A STEM Literacy Program for Students in Secondary-Tertiary Transition to Reduce the Gender Gap: a Focus on the Students' Perception

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ABSTRACT [1]

This study concerns the design and implementation of a STEM literacy program for 11th to 13th-grade high achieving students, mainly females. The program, funded by the Italian Ministry of Equal Opportunities, aims at reducing the gender gap in the STEM disciplines and at orienting students towards university studies. We carried out a qualitative analysis of the students' perception in terms of (1) a-priori expectations about the STEM literacy program and (2) a-posteriori thoughts and reflections about the attended course. Our analysis shows that students aspiring to participate had strong motivations with respect to the program; moreover, most students who participated in the program displayed satisfaction and an increase of awareness about their learning. We put a specific focus on the mathematical sessions of the curriculum, involving students as designers of educational resources. Some differences between male and female students arose for what concerns the perception of the program and the awareness of the impact of the STEM literacy program on their own learning.

Keywords: Gender Gap in STEM, Transition from Secondary to Tertiary Education, STEM Literacy, Technology-Enhanced Teaching, Mathematics Education.

1. INTRODUCTION

In this paper we deal with the design and implementation of a STEM literacy program addressed to senior students at secondary schools with the purpose of orienting their transition to tertiary education. The lucky occasion of a ministerial call led us to pay particular attention to the gender gap in scientific subjects.

Gender gap in STEM

In June 2020 the Italian Ministry for Equal Opportunities launched a call for grants entitled "STEM 2020", [13], whose goal was to finance projects, including science camps, promoting education in STEM disciplines for groups of students in which the female component was higher than 60%. The ministerial call required that the projects under evaluation should: fight against stereotypes and biases that feed the knowledge gap between girls and boys with respect to STEM subjects; stimulate STEM disciplines learning, also by using innovative teaching approaches; foster the sense of self-efficacy of female students about their attitude towards scientific knowledge.

There were two reasons underlying the call "STEM 2020". One reason was the pandemic emergency, which forced us to suspend school attendance from the beginning of March to the end of June and confined students at home, leaving them eager for interpersonal face-to-face relations. Another reason was the gender gap in STEM disciplines in Italy, which provided the fundamental motivation for the call.

Many institutional documents and literature in STEM education ([2]; [11]; [12]; [15]; [16], [19]) suggest that increasing personal scientific literacy implies an improvement of social competencies (e.g. critical thinking, analytical skills, creativity, problem solving and resilience). These key competencies are related not only to individual knowledge and skills, but also to "personal fulfilment and development, employability, social inclusion and active citizenship" ([11]). Hence, they promise to be essential in today's competitive and complex European job market, where there is an offer of 2 million unfilled jobs in science although there are 12

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million unemployed young people ([18]).
In tune with the general need for targeted actions fostering STEM education, the recommendations contained in the final report of the Gender Gap in Science project ([12]) suggest practices that encourage girls' participation in scientific activities in school and non-school settings and that favor their learning of scientific subjects. Moreover, specific suggestions for overcoming the gender gap in Mathematics were formulated at the World Meeting of Women in Mathematics, held in Rio de Janeiro on July 31st, 2018, in the framework of the International Congress of Mathematics. Some of these suggestions focus on the strategies to stimulate girls to become undergraduates and/or to do research in Mathematics. In particular, the importance of starting to promote gender balance in the early stages of education is underlined, and the key role played by teachers in this process is stressed ([17]).
Since the fourth and fifth Goals of the 2030 UN Agenda for Sustainable Development ([2]) are "To ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" and "To achieve gender equality and empower all women and girls", respectively, any social stakeholder - educational agencies as well as schools and universities above all - must feel committed to actions which can decrease gender gap. This is particularly true for our context, the School of Engineering at Università Politecnica delle Marche (Italy), where there is a wide gender gap between undergraduate students, especially in Computer Science, Electronics and Mechanics curricula.

