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PISH COUNTRY STUDIES

GREECE

PISH PROJECT

Erasmus+

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Section 1: Introduction

Table 1: Profile of respondents to the country report.

Profile of the respondents	
• Number of teachers interviewed	6
• Number of students interviewed	6 (3 foreign students, 3 local students)
• Names of HEI represented in the Interview	University of Thessaly, University of the Aegean, Aspete
- Countries of origin of foreign teacher (s) interviewed (if the teacher is a foreigner).	All the interviewed teachers were Greek.
- STEM courses taught by the teachers interviewed	- Education Technology, - Pedagogical Applications of Computers, - Computer Programming, - Educational Robotics, - Computing Science, - Models for the development of STEM curricula, - Production and evaluation of STEM educational activities, - Science Teaching, - Computer Science, - Communications Technology, - Applied Mathematics, - Mathematics.

- Country of origin of students interviewed	- Greece, - Russia, - USA, - Germany.
- STEM discipline or field of study of the student	- Maths, - Physics, - Mining engineering, - Architecture.
- Gender of teachers interviewed	5 male, 1 female
- Gender of students interviewed	Female

Section 2: State of the art on HEI STEM in Greece

Section 2.1 Profile of STEM students in Greece

This section provides insight on the profile of STEM students in Greece.

Table 2: Profile of HEI STEM students in Greece

Indicators	
• Number of HEIs in the country.	26
• Number of STEM students in each HEI.	On average there are 615 students. It should be noted that the most places are given by the University of Thessaly 1137 and the University of Patras 1068 in the last two years.[1]
- Average number of student per class.	According to the stem teachers' answers, the number of students per class ranges from 100-200 in some subjects (especially in theoretical subjects), while in smaller classes from 30-50 in laboratory subjects.
- Average age range of STEM students (Optional)	18-23
- Average number of foreign students per class	Half of the teachers answered 10% and the other half 2%
- Percentage of students from EU	The total percentage of foreign students is 3,4% (715.2 total of domestic and foreign students). Specifically, approximately 17.000 students come from EU and non-EU countries). It should be noted that the majority of those coming from European countries are from Cyprus (approximately 12.200 students for the years 2016-2019),

[1] The data were taken from the website of the Ministry of Education (https://www.minedu.gov.gr/)

	while students from non-EU countries studying at Greek universities are about 2.500.
- Percentage of from Non-EU countries	The number of students coming from countries outside the European Union is 2.500. Iindicatively three of the countries that are represented to a significant degree in Greek universities: • Russia (with 438) • Syria (with 214) • Egypt (with 158 students)

The data for completing the table were retrieved from research in scientific literature and statistical publications about the topic and the conducted interviews with teachers. Specifically, the data about the number of HEIs and the number of STEM students in them came from data on the website of the Ministry of Education. Regarding the percentage of students from EU and non EU countries, the statistical data were retrieved from the website of the UNESCO Institute of Statistics and relate to the years 2016-2019, while for the remaining requests the data were obtained from teacher interviews.

Section 2.2: State of the art on STEM education in Greece

- National attitude/policies and initiatives towards promoting STEM education in Greece.
- University initiatives towards promoting STEM education in Greece.
- Teaching methods/approaches used in STEM education in Greece (optional if you are not able the relevant information).

STEM meets for the first time in Greece in 2012 but has not been included in the official curriculum. To date, only a general guidance framework is applied in the Greek educational context. Specifically, from the school year 2011-2012, robotics is an auxiliary part of the DEPPS-APS[2] of the Informatics course, from the 5th grade of Elementary to the 2nd grade of High School, while the course is expected to be two hours for all Primary School classes, to be taught by Informatics Teachers and to be addressed to all children (Φ.3 / 609/60745 / Γ1 / 28-5-2010). Also, the

[2] Interdisciplinary Unified Curriculum Framework-Curricula

introduction of Informatics in the All-Day Primary School is determined based on the feasible or factual model (APS, 2010). Therefore, it is not approached as a learning tool, but as a separate subject, while its character is not mandatory. It has the form of a teaching proposal that comes to complete the curriculum.

