

Boosting up our students' 21st Century
Skills through STE(A)M

Section1 - Summary

1.1	Author	Anthitsa Gkougkoustamou, Biology teacher in public secondary education.
1.2	Background	Biology teacher holding a MSc with a 20year experience in teaching, representing the teachers from the biggest middle high school in our district.
1.3	Descriptive title	Boosting up our students' 21rst Century Skills through STE(A)M
1.4	Abstract	The proposed educational policy aims at enhancing all those skills considered to be absolutely necessary for the citizens of the 21rst century. The beneficiaries will be both the students and the teachers of our school, which will have the opportunity to cultivate learning, literacy and life skills through the STE(A)M approach. The educational plan expands over a period of 2 years and engages the whole school community-teachers, students and parents, over a thousand citizens of our Municipality.This ambitious- yet achievable-program can make a significant difference in preparing our future citizens to approach their future with confidence, to dream big and to achieve big.

Section 2 - Goals

2.1	General goal	Students become more and more passive and indifferent to school content and school processes and fail to recognize their relevance to their everyday life. By using the STE(A)M approach in teaching school curricula this can be altered and students will be offered chances to develop skills to guide them successfully through life.
2.2	General goal description	Our educational system and the curricula applied in secondary education favors fragmentation of knowledge into concrete and distinct subjects taught by different teachers in different periods. This approach seems to fail in connecting the knowledge provided with real life problems and many students lose their interest in school curricula, becoming detached from the content of the education provided to them by secondary school. To make matters worse, the teaching approaches used don't provide the students with the suitable stimuli to help them develop fundamental life skills –as stated by the World Health Organization- like problem solving, decision making, creative and critical thinking, communication and interpersonal skills and self -awareness. Students don't get actively engaged in the learning process and many of them complete the basic education without actually having concurred what is supposed to be necessary for them to deal with real life. All these issues can effectively be improved by the integration of the STE(A)M methodological approach in teaching school curricula. STE(A)M education develops and cultivates 21st Century Skills which include knowledge, skills and attitudes that citizens need to possess to be able to fully participate in contribute to today's society –as stated by UNESCO 's International Bureau of education. In this 2year policy education, teachers in our school will be supported in becoming familiar with STE(A)M approach and gradually become able to design and implement it in their classes to help our students be “life ready”.
2.3	Strategic goals	<ul style="list-style-type: none"> • Enhance our students' collaboration, communication, critical thinking, creativity, ICT literacy, flexibility and productivity by at least 15% as judged by self-assessment evaluations before the implementation of the program, at the end of the 1st year and at the end of the second year. • Increase our average students' engagement in and understanding of STE(A)M disciplines by 20% as judged by their oral and written evaluation scores by the end of the 1st and second year.

		<ul style="list-style-type: none">• Increase the percentage of our school's teachers that have received basic training in STE(A)M approach to 50% by the end of the second year• Increase the number of teachers in our school that implement STE(A)M methodologies in their classes at least to 1/3 of the teaching personnel by the end of the second year.• Create an intra-school network of closely collaborating and mutually supportive teachers in STE(A)M projects by the end of the second year.
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Section 3 - Targets

3.1	Beneficiaries	<ul style="list-style-type: none"> ✓ The students of our school will have the opportunity to actively engage in problem-solving-based learning and team-based-learning that embraces Science, Technology, Engineering, Arts and Mathematics in a holistic approach. That will increase both their level of understanding of the correspondent disciplines and their interest in those subjects as they will experience their implication in everyday life situations. More importantly, their skills in communication, collaboration, critical thinking, creativity, innovation and their ICT literacy will be cultivated along with their productivity, flexibility and adaptability, initiative and social skills. All of these are 21st century skills essential for young people in order for them to successfully cope with life's challenges in a rapidly changing environment, to approach their future with confidence, to dream big and to achieve big. ✓ At least 20 teachers of our school will become familiar with the STE(A)M educational approach and will be supported in designing and implementing this approach in their classes. This is a very crucial first step to enhance our teachers' competences and self-confidence in STE(A)M methodology in order for them to use this tool to cultivate our students 21st century skills.
3.2	Recipients	The recipients are the same as the beneficiaries.
3.3	Special needs	Almost 10% of our students have been diagnosed with some kind of learning difficulties and receive specialized help by teachers trained in special education. Furthermore, almost 20% of our students come from underprivileged families. The implementation of STE(A)M projects will have a positive effect in a more inclusive education for all of these students.