Technology-enhanced teaching and learning at our university

Our university (Università Politecnica delle Marche, Ancona, Italy) has been engaged for a long time in the promotion of the use of technological tools for the overcoming of the learning difficulties in STEM disciplines. In particular, a Ph.D. program in e-learning was carried from 2007 to 2013 and a policy of incentives for additional teaching activities run via Moodle has been put in place since 2012.
A group working in Mathematics Education grew around the university proposal "Didattica Multimediale della Matematica" (P.I. Francesca Alessio), which was funded in 2017 by a local grant of 40,000 Euro; one of the main outcomes of its activities is the website "Matematica per Immagini e Animazioni" (https://math-diism.univpm.it/progetto/), where some files aimed at supporting the traditional face-to-face university mathematics courses are collected.
The faculty involved in this project observed an improvement of the performance of the undergraduates attending the courses in which the students were offered learning tools (mostly digital ones) to deal with mathematical contents; some of them carried out specific investigations to get a better understanding of the effectiveness of these instruments ([3]; [4]; [5]; [9]; [22]; [23]).
Moreover, many faculty members, including the authors of the present paper, are involved in the research group DIGiMATH of the Italian Union of Mathematics. The group, involving about 50 members from 25 Italian universities and 2 institutions, develops research projects aimed at a careful integration of technology in teaching and learning at university level (www.digimath.it, https://umi.dm.unibo.it/gruppi-umi-2/gruppo-digimath/).
The project we describe in this paper is under the patronage of DIGiMATH.
Other members of the project team are involved in the school-university relationship (school-university delegate of our university), in the school-university transition (members of the guidance and tutoring commission of the engineering faculty of our university). The external consultants are also experts in organizing summer schools in the field of Artificial Intelligence and Information Technology.

Research questions

Within this scenario, on the basis of the ministerial call, our expertise as teachers in a polytechnical university, and our specific research interests in Mathematics Education, we designed a learning path devoted to senior secondary school students, with a specific focus on Mathematics .
We aimed at analysing the students' perception of such a STEM literacy program either in terms of a-priori expectations of students aspiring to participate in the program and a-posteriori reflections and thoughts of students who attended the program. The specific research questions we address are:

1. How can we design a learning path characterized by non-traditional teaching strategies and aimed at familiarizing students with STEM subjects in the secondary-tertiary transition?
2. What are the students' expectations with respect to such a STEM literacy program?
3. What are the students' reactions on such a STEM literacy program?

2. THEORETICAL FRAMEWORK

In this section we recall the essential elements that guided the design of the STEM literacy program and, in particular, the mathematical sessions. According to recent studies about STEM education ([6]), we adopted a STEM Project-Based Learning (STEM PBL) approach. It consists of educational practices aimed at constructing learning by means of open and challenging tasks to be solved. Thus, students are encouraged to critically think on real problems, activate resources from different knowledge areas, and make connections between them; moreover, they are required to investigate, make decisions, design, and provide a final product.
From a methodological point of view, the STEM PBL

approach envisages collaboration among students, peer communication and problem solving. All these features were essential in the realization of our STEM literacy program, which aims at a double goal: on the one side, fostering familiarization, knowledge, and skills of the single STEM subjects and, on the other side, inducing students to integrate different STEM approaches and tools to solve the proposed problems.

A key element of our project is the target group: we offer the program to students facing the secondary-tertiary transition; hence we need to orient them in the choice of university studies, giving them a taste of the core ideas and epistemology of the STEM subjects.

Our project team was interested in the issues of transition from secondary to tertiary education for a long time. In particular, two of the authors of the paper are members of the Committee for the Entrance Test since its foundation in 2013 and several teammates have been teaching short courses in high schools (both for teachers and for students), with the goal of giving a better awareness of crucial scientific contents.

For what concerns the mathematical sessions, our research follows the mainstream of the few studies concerning the involvement of students as (co-)designers of learning resources and activities ([8]; [10]; [21]), in particular by exploiting digital technology. According to these studies, the educational benefits of such an experience may occur not only at the cognitive level of learning, but also the metacognitive and the affective ones. Indeed, the students are involved in the design of digital activities devoted to other students and, in this way, they can deepen their understanding of mathematical topics and to identify the critical aspects of it, thus developing more meaningful learning. In a few words, they turn out to be involved in a virtual and asynchronous peer-tutoring activity. Moreover, the use of technology to implement tasks for other students increases the engagement with mathematics and logical, technological and communicative skills [7].

