina Nikolova[1]

Introduction

Providing digital professional learning opportunities for secondary teachers' competence development is on the base of the ***Enhancing Learning In Teaching via e-inquiries (ELITe)*** Erasmus+ project as a priority of the "Education and Training" EC policy agenda. The main project goal is to support teachers' professional learning for competence development, targeting specifically in-service educators in the STEM domain. Achieving this goal pass through conceptual, methodological and domain specific perspectives, forming respective specific objectives of the project.

The multiplier event E3 is focused on the ***deepen understandings on the requirements for STEM teachers competence development at national levels***, as conceptualized and expressed by policy makers, policy mediators and practitioners. The presented report describes the methodology of the E3 multiplier event design, conduct and delivery, as well as the main conclusions from methodology and domain specific aspects of STEM teachers' competence development in Bulgaria.

As the educational reform in Bulgaria has just started, there are many challenges faced from all the stakeholders – policy makers, policy mediators, teachers' trainers, STEM teachers, and broad society. The role of the report is to clarify main opportunities and barriers, as they are seen by each stakeholder's group, and to find a way to negotiate the possible ways for their extended use (opportunities) and solving or removing (barriers). The extracted analysis and resume will be used as input for further inquiry-based learning model development and the design and implementation of specific digital learning scenarios for STEM teachers' training.

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Approach and methodology

Aims and objectives of the events

The aim of the multiplier event E3 is to communicate and negotiate with policy, policy mediators and practitioners outcomes from activity 1.1 and Intellectual outcome O1, i.e. "Policy envisions and requirements for STEM teachers competence development in Greece, the Netherlands, Bulgaria and Spain", focused on the Bulgarian situation.

Expected outcome is the identification of systemic opportunities and challenges to implement training activities for STEM teachers' competence development in Bulgaria. This will be documented in a national report, accompanied by the "key-messages" document, as a part of the ELITe report

The EASW methodology

The ***European Awareness Scenario Workshop (EASW)*** methodology relies on working in varying compositions groups and in plenary to develop scenarios on the workshop topics, name barriers and propose strategies and steps for realizing the goals and overcoming the barriers. Building on concrete "scenarios" or problem constellations, it invites working group members to think about realistic challenges rather than dreaming up unlikely problems and solving them. Such a workshop follows three phases - the critical analysis phase, the visionary phase and the implementation phase – "to create a basis for local action". The EASW setting *allows for interaction between stakeholders* - rather than a static one, in which presentations are provided to participants, and *aim for consensus building rather than instructional approach.* One disadvantage of EASWs is their reliance on stakeholder balance, which might never be reached realistically. However, targeting a certain number of distinctive stakeholders is a good starting point to make "bringing together a broad range of interests" a little more concrete.

Following the EASW methodology, the multiplier event E3 was structured in three session – ***Raising issues*** session, ***Negotiation*** session, and ***Structuring proposals*** session. During the *Raising issues* session participants work in homogenous groups, aiming to identify the opportunities and challenges on implementing activities for STEM teacher's competence development. During the *Negotiation* session they were re-arranged in heterogeneous groups, looking for solving the conflict aspects and generating recommendations on how to take advantage of the opportunities and how to avoid / deal with the challenges. The aim of *Structuring proposal* session was, in plenary, to map the issues and recommendations in the frame of broader educational priorities.

Rationale for selection of participants

For the successful implementation of the EASW methodology, three homogenous groups of stakeholders were identified: **policy makers**, **practitioners** and **broad society members**. Policy makers group involves representatives of Ministry of Education, Regional Management Centers of Education, National Center of Information support, professors responsible for teachers' training curricula from main universities in Bulgaria, head teachers responsible for local school policy in STEM teaching. Selection of the practitioners - STEM teachers from different regions in Bulgaria, representing general and vocational schools, was based on the good relationships of the Faculty of Mathematics and Informatics, Sofia University, and pro-

active schools in Bulgaria. The group of the broad society members includes active parents and representatives of private educational centers, private companies and research centers.

Rationale for selection of specific issues for discussion

In Bulgaria, since 2016, there is a new Law on pre-school and school education, accompanied with several ordinances, regulating its application. Special attention was paid to Ordinance #12, regulating the teachers' professional development and the way of attestation, and the Ordinance of National requirements for 'teacher' professional qualification. They stimulate teachers' professional development by regular trainings, participation in research activities and experience exchange events. The new students' national educational standards and curricula for STEM education also is a challenge in front of the teachers and teachers' educators. Another important initiative of the Ministry of Education and Science, called *Innovative school* supporting schools, is providing innovative vision, development strategies, and teaching approaches, and is stimulating the school managers to involve the pedagogical staff at schools in activities, enhancing their academic, pedagogical, administrative and communicative competences.

As a result of the analysis of all these documents, we identify the main issues and describe them in the ***Key messages*** document. On the base of these issues we formulate the main topics for the multiplier event discussions:

- **Teacher competence are needed to design IBL activities in the class. Teachers needs a support for IBL day-to-day application. Content should be provided to spread widely the approach** (micro level)
- **Opportunities and challenges in schools management of strategy, curricula and teaching approaches** (mezzo level)
- **Opportunities and challenges in building teacher competences by the teacher trainings** (macro level)

Implementation

Setting and context of event

The multiplier event E3 took place on 29 of June 2017, at the end of the academic year in Bulgaria, in the Mirror Conference Hall at Sofia University.

The first invitation letter was sent to 53 persons, representatives of the Ministry of Education and Science, 5 Regional Management Centers of Education, National Center of informational support of education, 5 Bulgarian universities, responsible for teacher education, Bulgarian Academy of Science, 15 schools (headmasters, STEM teachers and parents were invited), Chamber of Commerce, 2 museums, 3 IT companies, 4 publishing houses, and one non-government organization. Invitations were sent via e-mails, with attached short information about the ELITe project and multiplier event goals, presented as a flyer, text information about previous stage – Analytical report of National policy documents, and Key messages

document as a conclusion of Analytical report. The invitation was sent to 53 persons in total, and the participation was confirmed by 48 persons, who received a remainder a week before the event. The actual number of participants was 43.