In the same direction, the faster development of STEM is found in private bodies that design and implement programs oriented to the components of STEM since pre-school education. Specifically, STEM clubs and teams in private schools, competitions (First Lego League, WRO, etc.) with the support and subsidy of many private companies, while many university institutions claim a dynamic presence in the field of STEM, either with postgraduate programs or with relevant teacher training or with the creation of robotics and STEM academies. A typical example is the approval of the Ministry of Education in the Organization of Educational Robotics & Science WRO Hellas for the pilot conduct of Skills Laboratories for Primary and Secondary Education with the title of program "Pilot Application of Educational Robotics in Robotics" (ΠΕΡΕΔΓ – mbs)[3]. In particular, the program concerns the school year 2020-2021 and aims to enhance the cultivation of mild skills, life skills and technology and science skills in students in combination with the formation of a modern program framework with a structure of Open, Live Curricula and Procedures. In other words, the Skills Workshops are an innovative didactic and educational activity, which consists in the pilot addition of new thematic cycles in the kindergarten and in the compulsory timetable of the Primary and High School, utilizing exploratory - exploratory learning methods (WRO Hellas[4]).

More practically, steps for the promotion of STEM in Greece have been made by the country's participation in various European programs, funded by the European Commission. Specifically, Scientix is one of them, it took place in three stages (2009-2012 / 2013-2015 / 2016-2019), is supported by the European Schoolnet network, and provides interested teachers with the opportunity to attend various seminars, workshops and workshops aimed at their education and training in teaching innovations. Also, according to I.E.P.[5] 100 Greek schools (Primary, Secondary Schools and Lyceums) participate in the European project H2020: "Open Schools for Open Societies - OSOS" ("An open school in an open society") focusing on STEM objects on topics related to contemporary social challenges (I.E.P., 2017). At the same time, the participation of Greece in the three-year European program TERECoP (Teacher Education in Robotics - Enhanced

[3] https://www.minedu.gov.gr/
[4] https://stem.edu.gr/
[5] Institute of Educational Policy

Constructivist Pedagogical Methods) contributes to the development of STEM objects in the Greek educational context, as the goal was the in-service training of teachers on educational robotics (Alimisis, Frangou & Papanikolaou, 2009). Finally, the Ministry of Education provides licenses and sponsorships for relevant competitions, while several robotics festivals and competitions take place with the participation of public schools and the supervision and coordination of the Regional Directorates of Education of the country[6].

Finally, the study of national education policy for STEM shows that its development is slow and that is in public education, in contrast to the private one, which is identified as greater development. In fact, even at the level of European countries it is observed that although the usefulness of STEM education is recognized, nevertheless the funding and state support is mainly focused on higher education (Kalolo, 2016: 68).

Table 3: Overview of class setting for HEI STEM students in Greece

General Respondent Indicators	
- Average number of students in the respondent students' classes.	According to the STEM teachers' answers, the number of students per class ranges from 100-200 in some subjects (tespecially in theoretical subjects), while in smaller classes from 30-50 in laboratory subjects.
- Average number of foreign in the same class with the respondent student.	According to data from teacher interviews, half of the teachers answered 10% and the other half 2%
- Mode of teaching (e.g., active learning, collaborative learning,	According to the answers of the teachers at the top of their teaching choices is located: _ Lectures (with all teachers stating that they use it in their lessons) _ Presentation (with five out of six teachers choosing it)

[6] Educational Robotics Olympiad https://wrohellas.gr/
Informatics Student Conference http://math-syn-pli.gr/
Student Robotics Festivals
European project ROBOESL-EDUMOTIVA-European Lab for Educational Technology

