MULTI-STAKEHOLDER PARTNERHSIPS IN STEM EDUCATION

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Abstract

Expertise in science, technology, engineering and math (STEM) is becoming an increasingly important part in modern education systems. High quality STEM education is fundamental for the future of our society and, in order to ensure it, several international initiatives have been carried out, in Europe, during the last few years. This article will describe a number of stakeholders with a strong presence in the STEM education scene while analysing how strategic cooperation, built in the form of multi-stakeholder partnerships, has the ability to influence the current state of STEM education. The article will also provide with a number of specific examples of multi-stakeholder partnerships that have been running during the last years and will point out on the benefits and weaknesses of this particular approach.

Keywords: STEM, project, education, stakeholder, multi-stakeholder partnership, cooperation.

Introduction

Scientix, the community for science and math education in Europe, initiated by the European Commission (Research and Innovation DG), has set up the Scientix observatory to provide a regular overview of the state of play of different themes related to STEM education. The themes and initiatives examined vary in duration, scope, audience and methodology yet all of them include elements of the project management and STEM education areas.

This article draws, to some extent, from the discussions between project managers and project representatives participating in the 11th Science Projects Networking Event organized by Scientix on March 18th, 2016 where best ways to manage project stakeholders within a project cycle were discussed. The event brought together 22 participants from 15 STEM education projects and organizations (HEUREKA, AmgenTeach, Sala Aula do Futuro, Óbidos Technological Park, Limasat, Botbloq, STEM & MAKERS/FEST EXPO, Sea Change, Tempus Public Foundation, Coventry University, Satellite and Robots for disabled people, CERN Education, BiOutils, eCity, AMIGO).
Project stakeholders in STEM education

As STEM disciplines have become more and more relevant in the education field, an increased amount of successful projects has emerged targeting specific areas of STEM education. There is a number of reasons for this occurrence: From supporting competences that are not formally covered in schools or developing extra-curricular activities to promoting socially desirable science.

In order to understand any project dynamics, it is important to first consider its basic components, namely project stakeholders. A broad definition of a project stakeholder is that of “an individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project, program, or portfolio”.

In view of the previous definition, there is a wide variety of project stakeholders that could be considered relevant in STEM education. In order to illustrate its significance, several of them and its role in the field will be described while showing how they have been targeted in a number of current projects or initiatives.

- Above all, students will always be the end-user stakeholder. That is, the one actor whose needs are supposed to be responded to. Therefore, any STEM education project or initiative will be supposed to have students as the main and ultimate recipient. As means of example, while Scientix supports Europe-wide collaboration among STEM teachers, education researchers and policymakers, that is purely the channel through which to develop a comprehensive STEM education community that has the means to improve the quality of STEM education delivered to students, the final end-users. A direct example is that of the AMIGO² project, focused on personalizing STEM activities for each student based on recommendations according to their profile and interactions with the projects’ eLearning platform. Likewise, it promotes new methods to create and use educational contents to motivate students while using technology applicable to other learning domains too.

- Educators, being the main suppliers in the academic context –usually in formal education- play a central role in providing with quality instruction. Thus, Continuous Professional Development or initiatives for teachers’ evaluation among other ventures will be necessary to ensure they excel in their performance. In that regard, many ongoing projects specifically target teachers, often to offer different training opportunities. An example of this is the case of the AmgenTeach project, targeted at strengthening the skills of life science secondary school teachers for the use of inquiry based teaching strategies through a series of face-to-face training workshops as well as through distance learning activities³. To pinpoint a national example, the HEUREKA project offers training for teachers on e-learning, on the use of interactive whiteboards, GIS software and even provides with education activities about creating curriculum, based on learning outcomes and with the overall objective of developing modern, innovative and student oriented curriculums in Croatia⁴.

1 https://www.pmi.org/~/media/PDF/learning/engaging-stakeholders-project-success.ashx
2 http://www.slideshare.net/Scientix/scientix-11th-spne-brussels-18-mar-2016-amigo
3 http://www.amgenteach.eu/
4 http://www.slideshare.net/Scientix/scientix-11th-spne-brussels-18-mar-2016-heureka
• Educational institutions of different kinds and levels are the basic structures to provide not only with the instructional services mentioned above but also with competent learning environments, thus being the basis to sustain educators\(^5\).