Following the EASW methodology, participants were separated in three groups:

- **Policy makers** – representatives from Ministry of Education, Regional Management Centers of Education, National Center of Information support, professors responsible for teachers' training curricula from main universities in Bulgaria, and head teachers responsible for local school policy in STEM teaching
- **Practitioners** – STEM teachers from general and vocational schools
- **Broad Society members** – parents, representatives of private educational centers, private companies, NGO and research centers

Structure of the event

The workshop started with registration of all participants. Upon registration they received a different colored badge according to the group in which they were involved, paper folder including a workshop agenda, an ELITe project flyer, and an evaluation questionnaire. They were also invited to take wrapped-up candy with the request to preserve the wrap, which will be used for a warm-up social activity.

The workshop was opened by the Vice-Rector of Sofia University Assoc. Prof. Eliza Stefanova. She highlighted the importance of this project for the professional development of STEM teachers. Assoc. Prof. Stefanova also expressed her happiness to collaborate with stakeholders from all over the country in order to strengthen the role of inquiry-based learning (Figure 1).


Figure 1. Opening

After the Vice-Rector speech, Nikolina Nikolova delivered a presentation on ELITe project, which provided detailed information in relation to project description and aims. She also presented the results from the Analytical Report of national policy documents on policy envisions and requirements for STEM teachers' competence development and ***Key messages*** for consideration. Furthermore, Nikolina provided instructions in relation to the warm-up activity: all people, having the same colour wrap shall make a group during the coffee break and agree on one word, which describes their common feelings, emotions, and attitude to the position they practice at work place. The coffee break finished with short presentation of colored groups – names, institution, and common word (and why they choose it) of participants. Then

also write this word on a colourful piece of paper and pin it up on a cork board. One representative of the group explained how all group members have come up with this word (Figure 2).

Figure 2. Familiarizing with the ELITe project and getting knowing each other

After all participants got to know each other better by participating in the warm-up activity, they were divided into three focus groups (policy makers, practitioners and broad society members) arranged around three round tables. Each one of the groups have to choose two moderators, which have to lead discussions on different topics and questions such as:

- Which are the greatest challenges, which the new Law places this school year?
- What new doors the new Law opens?

Nikolina presented the De Bono's Six Thinking Hats method, which was the main tool for implementation of SWOT analysis by each group. Each group's discussion was based on the ***Key messages*** of the Analytical Report of national policy documents on policy envisions and requirements for STEM teachers' competence development. During the discussions, each participant used a hat colour, according to the perspective from which s/he tackles the issue (e.g. judgement, creativity, management etc.), according to the Bono's method. Then the moderators wrote down on 4 different colours pieces of paper, each colour representing strengths, weaknesses, opportunities and treats of the new regulatory framework (SWOT analysis). All aspects of the SWOT analysis were presented in front of all participants by appointed representative of the group. Then the coloured sheets were hung on a rope, so that everyone is able to read them (Figure 3).

Figure 3. Homogenous groups' work using the De Bono's Thinking Hats

After each group has presented its opportunities and challenges in form of SWOT analysis, and hung up the pieces of paper with main points, all participants voted in favour of statements of the SWOT analysis by stamping a coloured sticky dot. The ones which gather most of the votes are used as a base of negotiation during the second session (Figure 4).

Figure 4. Presenting and voting on raising issues

Then all groups mix, so that there are three new groups with equal number of representatives from policy-makers, practitioners and broad society members. The session started with a summary of the main topics of interests (according to the voting in the previous stage), similarities and differences in different group's vision. The next task for the participants was to focus of differences, to look for reasoning and negotiating a solution. The purpose was each group to find a compromise vision for STEM teachers' professional development and Inquiry-based learning. They wrote down the ideas and their common suggestions from the negotiating phase they had, and then presented and justified it in front of all participants (Figure 5).

Figure 5. Heterogeneous groups' negotiation

During the plenary session of the multiplier event, the heterogeneous groups presented the suggestions for negotiation. A summary and conclusions on the main needs and considerations in relation to STEM

teachers' training was agreed between all participants. Furthermore, the requirements for effective and efficient teachers' trainings – topics, logistic, delivery were outlined (Figure 6).

Figure 6. Plenary session: Mapping of issues, structuring proposals, and certifying participants

Evaluation of the events

Initially, each participant had received a sheet of paper containing evaluation questionnaire. The filled in questionnaires were anonymous and they were handed over to the organizers just before the closing of the event. The participants were asked to evaluate the organization of the event in terms of content / thematic, process and venue, background materials, process / methodology of the event, and overall satisfaction from the event.

SWOT analysis was performed a few days after the multiplier event by the organizers using open questions of the questionnaire, participants' feedback during the event, collection of the results during each session work, and how they evaluate the participants' activity and quality of work. It presents strengths, weakness, opportunities and threats in relation to planning and implementation of the multiplier event, the effect of networking, and quality and relevance of outcomes (Figure 7).

Figure 7 Evaluation of the homogenous groups first outcomes

Documentation of outcomes

Raising issues Session

During the Raising issues session different homogenous groups were focused on the different area of issues:

Policy makers were engaged mostly with the national standards on teachers' qualification, new obligatory topics for teachers' trainings, ways to receive feedback from teachers and broad society, requirements for teachers' annual working plan and students' textbook, how to deal with concurrency between teachers' training providers, i.e. how to assess (in advance and post-event) relevance and quality of particular teaching training course and / or teachers' training provider.

Practitioners discussed mainly administrative issues and how the administrative work can be done in more efficient and effective way; the need of relevant environment for STEM teaching – textbooks, simulations, specialized labs; the new subject in students' curricula, the new students' summative exams and how they corresponds with national standards of education; the teachers' attestation process – the period of attestation, who and how to choose particular trainings which particular teacher shell attend, what are aftereffects of attestation in terms of teachers; carrier development, salary, penalty.

Broad society members were interested to the results of teachers' work and also commented the possibility of earlier graduating of students (10-th grade, approximately 16 year's old students) and joining the labor market. Another topic of interest was related to the lack of the motivated and qualified teachers in STEM disciplines of school, the new requirements for school-parent communication and sharing responsibilities.