3. METHODOLOGY

Context of the research and participants

According to the constraints imposed by the grant we received from the Italian Ministry for Equal Opportunities, we had the possibility to create a short STEM curriculum: 40 hours of lessons, 20 of which were devoted to Mathematics, 8 to Computer Science, 6 to Physics and 6 to Chemistry. The program lasted from October to December 2020 and was scheduled in 10 modules of two consecutive 2-hours sessions. All sessions envisaged collaborative activities in groups of three or four students. Ten faculty members and two external consultants, experts in Natural Science, Computer Science, Mathematics, and Technology were involved in the teaching activities. In tune with the philosophy of the project and the recommendations of international documents about STEM education, we tried to present as many female role models as possible: the director of the project was a woman (the second author of the present paper), and the teachers were 7 men and 5 women. A specific action devoted to the reduction of the gender gap in STEM was a brief introduction about the issue during the first meeting of the program.

Due to the Covid-19 emergency, the last six modules of the program took place remotely via the Zoom platform. In these cases, the activities in working groups were organized through the breakout rooms of Zoom.

The learning path involved 20 high-achieving 11th to 13th-grade students (14 female, 6 male); they were selected among 92 students (44 female, 48 male) who had applied the program. The selection was made on the basis of two elements: the scores achieved in the STEM subjects in the previous two school years and the answers provided to an application form concerning the motivations to be involved in the STEM literacy program.

Thanks to the success of this first edition and to the improved sanitary situation we were able to run a second edition of the program, which was financed by the Università Politecnica delle Marche and took place in June - July 2021.

Research data and methodology

To answer the second and the third research questions concerning the students' reaction on designed learning path about STEM, we used the following tools:

(a) an application form filled in by 92 students aspiring to participate in the path, and

(b) a survey completed by the 20 students who concluded the path.

Both documents were designed by the project team and were submitted by students online.

In the application form we asked students about the reasons motivating them to participate in the program (open-ended question). The second questionnaire, submitted after the conclusion of the program, consists of five sections, a general one and four more specific ones on the STEM subjects treated in the program. It concerns general reflections on the course, including the perceived usefulness, the impact on the learning of STEM disciplines, possible critical issues, and suggestions for future implementations. We chose to make the questionnaire anonymous so that students felt free to be honest. The questions on which we focused on for the present study, from the general and the mathematical sections of the survey, are:

(1) Was the program useful/interesting for you? Why?

(2) What aspects did you mainly appreciate?

(3) Do you think that your file could support students in overcoming specific difficulties concerning the mathematical topic at stake?

(4) Do you think that the design of the files supported you in the understanding of the mathematical topic at

stake?

A qualitative analysis of the answers to both questionnaires was carried out. The researchers read the texts and coded them individually, referring to the research questions and to the theoretical framework; then they discussed the emerging themes until they agreed on the most relevant ones ([20]).

4. THE STEM LITERACY PROGRAM

Considering the most relevant recommendations of the institutional documents addressing the gender gap in STEM, we designed a learning path, which can be defined as a STEM literacy program ([24]). Indeed, it aimed to give students in the secondary-tertiary transition the opportunity of approaching STEM subjects.

The core idea of the project was making students conscious protagonists of their learning, to be fostered through innovative teaching methods and mediated by careful use of technologies. So, we identified three essential elements for the design of our STEM literacy program: the STEM PBL approach, non-standard teaching methods, strongly supported by digital technology, and the involvement of students in creative design processes. This allowed us to answer the first research question.

In the following, we list the activities promoted in the sessions of the program, after an introduction about the gender gap in STEM in Italy.

With regard to Computer Science, students were introduced to the development of smart mobile apps integrated with Artificial Intelligence technologies. After discovering the potentialities and limits of different algorithms, the participants were guided in exploiting some Artificial Intelligence software libraries in order to create a smartphone application. Students worked in the AppInventor environment and exploited the MachineLearning4Kids platform, with the goal of creating a mobile app with specific functional requirements. The features of AppInventor allow the programmers to develop applications by using visual programming, thus focusing only on the application logic, without the knowledge of any programming language.

For what concerns Physics, the teachers chose a historical approach and provided lessons with a simplified treatment of some topics of Modern Physics. The historical stages and the experiments that led to the formulation of special relativity on the one hand, and the birth of quantum mechanics on the other, were retraced. Particular emphasis was given to applications and outcomes, unexpected in view of common experience, in order to fascinate students and engage them with Physics.

