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Reflections on inclusive leadership education: from professional communities of practices to students

Riflessioni su un'educazione inclusiva alla leadership: dalle comunità di pratica professionale agli studenti

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ABSTRACT

The central role of education has been part of discourse since ancient times. We will investigate the role of leadership in education from Communities of Practice (CoP) to students, the leaders of tomorrow. This will be done through the direct experience of the authors related to their enacted educational activity, experiences described through the lens of leadership and its development process in class, school, and in local and national communities. Reflections and best practices will conclude the work.

SINTESI

Il ruolo chiave dell'educazione è affermato fin dall'antichità e noi indagheremo il ruolo della leadership nell'educazione dalle CdP (Comunità di Pratica) agli studenti, i leader di domani. Questo sarà fatto tramite l'esperienza diretta degli autori nell'azione educativa quotidiana, esperienze descritte attraverso le lenti della leadership e tramite il suo processo di sviluppo in classe, a scuola e nelle comunità di pratica locali e nazionali. Riflessioni e suggerimenti concluderanno il lavoro.

KEYWORDS: Communities of Practices, leadership, leadership frameworks

PAROLE CHIAVE: Comunità di Pratica, leadership, *leadership frameworks*

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Introduction

Education is recognized as playing a central role in reaching the Sustainable development goals (United Nations, 2015; Bokova, 2017). The centrality of education has been stated since ancient times by prominent philosophers such as Seneca in many of his works, including his "Epistulae morales ad Lucilium".

Various frameworks of intended leadership education have been proposed, emerging from frameworks (Waters et al., 2004; Waters & Cameron, 2007; Kools & Stoll, 2016; Stoll & Kools, 2017) for teachers (Gouseti et al., 2021), and students (OECD, 2019), and from the scientific literature related to leadership development and competencies in the realm of the formal school system (Leithwood, 2021) and CoP, both non-formal (Prenger et al., 2017) and formal (Dovigo, 2010). This analysis will focus on the Scientix CoP (Nistor et al., 2019), which embraces both STEM (Science, Technology, Engineering, and Mathematics), where improvement is considered a matter of urgency (Niewint-Gori & Gras-Velazquez, 2020), and all other disciplines (STE(A)M) (Jiménez Iglesias et al., 2018). In this context, computing CoP (Morelli et al., 2014; Morrison et al., 2012; Sentance et al., 2014), related to small school settings (Mangione et al., 2021) and rural areas (Wang et al., 2021), offer examples of successful experiences with broad contextual diversity. Theory-based instruments, e.g. the inclusive leadership questionnaire (Li, 2021; Crisol Moya et al., 2020), have been developed and validated, suggesting that inclusive leadership promotes a favorable school climate and culture emphasizing high expectations and quality education.

In this work, we will investigate the role of leadership in education, starting from the CoP to arrive at the students who will become tomorrow's leaders. This will be done through the direct experience of the authors.

The experiences will be described through the lens of leadership education and will focus on the developing process and best practices related to leadership at the class, school, local communities, and at the national level throughout the Scientix CoP.

Reflections and suggestions for policymakers and educational stakeholders will conclude the work.

1. The Scientix CoP

The Scientix project[1], now in its fourth reiteration, is supported by the European Commission H2020 and is coordinated by the European Schoolnet (EUN). Scientix promotes and supports European-wide collaboration between STEM teachers, pedagogical researchers, policymakers and other STEM education professionals.

The activities are coordinated by the European network of national coordinators[2]. In Italy, the coordinator is Indire, the National Institute of

[1] http://www.scientix.eu/home.
[2] http://www.scientix.eu/national-contact-points.

Documentation and Educational Research[3]. Scientix Ambassadors[4], members of the Scientix Teaching Committee, promote and inform their peers from across Europe. They present Scientix in national schools and teachers' associations, at conferences and workshops and can advise teachers on how to collaborate at the European level in the STE(A)M sector. They also help develop and test the various Scientix project tools and services and ensure the pedagogical quality of the Scientix archive.