The outcomes of the Raising issues session, related to the new National regulatory framework, were summarized and presented as a SWOT analysis result, as shown in Table 1**Error! Reference source not found.**:

Table 1. SWOT analysis of the National regulatory framework in accordance with teachers' competence development

(S)TRENGHTS
1. Opportunity for teachers' freedom to create new subjects and to implement new teaching methods and innovative training
2. Greater interest of the teachers to the qualification courses, better selection of the courses' topics
3. Opportunity for teachers to participate in training outside the country (e.g. CERN)
4. The new regulation gives opportunities for differentiation of the education after 10th grade
5. Creation of a e-system and entering the students' absences from school in the e-system; Suspension of the child allowances upon pupil's absenteeism, these amounts to be transferred to the budget of the school
6. All pupils can participate in the ranking for entering the desired school
7. The existence of detailed regulatory framework make educational process more structured

8. Existence of a definition for Textbook
9. Existence of the strongly defined system of teachers' assessment
10. Ordinance #13 on civil, health, ecological and intercultural education provides directions for STEM teachers work goals
11. Ordinance #12 on professional development of teachers, Section 5: Conditions and order of teachers', headmasters' and other pedagogical staff's qualification provide new possibilities for teachers' professional development
12. Entry of the Career Guidance and Entrepreneurship education in school
13. Availability of New Aspects – The Inclusive Education
14. Regulatory Requirement for Planning an Annual Thematic Plan for each subject
(W)EAKNESSES
1. The consequences of teacher attestation upon their payment and career development are not regulated/defined. Lack of indication of what is happening at unearned 4 qualifying points upon the attestation of a teacher
2. Lack of choice for professional qualification
3. Lack of possibilities for imposing penalties for students' misbehavior and misconduct. Long and cumbersome procedure for students' penalties
4. The school documentation - repeatedly filling in the same data and information in different pieces of requested documents
5. Reduced number of hours in the science subjects. As a consequence – overburden of excessive study content for the class hours.
6. The standards for learning content are not well-formulated
7. Lack of equivalence among the different schools with respect to the National External Assessment; As a result part of the schools 'accumulate' lack of knowledge and fall behind in their educational process
8. Lack of differentiation for the (reasons of) absences of different types of students (talented students, competitions) – upon 25% or more of class absence in particular subject leads to compulsory after-school-year corrective exam, irrespective of the reasons for absenteeism
9. The subject curricula (the programs of study by subjects and grades) should NOT be anonymous – there is a need of taking personal responsibility of students' curricula as well as of communication between curricula authors, teachers and society.
10. There is no clear separation of the roles between curriculum authors, textbook authors, and external evaluators (to participate or not, in textbooks' evaluation commissions) – prerequisite for conflict of interest
11. New curricula by subjects and lack of textbooks and study materials for them
12. New National External Assessment "Digital competences" at 10th grade
13. No inspection standards
14. Subjectivity of the superiors (principals, inspectors)
15. Lack of possibility for feedback from different institutions to the school
16. Participating in external evaluation process – assessors, questors – is not paid.

17. **It is not always possible to use the ICT capabilities - in the absence of projectors, computers, boards, markers, etc.**
18. **Unprepared teaching staff for the new subject "Computer Modeling"**
19. **The teacher attestations – at a long time period**
20. **Lack of qualified teachers**
21. **The exclusion of the Informatics subject (Comp. Sc.) from the compulsory curriculum in certain school curricula at national level.**
22. **There are no good conditions for out-of-class work of the teachers in school during the school day**
23. **Parents' refusal to fill in information; Incorrectly filled in information**
24. **Lack of sufficient information about and for the parents**
25. **The preliminary planning of the teaching activity in the Annual Thematic Timetable is in very great details (the education is student-oriented and very often is not known in detail as themes, duration, and timetable at the beginning of the year)**

(O)PPORTUNITIES

1. **Flexibility with regard to the school curricula. Opportunity for innovative practices through the school curricula.**
2. **Opportunity for new methods of teaching without criticism (punishment) by policy mediators or headmasters**
3. **Schooling with electronic materials, including dedicated for home use (School bags lightening)**
4. **Centralized Ministry of Education and Science (MES) to release e-forms for parents for different studies**
5. **An administrative staff or assistant to be appointed to the class supervisor**
6. **Team Buildings and Teacher training under a Differentiated Model**
7. **To regulate the work of the teacher as a quaestor, as participant in organization of Olympiads and competitions. Not to be assigned as another additional duty.**
8. **“School for parents”**
9. **Opportunity to digitize the whole process in the external evaluation of digital competences in the 10th grade**
10. **Ensuring normal working conditions, consumables and equipment for the class work.**
11. **Generate the necessary reports for the Regional Educational Management from the electronic diaries.**
12. **The school curriculum (the learning plan - which the subjects how many hours to be studied) is year for year. This provide flexibility to change it the next year as a result of experiment**
13. **Introducing financial penalties for parents for particular misconduct or repeated misbehavior by them or by their children. Sanctions and community service for such students / parents**
14. **Cloud technologies and their role for better relationships with parents**
15. **Distance education on special subjects**
16. **Verification of teacher competences by an independent organization.**

17. Future teachers – opportunity of training on Introducing and Working with Regulatory Documents.
18. Innovative schools – possibility for more flexible and creative new curricula (school learning plans and study programs by subjects) according to the school profile and vision
19. Opportunities for the innovative schools for new communication and relationships with parents and teachers
20. Period and time for conducting qualifications gives opportunity for teachers to react to their professional needs.
21. The separation of the secondary education at 2 levels – A possibility for earlier professional realization of students.
22. Possibility for the students to enter the labor market after grade 10.
(T)HREATS (from external factors and environment)
1. Pupils cannot repeat a class until grade 4
2. Many documentation – the Annual Thematic Timetables, etc. – a danger for burden with a not typical work to the teacher. Overloading teachers by duplication of paper- and electronic-based documents, with administrative duties
3. The teacher's salary should be refined - based on either teaching classes normative or on 8-hour working day
4. Low payment of the teachers' work
5. Poor correspondence between the MES and Higher Education (HE) regulations – they are applied differently
6. Illiteracy
7. Absenteeism of students - there are no criteria for assessing the reasons for them; In the absence of attendance at 25% of the classes - corrective exams (At 25% absences the student is left without final subject grade for the year).
8. Lack of control over the quality of teachers' training courses. There is a threat that different organizations, offering teachers' training courses, to offer low quality courses to attract more teachers by easily obtaining qualification credits.
9. Collecting certificates and a psychological test are a purely formal reporting and accounting
10. Some institutes 'produce' teachers, and it is not clear whether they (institutions) themselves have this right
11. Lack of external control for the pedagogical qualification – 'post-diploma qualification' and other forms
12. The penalties – a long and cumbersome procedure that creates unworkable regulations
13. Selection of teacher training courses by the school principals on the base of the price of the training courses
14. Lack of willingness and interest by part of the parents to participate and support the school endeavors to educate their children (do not pay attention to the achievement of their children via the electronic diaries)
15. Lack of regulated funding for STEM education environment