	_ Teamwork and group projects (with five out of six teachers choosing it) _ Discussion (with five out of six teachers choosing it) _ Individual assignments (with four of the six teachers stating that they choose them) However, it is worth mentioning that, some of the teachers indicated other methods and practices they use such as lectures which include discussion and problem solving as methodologies as well as case studies, laboratory/experimental activities and workshops. Our target group tried to emphasize and be precise in the responses so as to depict a clear view for the purposes of the present report.
- Mode of student interaction within the class	Most teachers say they use group work (3-5 people in each group) to achieve collaboration between students. In fact, teamwork is implemented to a greater extent in laboratory courses. Some also mention the method of whole class discussion and workshops in the classroom, while also mentioning the work of students in groups on a real problem in order to apply this knowledge, suggest solution paths and work with all the necessary cognitive tools. Another method mentioned is the use of WEB 2.0 Tools.

Decoding discipline (Pace & Middendorf, 2004) is a major teaching challenge at the tertiary level. Teachers should introduce and guide students in a process of bridging the gap between their scientific thinking and students' efforts to understand this thinking and consequently specialized study content. That for teachers at the level of the relationship between scientific models and their contents is considered a self-evident assumption, can be a significant obstacle for students to understand scientific knowledge. The teachers themselves may have encountered during their basic studies similar problems of understanding scientific thinking and constructing scientific knowledge with those faced by their students. The effectiveness of their teaching depends to a large extent on

the correct diagnosis of these difficulties by the teachers and their correct treatment. The relevant literature lists specific practices that teachers can follow to help their students overcome these difficulties. These include identifying an obstacle in the student learning process, presenting the stages involved in the procedures followed by experts in their field, motivating students to try and practice in these procedures, evaluating how they respond to students in such teaching activities (Riegler & Palfreyman, 2019). An equally important challenge is that of the active involvement of students in the teaching process. Creating a learning environment with key features of exploratory orientation and the use of interactive teaching methods can contribute to effectively addressing this teaching challenge.

The applied teaching applications by the teachers who participated in the research are moving in the direction of the above methods of dealing with the basic didactic challenges.

Specifically, the most common teaching method is that of the “lecture”. The lecture is a historical teaching method at the university and despite the criticism it has received to date has a firm place in the repertoire of teaching methodology in higher education, especially in departments with a large number of students. As far as our research is concerned, it appears that it is being used to a relatively large extent in relation to the methods mentioned earlier.

“Open discussion” is also mentioned as a relatively common teaching method. In the context of this method, the teacher is allowed to understand the way of thinking of his students and to identify the obstacles that must be overcome to approach and understand the scientific way of thinking. Furthermore, this method offers incentives for students to actively participate in teaching as it enables them to submit their questions and their perceptions and knowledge, and to engage reflectively in a collective process of formulating scientific questions and seeking possible theoretical explanations. Both in terms of the application and the results of this method, ethnographic data would be useful to shed light on the "how" of the performance of this method, the character of the roles of the teacher and the students, the dynamics of the relations between the participants and the quality. of the requested active participation of students.

“Individual work” is also referred to as a method. This method mainly serves two purposes: (a) the diagnosis of the level of knowledge acquisition by each student individually and any obstacles he faces and (b) in the individual assessment of students.

Finally, there are other methods that have been mentioned by teachers and play an important role in teaching, such as “lectures which include discussion and problem solving”, “case studies”, “laboratory/experimental activities”, “workshop”. However, the most common of the above

methods of teaching is that of "dialogue in combination with problem solving". In the context of the dialogue, the obstacles to access to scientific thinking and knowledge that students face are detected and in the context of the "problem solving" method, they are allowed to understand the procedures followed in the application of scientific knowledge. This framework can also help the teacher to understand the potential barriers to understanding scientific thinking that their students face. In any case, this is an effective method of training students in the process of scientific thinking and action. However, we would need more and mainly ethnographic research data to decide on how this method works in practice, as its success depends on several conditions, such as students' interest in the problem to be solved, its degree of complexity, its authenticity, and its proximity to everyday life.