As means of example, the main aim of the eSkole project (coordinated by the Croatian Academic and Research Network) is to introduce ICT in the school system as part of a larger initiative to create digitally mature schools. While the overall objective of the e-schools program is to contribute to the capacity building of the primary and secondary school educational system, the projects' primary objective specifically addresses and targets schools, aiming to reach a certain percentage of digitally mature schools in Croatia\(^6\).

Along the same lines, the main aim of the Go-Lab project is to open up online science laboratories for the large-scale use in school education. The projects' implementation plan is developed in 3 phases, covering 3 school years and targeting 1000 schools in the 15 participating countries. For that matter, schools are specifically targeted, as before and during each phase several schools are approached in order to develop in-school implementation, community building and support activities\(^7\).

Similarly, the University of Coventry, through the Faculty of Engineering and Computing, currently delivers activities with a particular emphasis on increasing the number of pupils taking STEM subjects and embarking on to STEM degrees, as well as on broadening participation from underrepresented groups in higher education programs\(^8\).

• Policy makers are the authorities with the ability to set a specific policy framework, those able to maximize the capacity building of a particular action and to bring STEM education to the forefront of the political agenda in different contexts.

The STEM Alliance project exemplifies how can a project bring together policy makers with other stakeholders, in this case being the industry sector, in order to promote the attractiveness and importance of STEM studies and STEM jobs in schools and to contribute to innovation in STEM teaching in schools\(^9\).

• Researchers, scientists and academia members can also be leading stakeholders in a number of areas of STEM education, such as teacher training or policy formulation\(^10\). In fact, several members of the STEM education community are aiming for researchers to become more involved with teachers and generally, with the educational community, in an effort to bring research closer to a bigger audience, to promote citizen science and overall, active citizenship participation.

As means of example, the RRI tools project is one of the current initiatives trying to mainstream academia while adjusting the objectives of current research and innovation practises with the needs and values of the societies supporting them. The initiative not

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\(^6\) [https://prezi.com/lyvsb5thyar9/eschools-project-scientix-projects-networking-event/](https://prezi.com/lyvsb5thyar9/eschools-project-scientix-projects-networking-event/)

\(^7\) [http://www.go-lab-project.eu/](http://www.go-lab-project.eu/)

\(^8\) [http://www.coventry.ac.uk/study-at-coventry/parents-and-teachers/the-phoenix-partnership/stem-outreach/](http://www.coventry.ac.uk/study-at-coventry/parents-and-teachers/the-phoenix-partnership/stem-outreach/)

\(^9\) [http://www.stemalliance.eu/](http://www.stemalliance.eu/)

only targets researchers (but also educators, industry, and policy makers and civil society) and aims for these to work together and improve their relationship. Additionally, and just to name a few, professional associations can be major players in formal education while science centres and museums can also exert a great impact in the context of informal education. And one should not forget other actors that, while not being purposely or directly involved in STEM education initiatives, are also capable to strive considerable influence. Media outlets, industry partners or even civil society as a whole are some examples. Nevertheless, accounting for the limited scope of this article, this section has only portrayed the most recognisable stakeholders in the field.

Partnerships and multi-stakeholder partnerships in STEM education

While it is undeniable that the wide range of actors displayed above is actively working in different areas of STEM education, it should be noted that isolated work is seldom found and that initiatives targeting just one actor are decreasing. As a matter of fact, most stakeholders end up engaging in joint collaborations and forming partnerships within projects as a way to accomplish common objectives and to achieve their goals not individually but collectively.

In broad terms, a partnership can be defined as a voluntary and collaborative relationship between different parties that agree to work together to accomplish a shared purpose or to undertake a specific task while sharing risks, duties, resources, skills and benefits. Whether for advocacy reasons, for the sharing of resources or for the exchange of knowledge and skills, project partnerships will always be created with a particular goal in mind. Specifically, in the context of education, they should ultimately work for the collective benefit of pupils or, more generally, to stimulate systemic approaches to STEM education by helping the overall enhancement and development of educational systems.