Regarding Chemistry, the innovative approach that has been proposed uses computational methods which implement the laws of mechanics. The free software CHIMERA was used for the three-dimensional design and geometric optimization of simple molecules. Students had the possibility to analyse the relationship between the structure and the properties of some simple molecules, formed by a small number of atoms. By online resources sharing, the teachers were able to follow step by step the activity of each student. Molecular mechanics and quantum mechanics were used in order to predict the chemical characteristics and behavior of the molecules. Then the results obtained within the two approaches were compared. At the end of the course, it was also shown how this approach allows the visualization and rationalization of the properties of very complex molecular systems too, such as natural and synthetic macromolecules.

Finally, for Mathematics, on which we mainly focus in this research, students were involved in the design and implementation of multimedia educational resources. The free software GeoGebra was used. This activity was expected and turned out to be suitable to enhance the female aptitude to reflect on their own and others' difficulties and to identify original and elegant solutions to help in overcoming them. The specific activities of the program are detailed below.

The mathematical sessions

In the first meeting, the teachers highlighted the potentialities of GeoGebra by showing and commenting on some applets concerning various mathematical topics and aiming at different purposes (explanation, exploration, visualization, remediation, self-assessment). In order to make students familiar with the software, in the second part of the meeting they were provided with a worksheet from [1], allowing them to create their first GeoGebra applet. In the second and third meetings, students were introduced to complex numbers, a topic that they had not treated at school. The choice of the topic was due to different aspects: it requires minimal prerequisites and, mainly, it lends itself to a natural integration between algebraic and geometric semiotic registers. After a brief historical introduction, the definitions of sum and product of two complex numbers, the elevation to integer powers, and the definition of n-th roots of a complex number were given, with the fundamental properties of such operations. Many examples were provided during the lessons and particular attention was devoted to the difficulties faced by university students. Furthermore, all the concepts were interpreted in the Argand-Gauss plane, also through the use of GeoGebra files. In the second phase of the learning path (the final part of the second and the third meetings and the whole last two meetings) students were required to design and implement digital resources aimed at facilitating the learning of some specific aspects concerning the complex numbers. Students were intentionally given the freedom to choose which aspects to focus on, although the teachers suggested them to consider the most common difficulties that other students could encounter in facing the topic, and the opportunities offered by the software to overcome those difficulties.

All the activities were carried out with the presence of the teachers, which were available to scaffold the students' design process and to provide them with technical hints.

5. RESULTS

Analysis of the students' motivations and expectations

The application form gave the candidates an open-ended question to express their motivation to be involved in the STEM literacy program. The answers allowed us to highlight the students' expectations with respect to such a learning path and so to address our second research question.

In Table 1 we report the most common themes emerging by the male and female students' answers. Often a single student referred to more than one theme. Most aspiring participants, both males and females, focused on their interest in deepening knowledge and skills in STEM subjects. Some students, mainly females, hoped the course would facilitate their orientation towards future studies or could make their passage to university easier. In many cases, specific aspects of our project were addressed, such as innovative teaching methods in STEM education, the opportunity to become a better and more aware citizen, and the overcoming of the gender gap. Probably induced by the pandemic, which reduced the personal face-to-face relations, some students declared that they wanted to be engaged in the program to collaboratively work in groups with colleagues. We notice that female applicants' answers contained a slightly more frequent reference to the possibility to deepen knowledge of STEM topics and to facilitate orientation to university (29 on 45 for females vs. 24 out of 47 for males in the first response; 17 out of 45 vs. 10 out of 47 for the second).

Table 1. Students' answers to the application form.

	Males	Females
Deepen knowledge of STEM topics	24	29
Facilitate orientation to the university	10	17
Citizenship/Labour marketplace	7	8
Applications/Interplay theory-practice	2	4
Innovative teaching/Use of Technology	5	4
Work in groups/interaction with peers	2	3
Overcoming of the gender gap	0	1

For example, a female student, S1, wrote that "*the main reason for my interest is knowledge. Knowing new things, discovering new worlds is the only way to be able to choose with a broad and clear vision. Knowledge means freedom*", addressing the themes of knowledge and of citizen competencies. S2, a male student, wrote: "*This learning path could be useful to decide in what scientific field I will specialize in*", referring to the orientation of university studies.

A female student explicitly referred to the gender gap, writing: "*As a girl and already young woman, I want to prove to myself and to the world that the gender gap, still broad in the scientific contexts, only depends on different entrance opportunities*".