Section 3: Intercultural Communication Challenges faced by STEM students

This section highlights the intercultural communication barriers and challenges encountered by students within and outside the classroom.

Section 3.1 Intercultural challenges encountered by Students within the classroom

1. **Intercultural communication challenges as experienced by students (both foreign and local) in the classroom.**

Language barrier: 3 in 6 students mentioned language challenges, mainly at the beginning, and one of them said that in some cases, group members needed to repeat something to understand it. However, all 3 report that language barriers are quickly overcome and this constitutes the general objective.

Misinterpretations in the interaction between students due to difficulty in understanding the cultural context: 3 in 6 students cited the different cultural context as a challenge. Specifically, one of the students stated that because of this the intentions of the interlocutors can be misinterpreted (in the beginning), while another that it is difficult to communicate and find common ground in some things (e.g., in humor).

Difficulty adjusting in working and studying habits: Three of the six students reported that they faced challenges, some to a greater extent and some to a lesser extent, regarding the way they work. In fact, two of the students mentioned that in the end this type of difficulty helps them to learn many

different ways of studying, since they have the opportunity to get information from each school, student and how they work. Therefore, this helped to build their own study style.

Students from different cultural backgrounds sometimes face discrimination from peers or educators. One of the students stated that she faced issues of discrimination related to gender, however the other students pointed out that they did not have similar experience. In fact, two of them reported that both their fellow students and their teachers were trying to create a familiar reception atmosphere. It is worth mentioning, however, that one of them stated that the discrimination faced by students from different cultural backgrounds is sometimes reinforced by teachers, although they do not expect it. In particular, the way they express themselves, as well as the way they organize the school curriculum and activities, can reproduce or reinforce these distinctions.

2. **Challenges as observed by the teachers in the classroom**

Language barrier: Three of the six teachers report that one of the challenges they identify with students in the first major period is language. As one of the teachers states, there is difficulty in understanding and producing academic speech or difficulty in understanding the required work in the second language. However, these conditions heal quickly.

Difficulties in collaboration: Half of the teachers cited the removal of barriers to cooperation between locals and foreign students as one of the main challenges. In particular, two of them attribute these difficulties to language barriers, which make communication and therefore cooperation difficult. On the other hand, one teacher considers the difficulty of collaboration as a consequence of the lack of infrastructure and methods that would contribute to more collaborative teaching. He also states that not only foreign students, but also natives are not familiar with the educational methods of cooperation, and this aggravates the problem.

Cultural context issues (to a lesser extent): Two professors also mentioned challenges related to cultural context issues. For example, in group work, native students often guide the process and seldom leave initiatives to foreign students, while the majority of foreign students seem to be more team players and tend to organize their work from the beginning of the semester, to set milestones, etc., which locals identify and try to adapt quickly.

Section 3.2: Intercultural communication Challenges encountered outside the classroom

1. **Intercultural communication challenges as experienced by students (both foreign and local) outside the classroom.**

    a. **Language barrier:** Three of the six female students seem to have encountered some language barriers during their first period of contact with an intercultural context. In particular, it seems that these barriers were removed more quickly at the level of social contact compared to the university context. According to one of the students, her association with people from different cultural and linguistic backgrounds helped in the use and exchange of two languages, while in the same direction another student pointed out that it helped her to manage and adapt linguistically and cultural characteristics faster during an intercultural encounter.

    b. **Cultural context issues:** In total, three of the six female students answered in the affirmative if they encountered a challenge in their communication both inside and outside the classroom. Specifically, one of the students mentioned that in social interaction with other students, sometimes you feel very close and can communicate without obstacles, while others find it difficult to communicate and find common ground (e.g., you feel that you do not laugh with same things). Also, one of the students who did not meet a challenge said that conversations on topics such as habits, traditions, religion, history, experiences help to build better relationships with foreign students and communicate better.