Hence, and in order to stimulate this more systemic approach, many projects will be conceived in the form of multi-stakeholder partnerships. These are collaborations that will include diverse actors and usually, although not always, a long-term approach and a dimension of sustainability that will make it easier to dive into the inter-related challenges in STEM education.

As mentioned, there are different ways of forming a multi stakeholder partnership. While these will vary on a number of factors, the level of engagement and autonomy desired is often a

11 http://www.rri-tools.eu/
14 Strategic Partnership: Challenges and Best Practices in the Management and Governance of Multi Stakeholder Partnerships Involving UN and Civil Society Actors
decisive one. From partnerships designed to work on a specific area or issue to those who will take on the challenge of addressing an entire field\textsuperscript{16}.

This gradation can be illustrated through the cooperative framework developed by the SAILS project. While SAILS had initiated a broad approach targeting many European projects to engage in joint promotional activities (as well as in other actions such as the sharing of materials and information with several projects) the approach was narrowed to specific partnerships and activities with a number of selected projects. In the case of Scientix, specific joint actions were drawn, namely the promotion of SAILS activities through the network of Scientix National Contact Points or their involvement in Scientix networking events.\textsuperscript{17}

**Advantages and drawbacks of multi-stakeholder partnerships in STEM education**

As mentioned, partnerships arise when a single actor is not in a position of attaining a goal by itself but is in need of further partners. In that sense, the main benefit of multi-stakeholder partnerships is that they allow for the collaboration of several parties that, while having dissimilar interests, share a close vision and common or parallel goals. Furthermore, the broader framework of these partnerships will bring a dimension of sustainability by including a larger number of stakeholders operating at different levels of a same field and by promoting a transparent and accountable model.

Particularly, in the STEM education field, multi-stakeholder partnerships have been exceptionally useful for the exchange of materials, expertise and best practices between different stakeholders and across countries. Indeed, partnerships of this kind have the capacity to maximize projects’ assets, which can be translated in a larger mobilization of resources, competences and overall, to be able to achieve greater influence and impact\textsuperscript{18}. Multi-stakeholder initiatives in STEM education have also opened the possibility to mainstream pilot initiatives after learning from prior successful models (by internationalizing a national initiative or, on the contrary, by developing localized approaches inspired from broader initiatives).

Nevertheless, there is also a number of challenges that can arise from the creation of multi-stakeholder partnerships. The most recognizable struggle lays in stakeholder governance, that is the relationships created between different participants within a same project\textsuperscript{19}. While multi-stakeholder partnerships are a great way to stimulate broader decision making and to promote inclusive and participatory initiatives, some argue that they can suffer from a potential weakening of traditional key stakeholders. Therefore, when conceptualizing a partnership, stakeholder analysis will be encouraged as well as a clear definition of each stakeholder’s


share of power (their role, rights and liabilities)\(^{20}\) and close stakeholder monitoring to avoid internal competition and to promote the finding of common grounds.

## Conclusions

By portraying a number of actors actively working in the STEM education area, this article has been able to exemplify how these have been targeted as relevant stakeholders by current projects in the field. Consequently, it has been found that, while an initiative would place its main focus on a particular actor, it would still collectively approach a number of different stakeholders, hence reproducing the interrelations existing in the area in the context of a particular project.

Accordingly, it has been deemed appropriate to examine the concepts of partnership and multi-stakeholder partnership too. Although the number of definitions found for these concepts has been manifold, most of them still point to similar concepts such as commitment, collaboration or exchange that, while being broad concepts, are still suitable to understand how collaboration between actors in the STEM education field has been occurring in the past few years.

Likewise, these concepts have been useful to conceptualize a number of advantages and drawbacks of the described partnership typology and to shed a light on the potential issues in the management of projects of the kind. Along those lines, it has been found that, although the advantages of multi-stakeholder partnerships in STEM education are numerous, specifically on the exchange of resources within different initiatives and on the opportunity to recycle ideas, governance issues still commonly arise. Nonetheless, these can be solved operationally through many different channels that will depend on the specific context of a project.

Overall, this article has provided with a very general overview of current collaborative initiatives in the field of STEM education and can be used to support further research on the matter.

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