This trend was confirmed by the answers to the application form of the second edition of the STEM literacy program, provided in July 2021. We single out a couple of sentences that we find of peculiar significance. A male student (NS1) underlined his interest in scientific subjects with very evocative words: "*Since I was a child, I have been bewitched by phenomena which animate the world around me, in other words by science. Already when I was 3 years old, I asked my parents what oxygen was! I took part in several competitions on scientific disciplines and now I am eager to test myself in this project.*" On the other hand, a female student (NS2) emphasized her fascination for new technologies: "[...] *Moreover I am attracted by the fact that the subjects are proposed through the use of new technologies, a topic I am very fond of*".

A survey on students' perception of the program

The analysis of the students' answers to the final survey allowed us to highlight different aspects. The answers to questions in the general section, concerning the perceived usefulness/significance of the course and the most appreciated aspects, revealed that all the students were satisfied with the experience. Their explanations addressed essentially the same themes in Table 1: the acquisition and the deepening of knowledge, the developed capability to use technological tools to support the learning, the methodology of working in small groups, the pleasure to take part in a university lesson, the interplay between theory and practice. For example, S3, a female student, wrote "*I really loved the course, since I had the opportunity to reason about some contents in a different way, also by using computational tools*". S4, a male student, declared "*I appreciated the real and active engagement of each student. I felt challenged by the proposed project and I enjoyed the work in my group*". S5, a female student, revealed that the experience definitely oriented her choice for university: "*It was a great experience! It convinced me to begin a university path in Engineering*".

Students also indicated some aspects to be improved, highlighting critical issues. For example, some participants gave not completely positive feedback about the Physics lectures (in particular, the discussed topics have been perceived as too abstract). These aspects were considered in the design of the second edition of the STEM literacy program. In particular, the contents of the Physics lectures have been changed: a short introduction of Acoustics has been presented, which has been followed by the Computer Aided Design of small parts of a musical instrument. Then, these components of musical instruments have been realized in our laboratory for 3D printing and have been tested by the students during the last lecture of the course.

For what concerns the mathematical sessions of the program, students generally appreciated the learning path, mostly for the opportunity of visualizing concepts and deepening mathematical connections. For example, a female student wrote "*often it is said that mathematics is abstract; this experience made concrete the concepts and this favored my understanding.*"
About the mathematical sessions, we also asked students to reflect on the impact of the experience as designers of educational resources on their own learning. In this respect, the analysis of the survey allowed us to identify two categories of answers, depending on students' level of awareness and on the perspective they assumed in reflecting about their files. A first category of students' answers revealed *awareness on how the produced files could be useful for the user*, that is the student who would interact with them. The 12 students (7 females out of 14 and 5 males out of 6) whose answers are in this category identified different benefits, mainly at the cognitive and the affective levels of learning: the opportunity to see a concretization of abstract concepts, the possibility of better visualization of topics and of exploring the correlation of related quantities, the chance of seeing many examples and limit cases, the active engagement in learning by means of the digital environment.
A female student, S6, constructed the file in Fig. 1 concerning the Cartesian and trigonometric forms of a complex number and its representation in the Argand-Gauss plane. Her design envisaged that the user is provided with the representation of a complex number as a vector in the Argand-Gauss plane and is required to identify and fill in specific input fields the real and imaginary parts of the complex number, together with its modulo and argument. As a specific feature of the file, whenever the user submits an answer, an immediate and formative feedback appears. Referring to this file, S6 wrote: "*I think that my file could support students to graphically visualize and to make some arithmetical calculations concrete. Hence this could foster the understanding of the topic at stake not in a mechanical way, but through their geometrical interpretation.".* S7 (male student) declared that "*such files make the study more engaging and joyful, since you can play with them until you understand how things work*".

