



List of strategies to promote self-efficacy in a STEAM school project

This list of strategies was made from the collaborative work of 10 teachers of 2 different secondary schools participating in a hackathon. These teachers felt that a typical school project was structured in different parts of very different nature, so strategies to raise self-efficacy reported in the literature may not act quite well in every part.

The final list of strategies to raise self-efficacy is aimed at providing examples to other teachers wanting to raise self-efficacy of their students in STEAM school projects. For this reason, strategies are structured according to the different typical parts of a school project.

We hope that more strategies can be added to this list from the experience of others.

List of strategies to raise self-efficacy according to parts of the project

PART 1: Setting a challenge

STRATEGY 1.1: Empower/ make visible students' initial capacities in a questionnaire "I can do/ I am an expert in..."

When setting a challenge, let your students say in which fields they are experts, which abilities they have, and which personal challenges they pose to themselves for the project... These results will be used at the end of the project to show students their achievements.

PART 2: Initial exploration/ triggering initial act

STRATEGY 2.1: (in case STEAM experts participate in this part) make guidelines for the experts

Select a STEAM expert close to students and that can add a gender/socioeconomic perspective to research in STEM. Make some guidelines for this expert to help them to adjust their discourse to the type of students (recommendations about how to talk with teens), which topics will be more covered in the scientific conference... and the time length of the talk.

PART 3: Investigation and construction of new knowledge

STRATEGY 3.1: Make evident students' learnings and their achievements

When designing a research, it is important that students express their previous ideas about the results, topic of discussion... (What do I think I will find...) in order to contrast them with their final ideas when interpreting and discussing data. As well, is highly recommended to ask students about their strategies when conducted the research (How did I work in this activity? Did this strategy work for me?).

PART 4: Structuring knowledge

STRATEGY 4.1: Avoid the use of an excessive amount of specialized vocabulary

The use of an excessive amount of specialized vocabulary of the STEM field can scare and cause rejection in students, especially those ones facing more difficulties. Revise the vocabulary you use and refuse to use a big amount of specialized words which can alienate students. Use only those words directly referring to phenomena.

STRATEGY 4.2: Discuss and agree on the structure of the final product (report, poster, slides, article...) with your students

Agree with your students on the final structure of the product you will ask them (report, poster, slides...). In this way, they will feel more confident about your expectations.

STRATEGY 4.3: Discuss with your students their answers on the initial questionnaire "I can do.../ I am an expert in..." in light of their achievements in the previous parts

Share and discuss with your students their answers on the initial questionnaire "I can do... I am an expert in..." after they have finished their work/investigation: *Did they manage to achieve all the personal challenges they posed at the beginning? Which of their capabilities were useful for them to do the investigation? Are there some other abilities/capacities they have developed from their work in the scientific conference?* The aim of this discussion is to make evident all students' learnings: not only those more conceptual, but competences/abilities.



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PART 5: Application of knowledge/ communication

STRATEGY 5.1: Provide opportunities for your students to show the products of their work to relevant actors (other colleagues, other schools, STEAM researchers...)

Creating opportunities for your students to show their results or products of project to relevant actors increase the significance of your students' contributions and the value of their work. Their contributions are not (only) a scholar product to have a good grade, but a product that makes sense in the world and can be valued for other experts.

STRATEGY 5.2: Provide emotional support to your students

Students will feel anxious if they have to present their results to other people. Support your students in this part emphasizing/convincing them about their abilities.

TRANSVERSAL PART: Evaluation of students' performance

STRATEGY 6.1: Share and discuss with your students the tools you will use to assess them throughout the whole project

For example, if you use assessment rubrics, agree on the content of each level with your students at the beginning of the activity. In this manner, students will better know where they are in relation to the whole project and which expectations of them you have.