16.	**Obligatory 8-hours working day for the teachers**

As it can be seen from the table above, there are same points marked as strengths as well as weaknesses. The reason is that they are pointed by different groups or / and from different perspective. For example, the detailed annual thematic plan provides regulation on what and how to be learned during the school year, it give also possibility for teachers in the same school or from different schools with common profile, to collaborate in preparation of the plan, but it also deprives teachers of flexibility to react according to student's needs during the academic year.

This and other popular (according to the sticky dots voting) points of interest were selected for the negotiating session.

Negotiating over the issues Session

During this session, the heterogeneous groups worked on negotiation on most popular (by mean of sticky dots voting) and most conflict (according to the homogenous group's results) topics. Table 2 contains the results of the negotiating process by groups, presented in form of recommendations on how to take advantages of opportunities and on how to overcome challenges emerged during the previous session.

Table 2. Heterogeneous group's results

Group 1	
1.	**To organize teachers' trainings in mixed forms – online and traditional learning**
2.	**A certain number (%) of qualification credits to be related to the specialty/subject teacher training (with academic and practical training)**
3.	**The qualification courses to be based on up to date subject content and teaching methodology**
4.	To embed multidisciplinarity in the courses
5.	**To offer courses related to the methodology of the research work, accompanied by practical exercises**
6.	**To create a public electronic system to study the users' (teachers, managers, stakeholders) expectations and needs of teachers' qualification courses, and to publish collected information**
7.	**There should be mandatory surveys to assess the qualification courses by the trained teachers**
8.	**There should be rankings of the courses based on the opinions/filled in questionnaires of the involved teachers**
Group 2	
1.	**There should be a great choice of course themes and qualification courses**

2.	**There should be methodological thematic trainings for STEM teachers (such as Methodological Instructions in Teachers' Books), however NOT in webinars, but in a practical and interactive way with teachers**
3.	**There should be much more e-simulations of particular phenomena process in STEM and teachers' trainings on how to use them in the classroom during inquiry-based learning process.**
4.	**To be clear who makes the choice of teachers' training courses that should be covered by a particular teacher:** – **The school subjects' departments?** – **The School Pedagogical council?** – **School management?** – **Individual teacher's choice?**
5.	**To improve the evaluation process in the educational system by:** – **Refinement of the criteria for selecting textbook assessors** – **Common evaluation card for evaluation of the observed lessons by inspectors of MES - by subject**
Group 3	
1.	There should be face-to-face teachers' trainings by subject domains
2.	**There should be courses for Integration of special educational needs (SEN) pupils and courses for inclusive education**
3.	**Courses on new teaching methods for the subjects taught**
4.	Courses on interactive teaching methods
5.	**Reducing the number of textbooks per subject:** – **The best is to have one textbook for in a subject for the whole country** – **To include a team of acting teachers in the textbook evaluation process** – **The duration of the period for evaluation of the textbooks to be long enough**
6.	**The national external assessment in the 7th grade – and the entrance exams for secondary schools, to be mutually coordinated and adjusted**

Structuring issues onto EU and national priorities Session

During the plenary session the heterogeneous groups' recommendations were presented, discussed, analyzed, summarized and arranged across different teachers' professional development options. These options are related to the **content** of the teachers' training courses, their **form**, and **assessment** of the courses and course providers.

The **teachers' training courses' topics** were the most discussed. The recommendation for them is to cover at least the following areas:

- **STEM subject matter** – new science achievements as well as changes in the students' curricula. Special attention is dedicated to the use of ICT's in STEM disciplines education in terms of

simulations of phenomena and dependencies, giving possibilities for students to experiment and generate hypothesis, reasoning, and conclusions. The use of professionally developed interactive digital learning resources and applications is much more important for schools where there is not labs for real experimental work.

- **Interdisciplinary** – practical trainings combining different STEM subject matter and relationships, in collaboration with other STEM subject teachers; learning design, implementation and evaluation of students' achievements.
- **Innovative teaching methods** – interactive methods of teaching / learning, design and implementation of student's inquiry, group work management, use of innovative ICTs in education, etc., focused to STEM education
- **Work with special students' groups**, tailored to the specifics of the subject and the educational need – involving students with special educational needs, work with talented students, work with students with learning disabilities.
- **Work with parents** – effective communication and collaboration with parents, involving parents in school live, 'school for parents'.
- **Dealing with administrative issues** - familiarizing with administrative framework and approaches for more effectively carrying out administrative work
- **Evaluation in education** – approaches and technics for evaluation of educational process, how to implement classroom pedagogical experiment, evaluation of students'' textbooks and additional learning resources, formative and summative students assessments, etc.

Most of the participants have no doubts on the **forms** of teachers' training courses. They don't think distance courses in a form of webinars are efficient enough – all the participants find the face to face communication among trainees and between trainees and trainers very important. They prefer active practical learning process instead of lectures and formal exams. Also, they find that demonstration and participation in innovative teaching methods implementation is very important for the successful transfer of given teaching methodology to the classroom. Beside of these, participant's opinion is that it is great idea to have training courses content online for future use, as well as to have an online tool for support of the established professional community during the course. In brief, the most important requirements, related to the forms of teachers' training courses are:

- **Face-to-face** or **blended** learning
- **Online courses** – as a current support, and as an archive for long term use.
- **Balance** between learning at **work place** (school) and out the door courses – regional, national workshops as environment for sharing ideas and experience

The last issues were related to the **logistic** of professional development courses offering and **transparency** and **assessments** of teachers' training courses. The participants in the multiplier event were united around the idea of a common online platform offering:

- Information about teachers' training providers
- Information about teachers' training courses – topic, annotation, duration

- Transparent information about how many teachers attended a particular course and how they evaluate it
- Public ranking system of courses
- Public ranking system of course providers
- Possibility for users to inform the course providers for their needs and expectations of particular courses.