Section 4 – Value proposal

4.1	Value proposal	Laying the foundations to become a STE(A)M oriented school to help our current and future students flourish.
4.2	Results	<ul style="list-style-type: none"> • 50% of our teachers will have been basically trained in STE(A)M approach by the end of the second year. • At least 1/3 of our teachers will have implemented to some extent STE(A)M methodologies in their classes by the end of the second year. • Establishment of an intra-school network of closely collaborating and mutually supportive teachers in STE(A)M projects by the end of the second year. • Almost all of our students will have experienced one or more STE(A)M projects by the end of the second year. • Increase our average students' engagement in and understanding of STE(A)M disciplines by 20% as judged by their oral and written evaluation scores by the end of the 1st and second year. • Enhance our students' collaboration, communication, critical thinking, creativity, ICT literacy, flexibility and productivity by at least 15% as judged by self-assessment evaluations before the implementation of the program, at the end of the 1st year and at the end of the second year.
4.3	Impact	Making a significant difference in our teaching approach which will have a greater impact to other schools in our region to start their own efforts towards adopting similar practices for their students as well.

Section 5 - Costs

5.1	Cost structure	<p>In order to implement this policy there are 4 crucial steps:</p> <ul style="list-style-type: none"> • Educating the teachers on applying STE(A)M methodology in their classes. This will be achieved through participating: a)in oncoming online MOOC courses offered by the European Schoolnet Academy (https://www.europeanschoolnetacademy.eu/courses/course-v1:STEAM_IT+IntegrSTEM_Secondary+2021/about) and b)in seminars and workshops organized in an intra-school level in collaboration with the Regional Center for Educational Planning (PEKES). Although these steps are vital, there is no cost. • Since our school building has currently no available space to set up a proper STE(A)M lab, we propose the acquisition of a “mobile lab”. That is, a set of 14 tablets and a laptop that can be moved from classroom to classroom to be used in the ongoing STE(A)M projects whenever needed. This will also require an upgrade in our schools wireless internet connection infrastructure to adequately cover the increased needs. The cost for the purchase of the tablets and the laptop are estimated be 3000 euros while the cost for the wireless internet connection infrastructure (materials and labor) are estimated to 300 euros. • Purchase of materials needed for the STE(A)M projects and field trips estimated to cost 1500 euros • In order to inform the parents and urge them to take an active part in the whole process extra meetings need to be held and informative material needs to be handed out estimated to cost up to 200 euros. <p>Total cost estimated at 5000 euros.</p>
5.2	Funding opportunities	<p>Our municipality’s financial School Committee has to cover the majority of the costs. Our school’s Special Purposes Fund. Our school’s Parents’ Association.</p>