Section 4: Challenges encountered by HEI Teachers in solving the identified challenges.

1. Two of the teachers cite time as a key challenge in the process of addressing the challenges described above. In particular, they report that both the absence of material for the implementation of a course referring to students with different cultural and linguistic backgrounds constitutes a time-consuming production process, as well as the planning of activities.
2. Students are not familiar with collaborative and experiential methods: One professor cites as a challenge the unfamiliarity of students, both native and foreign, with collaborative and experiential methods. In fact, the tendency of natives to dominate teamwork over foreigners, due to the advantage of language and familiarity with how to work in the classroom, is a major challenge for teachers.

3. One professor cites as a challenge the need to create space for international students. In particular, this process requires training of teachers in the practices and methods that can contribute to it and consequently, as mentioned above, time for the design and implementation of such methods, as well as infrastructure and resources.

Section 5: Initiatives adopted by HEI teachers to solve the problem

1. One teacher report that he uses written instructions and worksheets instead of oral instructions. Specifically, in this way, students have the opportunity to process the requirements, having more time at their disposal and thus to better understand them. In oral speech they do not have this advantage of time. At the same time, he states that it is important to make sure that the requirements are presented and analyzed in detail and are therefore understood by all.
2. Three of the teachers, state that they choose to create and use presentations in their lessons in a language common to the majority of the class (e.g., in English) or often try to transfer the key elements (keywords) to the common language in order to facilitate teaching and increase participation and interaction.
3. Most of the teachers, four out of six, reported that they used educational materials and methods to manage the challenges they encountered, such as collaborative knowledge development, case studies and work plans, group laboratory / experimental activities, group work. In particular, the provision of worksheets with specific tasks for the elaboration of topics in STEAM education, in alignment with the STEAM content epistemology and its elaboration in small groups, is an example. In addition, some reported that they try to raise a problem and encourage students to make assumptions, test them against reality, and optimize their model.

Section 6: Recommendations from students and Teachers on how to solve the challenges.

Below we have summarized the recommendations from both teachers and students with key responses on how challenges can be resolved as well as accompanying recommendations to be

potentially adapted or adjusted in the near future. We trust that both actors' experiences point towards valid and solid recommendations.

Teachers

a) The construction and use of multilingual material is a proposal of a teacher with the argument that cultural diversity allows the examination of multiple points of view. Therefore, this is an important experience in an educational context and allows for better teacher preparation, while giving teachers the opportunity to identify and respond to the needs of their students.

b) One of the teachers proposes the introduction of joint extracurricular activities, such as acquaintance evenings for local and foreign students, excursions and activities that lead to the strengthening of the teacher-student relationship, but also of students between them. In addition, the above practices that take place both inside and outside the university help to remove barriers and challenges related to cultural and linguistic elements.

c) Two of the teachers mention the need to focus on collaborative teaching methods. In particular, they argue that to do so requires teachers training for teaching methods and for intercultural challenges.

d) The formulation of central policies and practices is a proposal of two of the six teachers. Specifically, they mention the strengthening of existing services and institutions and the creation of services to which students can turn for procedural and academic issues. Also, another proposal is the financial support to the universities for infrastructure and the provision of more scholarships, thus facilitating the interaction of students from different cultural and linguistic environments.

Students

a) Two of the female students mention as a key proposal the provision of more accurate and extensive information before and during their stay and study from the university. In particular, in addition to information about the university and the study program, information related to more practical issues such as how the library, the reading room, how the university and its students operate in general are also necessary. Also, the provision of information about the country and culture is mentioned as important.

b) One student mentions as a proposal the development of an integrated strategy on the part of the university on intercultural issues (e.g., information on procedures, wider region / country, how to work and work within the university, teaching methods and practices contribute to interculturalism, actions to meet and strengthen student relationships with others, teachers, and the wider academic and local community).

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http://www.moec.gov.cy/analytika_programmata/programmata_spoudon.html