Evaluation Results & SWOT analysis

Evaluation questionnaire results

The evaluation questionnaire was filled in by 40 participants.

Asking about the quality of the organization, most of them give high level of satisfaction marks for the content, process, venue and facilities. They share that the event *was perfectly organized*, that they like *interactivity* during implementation and that *the very well air-conditioned conference hall* is a good choice for the hot summer day (Figure 8).

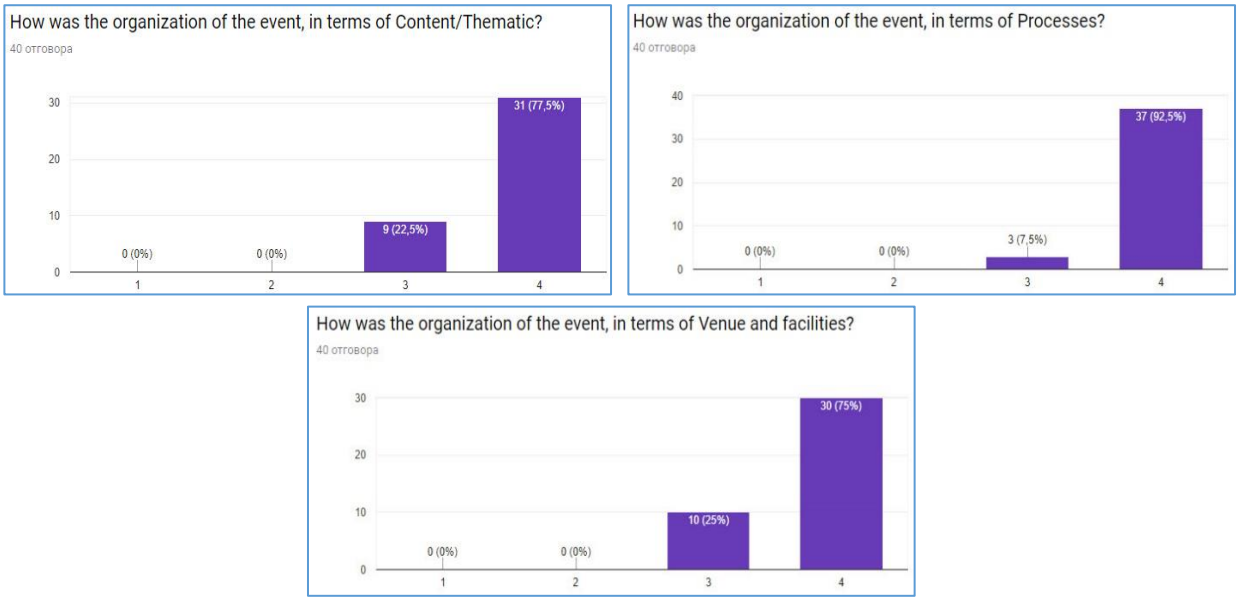


Figure 8 Evaluation of the organization of the event: 1 mean 'poor', 4 - 'excellent'

The participant find background materials – initial information, ***Key messages***, and presentation, relevant to the event topic and their personal professional interest, performing high quality of content (Figure 9 Evaluation of background materials).

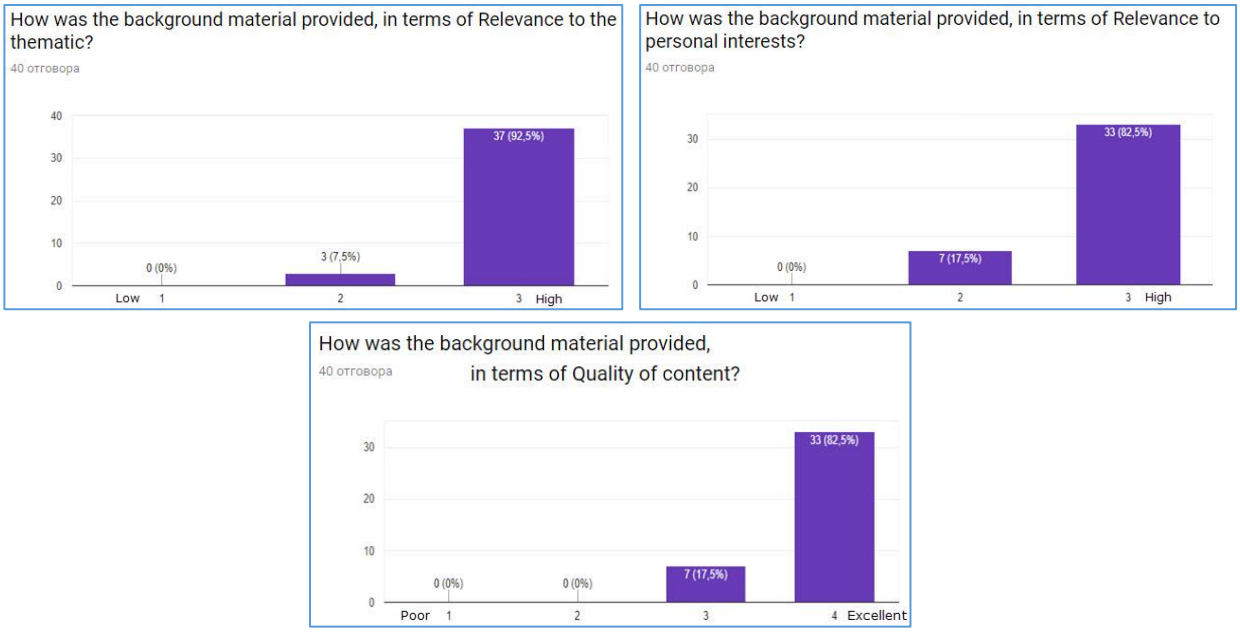
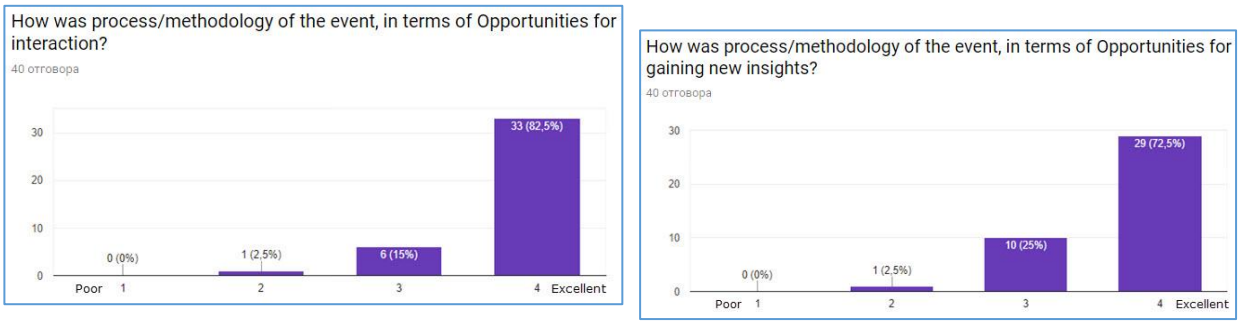