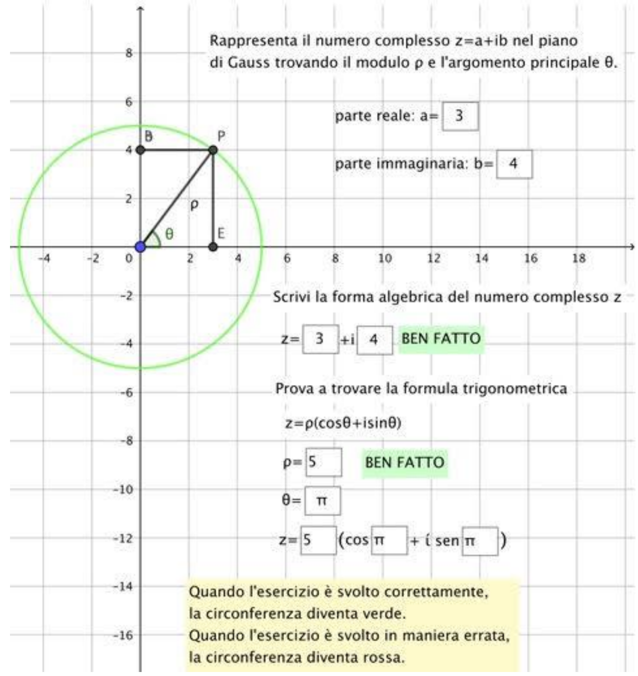

Figure 1. An example of a student's file

A second category of students went behind the awareness of the usefulness of the GeoGebra files for the user and also grasped the *educational benefits for the designer*. The 8 students (7 females out of 14 and 1 male out of 6) whose answers are in this category recognized the need of knowing in depth a mathematical topic to design an educational file.
The male student stated that "*although initially the request of designing a file for other students was disorienting, then it forced me to reason deeply on the content*". S8, a female student, declared that "*such an activity allows you to acquire a more complete knowledge since you change perspective...you don't only need to understand, you also need to make others understand!*".
Another female student, S9, created the digital task in Fig. 2, concerning a true/false interactive question about the conversion between the Cartesian and the trigonometric form of a complex number. In this case, the Cartesian form of a complex number is provided, together with different statements to be analysed regarding its modulo, argument, exponential and trigonometric representation. The geometric representation of the complex number in the Argand-Gauss plane is offered as an optional hint, which possibly could be accessed.
Commenting on the design process of her file, S9 said: "*thinking of possible false statements to put in the file was a way to understand what are the most probable mistakes one can do*".

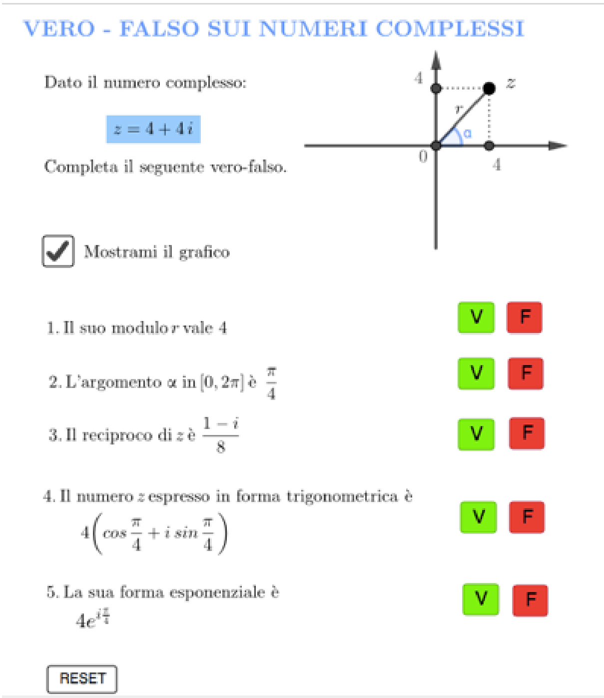

Figure 2. An example of a student's file

Another female student, S10, reflecting on her experience as a student in difficulty, inserted in her file some hints that the user could require in case of need. As shown in Fig. 3, the user is guided through subsequent steps in calculating the n-th roots of a complex number, where n is a variable natural number corresponding to a slider. The useful formulas to complete the task are recalled and the geometrical interpretation of the roots of the complex number is provided.