Section 6 – Action plan

6.1	Activities	<ul style="list-style-type: none"> ✓ A1. Organize and run 2 online introductory zoom sessions (1,5 hour duration each) on 21st century skills and STE(A)M in collaboration with PEKES for (at least) 20 of our teachers during the first 2 weeks. ✓ A2. Starting late October 2021, 20 of our teachers attend a 20-hour MOOC course on STEM education held by the European Schoolnet Academy (Integrated STEM Teaching for Secondary Schools). ✓ A3. By early December 2021, purchase the “mobile lab” equipment and upgrade the wireless internet connection infrastructure of the school. ✓ A4. Organize and run 5 2hour workshops (1 per week) simulating planning and execution of STE(A)M projects among the participating teachers with the help of the more experienced personnel and the consult of PEKES. These workshops aim at cultivating trust, collaboration and sharing between teachers along with enhancing their ability to implement STE(A)M and deal with potential faults either in planning or implementation. (December 2021-middle of January 2022) ✓ A5. Design (on a collective base) actual STE(A)M activities to be implemented in certain classes. (By end of January 2022) ✓ A6. Organize and carry out an informative event for parents presenting the education policy and asking their collaboration. Make a list of volunteers parents to be engaged in future STE(A)M activities. (Early February 2022) ✓ A7. Construct on-line questionnaires for the students’ self-assessment evaluations before the implementation of the program, at the end of the 1st year and at the end of the second year. Run the appropriate self-assessment questionnaire and analyze data collected. (By middle of February 2022) ✓ A8. Start implementation of the designed STE(A)M activities (middle February 2022). ✓ A9. Hold meetings of the participating teachers regularly on a weekly basis throughout the whole project to gain feedback, discuss aroused problems and seek solutions, exchange experiences and good practices, enhance team spirit and strengthen relationships, offer mutual support. ✓ A10. Upon completion of the implementation of the designed STE(A)M activities (by middle of May 2022) run the questionnaire for the students’ self-assessment evaluation by the end of the first year. Collect and analyze data. ✓ A11. After final exams (in middle June 2022), hold 2 meetings with the participating teachers to evaluate the course of the project and discuss results and thoughts for
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		<p>improvement.</p> <ul style="list-style-type: none"> ✓ A12. Hold an event to update parents and the whole teaching personnel as well as members of the Education Committee of our municipality on the course of the project and the results of the first year implementation. Discuss the plans for next year. (Late June 2022) ✓ A13. At the beginning of the new schoolyear (early September 2022) organize 5 workshops as in A5 recruiting new teachers from our school to the project with the help of the already participating teachers. ✓ A14. Run the whole process again: design more elaborate and extensive STE(A)M activities on a collective base –include field trips in some of them-, aimed to cover more classes, inform the parents and invite the volunteers to be engaged more energetically in some of them, rerun the students’ questionnaires for those who haven’ t participated in such activities the previous year. Implement the activities holding weekly meetings to exchange experiences, discuss problems, seek solutions throughout the schoolyear. (Middle October 2022 to middle May 2022). ✓ A15. Run the final students’ questionnaire, Collect, analyze data, compare with previous findings. After the completion of the final exams in middle June 2022, evaluate the program holding 4 2hour meetings with all the participating teachers and write down conclusions reflecting on the 2year process. Present the results to the whole teaching personnel. <p>A16. Hold the closing event of the program informing the parents and members of the municipality’s Education Committee on the 2year course of the implemented policy and the results. Have an open discussion with the members of the school community on the positive or negative aspects of the implemented policy and possible future applications.</p>
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Section 7 - Risks

7.1	Risks/ Competition	
	a. Risk description	The main risk lies in the great amount of workload this policy brings on the participating teachers.
	b. Probability	2
	c. Severity	2
	d. Mitigation strategy	Intra-school supportive network of all the participating teachers with regular (weekly based) meetings to minimize stress, help overcome difficulties and always keep the focus on the bigger picture (great benefits both for our students and for our professional skills).
7.2	Risks/Opposition	
	a. Risk description	Teachers, who don't want to participate in this project, might oppose to some of the planned activities- especially those that demand financial support by our school's Special Purposes Fund.
	b. Probability	2
	c. Severity	2
	d. Mitigation strategy	Keep an all-time open approach, inviting them to take part as guests or simply observers in the any of the activities to create bridges of mutual understanding so that no one feels left aside. Open invitation to join the project to anyone of our teaching personnel.
7.3	Risks/External menace	
	a. Risk description	The main external menace has to do with the possible lack of sufficient funding from our municipality's financial School Committee to purchase the "mobile lab" equipment.
	b. Probability	2
	c. Severity	3
	d. Mitigation strategy	Ask for permission to use –for a limited time- one of the schools Informatics lab in collaboration with ICT teachers, changing some of the STE(A)M activities to suit minimal use of personal computers, or adapt the activities and ask permission for usage of the students' smartphones.