Figure 9 Evaluation of background materials

Evaluation of the process and methodology shows only one person with thinking that the event should provide more opportunities of interaction, 1 person with opinion that there were no enough opportunities of gaining new ideas, and 2 participants with relatively low level of satisfaction of the event outcomes (Figure 10). The reason can be revealed by the fact that there were 4 teachers, who should left the event after the initial (presentation) session due to work commitments. The other possible reason could be the expectation of some of the participants that they can use the event to influence policy makers for dramatically changing of the regulatory framework. Although these very few negative comments, the huge majority of participants provide high scores of the methodology and process of implementation of the event. As one of them shares, '*This workshop gave us an opportunity for information exchange among colleagues, which provoked generation of new ideas with respect to our work at school*'.



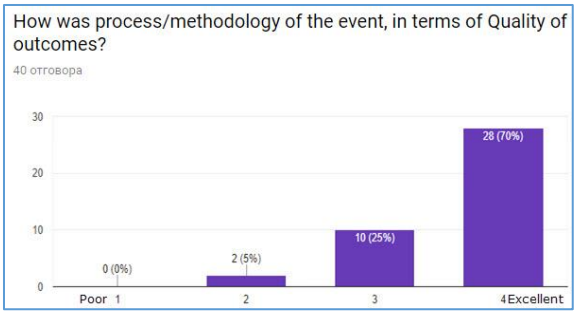


Figure 10 Evaluating the process / methodology

90 % (36 persons) show high level of overall satisfaction of the event. The participants' comments share the feelings and expectations, related to the further work:

- *Color codding - an interesting idea for group forming*
- *I am expecting an invitation for the next multiplying Elite's event in Bulgaria*
- *Satisfied with the focus group work (policy makers, policy mediators and practitioners)*
- P*articipation in the workshop gave me an opportunity to be acquainted with the strengths, weaknesses, opportunities, and threats in the new policy regulation concerning to STEM education. The group work provoked my active participation in discussion about many problems, daily work concerning my schoolwork.*
- *Please, organize more frequently such an events :)*
- *I am expecting more similar meetings and challenges!*
- *I would like to attend other such seminars.*
- *I would like to take part in other similar events.*
- *I would participate with a great pleasure again in future ELITe's events. Look impatiently forward for our next meeting within the project!*

SWOT analysis results

The success of the multiplier event E3 in Bulgaria provided the needed information about strengths and opportunities of organization and implementation of teacher training in STEM, in terms of possible re-use and the positive overall experience. In the same time, there are some issues for consideration, presented in the SWOT analysis (see Appendix 7).

Overall, the E3 event was very dynamic, interactive and rich of outcomes. The friendly atmosphere and intensive groups working become a base for long-term stakeholders' network development. The outcomes are very useful in terms of the ELITe e-scenarios development but also they can influence the quality of teachers' trainings at national level.

The main weak point is that the event took place at the last day of the school year when most of the teachers are engaged with year school reporting and some of invited ones could not be able to participate or should left earlier. Despite the situation, there were more participants on the event, than it was expected. It would be great idea if the ELITe team and tools can manage and support the developed stakeholders' community.

Conclusions

The multiplier event E3, delivered at the end of June 2017, developed a good network of policy makers, teachers' trainers, teachers and broad society members. The main issues elaborated during the event were the opportunity and challenges that the new regulatory framework provide for efficient and effective STEM teachers' trainings.

The common opinion is that the new policy documents provide much more flexibility and autonomy in decisions in front of all stakeholders' groups. At the moment not only the universities but also the science institutions, commercial and non-government organizations are eligible to offer teachers training courses, which raise the level of concurrency in terms of thematic of offed courses and quality of their design and implementation. This stimulates the course providers to look for teachers' requirement on the qualification courses and to search the best way to respond to them. Techers, themselves, are encouraged by the policy framework to upgrade their professional qualifications through attestation framework, requiring gaining of at least one qualification credit each year, that recognizes not only participation in trainings but also active participation in experience exchange activities – workshop, seminars, open lessons, conferences, etc., and pro-active behavior as researchers - both scientific and practical - at a classroom level. The schools receive a dedicated financial support for teachers' professional development and also has a flexibility to organize internal trainings.

The main outcomes from the ELITe project perspectives relate to the **thematic**, **methodology** and **forms** of STEM teachers' trainings.

Teachers shared their need of trainings on the new topics in the student's educational standards and curricula. For STEM teachers, very special topic of interest is **the use of relevant ICTs**, providing interactivity, that can compensate the limitations of school specialized labs (totally missing or poor of equipment). They need also practical courses related to the **interweaving of different disciplines**, providing ideas, design examples, and directions for students' achievement and the process assessments in implementation of interdisciplinary learning. They also need trainings on how to design, deliver and conduct an inquiry based learning on specific topics in specific grades.