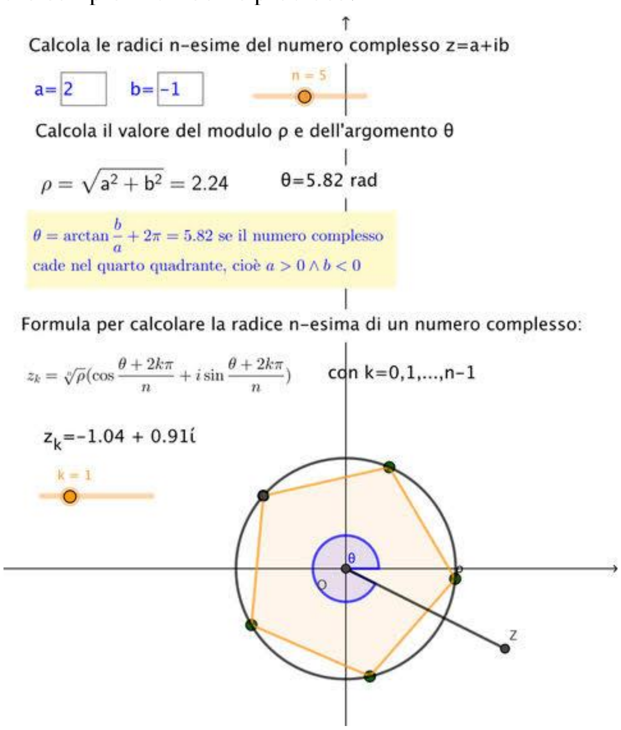

Figure 3. An example of a student's file

The student commented on her file saying: "*my file provides support to students in difficulty. I thought long to identify the most challenging steps of the procedure and then I inserted hints related to them in the file. This allowed me to put my hands on the topic...this is a completely new way to learn for me*".

The high percentage of female students in the second category with respect to the percentage of male students highlighted that the female students tended to fully grasp the educational impact of the mathematical sessions in a deep way. Moreover, the female students' reflections seemed to specifically focus on the difficulties of the user and on ways to support their overcoming.

6. CONCLUSIONS

In this paper we described the design and implementation of a STEM literacy program for students in secondary-tertiary levels transition. We collected and analysed students' responses to investigate their expectations for such a program and the reflections on the attended course. Students displayed high expectations and motivations to be involved in a STEM learning path and they were generally satisfied with the experience. Our analysis of the answers to the whole survey completed at the end of the program revealed that students are more likely engaged by teaching approaches involving them as active protagonists. In particular, students appreciated technology-enhanced activities, exploiting the potential of software for learning.
The STEM literacy program turned out to be effective with respect to different aspects: among them, the orientation of participants towards the university studies, the development of technological skills, the involvement of students in problem-solving activities, their engagement in a dynamic interplay between theory and practice. For what concerns the mathematical sessions, on which the present paper mainly focuses, students proved they have acquired knowledge and skills, allowing them to produce educational resources through GeoGebra. Moreover, their answers to the survey submitted after the course highlighted the development of awareness at different levels. Some students reached only the awareness about the usefulness of the produced digital resources for the user, other ones reached a higher-level awareness, concerning also the usefulness of the design process for the designer. Half of the female students displayed having reached this second level awareness and, in designing their files, manifest specific care of the possible difficulties of the user. This brought them to envisage formative feedback and hints in their file.
However, some criticality issues arose: the STEM literacy program did not provide a complete content-integration of the different STEM subjects. This was due to contingent reasons - such as the constraints of the

grant we received, the availability of teachers for the activities and the pandemic – but also to substantial aspects. Indeed, our path was devoted to students with heterogeneous backgrounds who were in the secondary-tertiary transition. Because of this specific target group, we cannot develop a complex design integrating all STEM disciplines, since students did not have common competencies. Further, we wanted to offer them an orientation for the university studies; this required that the specific epistemologies of the subjects emerged.

Another critical aspect, emerging from the students' answers to the survey, is the remote teaching/learning. Some students would have preferred that the course was taught face-to-face, so that the interaction with the teachers and within the working group would be easier.

As a further development of the research, according to design-based research, we plan to re-design the learning path as well as the methodology, in the direction of a more integrated approach to STEM subjects. In this respect we will also take into account the critical aspects arisen from the students' questionnaires, such as the difficulty to maintain the attention for too long theoretical lectures, or their suggestion for a longer duration of the course, and for a completely face-to-face laboratorial approach. Moreover, we would like to address the gender gap issue more deeply, by engaging the students in a wide discussion about this problem and the institutional, social and individual ways to overcome it. A partial implementation of these goals was realized within the second edition of the STEM literacy program, which took place in late June-early July 2021. In this program a specific 2-hour module on Gender Equality in Tertiary Education with a special focus on STEM disciplines was taught by the rector's delegate for Equal Opportunities of our university and by the director of the project. Moreover, we took into the consideration the students' feedback about the scheduling of the lectures: since in Italy the school year is already over at the end of June, in the second edition we had the possibility to implement a different schedule, in which the students attended 5 days per week in two consecutive weeks. They took up two hours of lectures in the late morning and two hours in the early afternoon, while in the middle they were allowed to use the university cafeteria, in order to socialize, make new friends and gain some knowledge of the typical university life.

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