All the stakeholders groups agree on the need of application of **modern teaching approaches** in the classroom. Special attention is dedicated to the interactive teaching methods which still are not very popular in Bulgarian schools. For STEM learning disciplines there is a special need teachers to be trained on how to design, deliver and conduct **inquiry-based learning** process.

Inclusive education is the other grate challenge in front of Bulgarian teachers. The Bulgarian society still is not ready to integrate fully people with disabilities. This is a big challenge in front of the parents relaying on the school not only to provide the integration of the children with special needs, but also to teach parents how to deal with them. For teachers is very important to be familiarized with the specifics of most popular disabilities and difficulties and how they relate to their subject taught – how to organize the classroom, which learning activities are appropriate and which are not, is there a need of special tools and how to use them. The issue is a challenge in front of the teachers' training providers also as they also need to study best practices and experience in the field.

Work with parents and broad society members is another weak point in Bulgarian educational system from past years and there is a need of training on how develop a good communication and collaboration between different stakeholders having attitude to the school life.

Different forms of assessment and relative feedback is still a problem for teachers having practices mainly on the use of open/closed questions tests but feel lack of skills in the evaluation of practical work, team work or inquiry-based learning and other innovative methods.

Another problem is related with the fact, that Bulgarian teachers are overworked with administrative engagements, and they need training on how they can deal with them in a more efficient way.

According to the **forms** of teacher' training, the common opinion is that there a need of development of strong network between STEM teachers, and between STEM teachers and trainers, so the preferable forms are a **face-to-face** and **blended** learning with a strong support of **online tools** for learning, communication, transfer to the classroom.

Discussing the teaching methodology, all the stakeholders share their believes that the teachers' training shell be based on the same innovative learning methods which are expected teachers to apply in the classroom, as opposite to the popular lecture-based teaching, traditional for long period in teachers' trainings in Bulgaria.

At national level, the multiplier event E3 participants suggested the development of a national online platform for offering and rating the teachers' training courses and providers.

The evaluation of the event shows a high level of quality and productivity. A new professional network was built between different stakeholders, based on constructive communication and understanding of each group's role and responsibility. The outcomes are very useful in accordance to the next ELITe project – development of teachers' training scenarios and e-learning content. They can also contribute to improvement of the teachers' training practices at national level. The evaluation questionnaire shows that participants are very satisfied by the organization, quality, and interactivity of the multiplier event.

Appendixes

1. Agenda/programme
2. ELITe flyer, presenting the ELITe goals and tasks
3. Key messages extracted from the Analytical Report of the Bulgarian national policy documents

ELITe Enhancing Learning in Teaching via e-inquiries, Erasmus+
Project Code: 2016-1-EL01-KA201-023847

ПРОГРАМА

за национален мултиплициращ научен семинар

Перспективи и предизвикателства пред учителите по природни, инженерни и математически науки

29.06.2017 г.

Продукт: SWAT анализ на нормативната уредба, свързана с изискванията към учители по природни, инженерни и математически науки, и ролята на изследователския подход в обучението по тези науки
Формат: European Assessment Scenario Workshop (EASW)

Програма:

10:00 – 10:15	Добре дошли
10:15 – 11:00	Представяне на проект ELITe и резултати от анализ на нормативни документи, свързани с подготовка, изисквания и кариерно развитие на учители по природни и математически науки, Ключови послания
11:00 – 11:15	Формиране на хомогенни фокус-групи. Постановка и разясняване на заданието
11:15 – 11:30	Кафе пауза
11:30 – 13:00	Работа по групи по ключовите послания: връзка между нормативна уредба и практика от гледна точка на типа група, изисквания към обученията на учители, роля на изследователския подход в обучението
13:00 – 14:00	Обяд
14:00 – 14:30	Представяне на резултатите от работата на всяка от фокус-групите. Маркиране на общи изисквания и разминавания в изискванията
14:30 – 15:15	Работа в хетерогенни групи. Разглеждане на различията. Търсене на компромисни решения
15:15 – 15:30	Кафе-пауза
15:30 – 15:50	Пленарна сесия: Представяне на резултатите от работата в смесените групи
15:50 – 16:00	Обобщение, закриване на семинара.

ELITe:

Enhancing Learning In Teaching via e-inquiries

(2016-2019)

2016-1-E101-KA201-023647

Erasmus+

Цели

Общата цел на проекта е осигуряване на подкрепа за професионално обучение за развиване на компетенции на учители, в частност на учители по природни науки, инженерни науки и математика чрез разработка на методология и инструментариум за изследователско обучение, базирани на доказани добри европейски практики.

Участници

Координатор: Foundation of Research and Technology Hellas (Гърция)

Партньори: шест организации от Холандия, Германия, Испания, Италия, Белгия и България – в лицето на Софийски университет „Св. Климент Охридски".

Специфични цели

Да задълбочат разбирането си за изискванията за развиването на компетенции на национално ниво по начина, по който са разработени като концепция и отразени от политици, политически медиатори и практици.

Да разработят, приемат и оценят ефективността на иновативната методология за гъвкаво и рефлективно професионално обучение за развиване на компетенции на учители по природни науки, инженерни науки и математика.

Да подкрепят възприемането на предложената професионална обучителна методология от заинтересованите страни, които се занимават с разработване на учебни планове за учители за по-добро прецизиране на предвидените политики свързани с обучението по природни науки, инженерни науки и математика на практика.

Очаквани резултати

Изследване на състоянието в 4 страничленки на ЕС по отношение на предвидени политики и изисквания за развиване на компетенции на учители по природни науки, инженерни науки и математика

Примерни дигитални сценарии за развитие на компетенциите на учителите по природни науки, инженерни науки и математика посредством изследователска методика.

Подобрени дигитални сценарии за учителите по природни науки, инженерни науки и математика посредством изследователска методика.

Хранилище за добри учителски практики.

Контекстуално обособени индикатори за оценка на развитието на компетенциите на учители по природни науки, инженерни науки и математика.

Наръчник с основни насоки за учителите по природни науки, инженерни науки и математика свързани с изследователски и рефлективни практики.

Системни възможности и предизвикателства пред развитие на компетенции на учителите по природни науки, инженерни науки и математика в 4 европейски национални контекста.

Рамка за развиване на компетенциите на учителите по природни науки, инженерни науки и математика посредством използването на изследователски подход.

Препоръки за политици и отговорните за разработване на политики в посока създаване на нов модел за професионално обучение на учителите по природни науки, инженерни науки и математика.

Доклад с оценка и валидиране на подхода на ELITe learning in teaching via e-inquiries

Ключови компетенции на българските учители по природни науки, инженерни науки и математика

Основни послания за дискутиране по време на семинара

Важни въпроси свързани с развитието на компетенциите на учителите по природни науки, инженерни науки и математика в България

Микро ниво

На ниво класна стая: Учителите трябва да могат да проектират класни учебни дейности, свързани с прилагане на изследователския подход. Учителите имат нужда от помощни инструментални средства за ежедневното прилагане на този подход, както и от подходящо учебно съдържание.

Мезо ниво

На ниво училище: Възможности и предизвикателства пред училищните ръководства за по-гъвкаво прилагане на нови стратегии, учебни програми и иновативни методи за преподаване.

Макро ниво

На национално ниво: Възможности и предизвикателства за изграждане на нужните компетенции на учителите чрез повишаване на квалификация и обучение през целия живот.

Основни теми за семинарите в България

Основен фокус и център на внимание ще бъдат въпросите свързани с ефективното прилагане на изследователския подход в обучението по природни науки, инженерни науки и математика. Ще се разгледат проблемите свързани с изграждане на нужните компетенции на учителите, ролята и отговорността на родителите, осигуряването на необходимите ресурси за прилагане на този метод в ежедневието.

Дискусии в еднородни групи

Поведизване на въпроси и проблеми: Възможности и предизвикателства пред подготовката и развиването на компетенциите на учителите за прилагане на изследователски подход в обучението по природни и инженерни науки и математика.

Дискусии в разнородни групи

Постигане на съгласие: Дискутиране на конкретни въпроси и проблеми, свързани с подготовката на учителите, постигане на съгласие и формулиране на конкретни предложения пред съответните национални органи.

Пленарно заседание

Финално структуриране: Финално оформление и структуриране на повдигнатите проблеми и предложения за решения, и намиране на съответствие с европейската скала на компетенции и правната рамка на Българската образователна реформа.

Семинарът ще се проведе на:

Дата: 29 юни 2017 г.

Час: 10.00 ч

Място: „Дома на Европа", гр. София, ул. „Раковски" №124

Организатор: Факултет по математика и информатика, СУ „Св. Климент Охридски"

Съфинансиран от програма „Еразъм+" на Европейския съюз

Ключови компетенции за българските учители по природни науки, инженерни науки и математика

Основни послания

За дискутиране по време на семинара

Описание на контекста

През последните десетилетия България се изправи пред необходимостта от сериозни промени в образователната система и основните закони в тази сфера. Последната реформа започна през 2010 г., като промените влязоха в сила през 2016 г.. Тези промени определят важна роля за учителя в образователните процеси. От друга страна се изискват сериозни промени в знанията, уменията и поведението на учителите. Това води до трудности не само за учителите, но и за всички други въвлечени институции – министерството, регионалните инспекторати, институциите подготвящи учители и училищата.

Важни въпроси свързани с развитието на компетенциите на учителите по природни науки, инженерни науки и математика в България

На ниво класна стая (микро ниво): **Учителите трябва да могат да проектират класни учебни дейности, свързани с прилагане на изследователския подход. Учителите имат нужда от помощни инструментални средства за ежедневното прилагане на този подход, както и от подходящо учебно съдържание.**

- Необходимо е учителите да изграждат и развиват компетенции за прилагане на изследователския подход в училище, да създават и прилагат сценарии, базирани на този подход в ежедневната си практика в клас.
- Необходимо е да се предоставят инструменти на учителите за по-лесно и ефективно прилагане на този подход чрез подходящи учебни дейности.
- Авторите на учебно съдържание трябва да нагодят учебния материал с цел възможност за прилагане на изследователския подход, като дадат достатъчно свобода на учителите да избират как да се случи това на практика.

На ниво училище (мезо ниво): **Възможности и предизвикателства пред училищните ръководства за по-гъвкаво прилагане на нови стратегии, учебни програми и иновативни методи за преподаване**

- Училищните управи да използват правото си на автономни решения и отговорността пред обществото за високо качество на образователни услуги, като създават условия и възможности за прилагане на изследователския подход в обучението

На национално ниво (макро ниво): **Възможности и предизвикателства за изграждане на нужните компетенции на учителите чрез повишаване на квалификация и обучение през целия живот**

- Министерството да организира и гарантира провеждане на обучения за учители на

национално, регионално и локално ниво чрез привличане на компетентни преподаватели и организации, специализирани в подготовката и квалификацията на учителите

- Министерството да стимулира създаване на подходящи инструментални средства и учебни материали за прилагане на изследователския подход в образованието

⇨ Основни теми за семинарите в България

Основен фокус и център на внимание ще бъдат въпросите свързани с ефективното прилагане на изследователския подход в обучението в природните науки, инженерните науки и математиката. Ще се разгледат проблемите свързани с изграждане на нужните компетенции на учителите, ролята и отговорността на родителите, осигуряването на необходимите ресурси за прилагане на този метод в ежедневието.

Повдигане на въпроси и проблеми (дискусии в еднородни групи): Възможности и предизвикателства пред подготовката и развиването на компетенциите на учителите за прилагане на изследователски подход в обучението по природни и инженерни науки и математика.

Постигане на съгласие (дискусии в разнородни групи): Дискутиране на конкретни въпроси и проблеми, свързани с подготовката на учителите, постигане на съгласие и формулиране на конкретни предложения пред съответните национални органи.

Финално структуриране (пленарно заседание): Финално оформление и структуриране на повдигнатите проблеми и предложения за решения, и намиране на съответствие с европейската скала на компетенции и правната рамка на Българската образователна реформа.