2. Voices from the field

The experiences, leveraging previous work (Maiorana, 2020), are drawn from the enacted educational practices of a diverse sample of the Scientix ambassadors and an educator in the humanities sector. Table 2 and 3 (see Appendix) summarizes context information related to learners' demography and experiences.

2.1. Education robotics and coding

At the end of the 2020/2021 school year, sixty K-7-students, with mandatory majority participation of girls, enrolled in a 40-hour robotics and coding summer camp. Table 1 reports the activities, their duration, and results. Four classes were formed.

One of the authors, as an external coordinating teacher, gave two start-up training lessons to four middle and elementary school teachers, and he had one coordinating meeting with the K-12-high school students who would act as tutors. The project rolled on intensive ten 4-hour meetings for a period of two weeks. Three technology areas have been employed.

- Coding with the use of the MIT Scratch platform. Students have used it to describe the problem they were going to address or the solution they had planned, or both.
- The Arduino platform as the electronic board was chosen for its ease of prototyping and flexibility at different levels of complexity, accommodating the pedagogical needs of a fast and feasible solution for K-7 students. It could be easily upgraded with the knowledgeable inputs of the K-12 students. The environment offers many sensors and actuators to implement small prototypes such as physical access point, rotating door, movable items, etc.
- The LEGO EV3 platform for educational robotics: an integrated environment, which is playful and motivating, mixing a construction and mechanical engineering approach on one side and computer science experimentation on the other. Similarly, to the Arduino platform, it has a great flexibility and could integrate competencies and levels of both K7 and K12 students.

[3] https://www.indire.it/en/.
[4] http://www.scientix.eu/in-your-country.

Activities	Duration - Result
Presentation of Agenda2030 objectives with a local perspective	2h
Discussion on matches between agenda objectives and local issues	2h – Group notes/Diary
Working in groups to define basic projects for solving one of the identified issues	2h – Group notes/Diary
Selection of one of the groups projects in each class	1h – Teacher discussion observation notes
Presentation using a coding platform to illustrate the problem and/or the solution	6h – Students' Scratch works
Laboratory activities with educational robots and electronic boards to acquire enough competencies for prototyping the solution	17h – Robot and Arduino prototypes, videos and photos
Meeting with local experts involved in the students' identified problem	4h – Diary
K7 and K12 students' interview	2h – Video Interviews
Collective class project presentations. Each class supervised by three-four K12 students produced and presented a multimedia work and working prototypes	3h – Multimedia presentation. Final Prototypes
Presentation of projects to the city mayor, city official, architects and parents	1h – Acknowledgment by headmaster and officials

TABLE 1 – ACTIVITIES, DURATIONS AND RESULTS OF THE ROBOTICS AND CODING EXPERIENCE

A special type of inclusive leadership, through a collective and distributed leadership experience, was formed. Alternating moments of control and guidance and sharing the role with colleagues and high school students became a clear example of sharing space and time to have each of the participating individuals in their teaching role use their talents for the best common results.

2.2. Protecting the heart

The draft constitutional law approved on February eight, 2022, by Parliament includes the protection of the environment, biodiversity, and ecosystems among the fundamental principles of the Constitution of the Italian Republic. The interdisciplinary didactic proposals presented to second-year primary students were carried out entirely during the pandemic period, exclusively with distance learning activities. This activity, commissioned by the Scientix project, aimed at revising learning resources.

The entire course was presented by one of the authors, in a webinar, as a training activity for the PTSO[5] (Paths for Transversal Skills and Orientation) aimed at students attending the first year of Social Sciences of the province of Naples who viewed the material and all the work done by the children. The group of secondary school students was made up of several classes and led by their teacher.

2.3. Colors of autumn

During the 2021/2022 school year, sixteen years old students of high school in Follonica (GR) made an experiment using the Inquiry Based Science Education (IBSE) method in STEM subjects. Teachers have projected an interdisciplinary approach to investigate the colors of autumn using apps.

In IBSE, smartphones could be a scientific instrument that allows students to make accurate measurements on sound, movement, position, light, or color. It is easy to use, engaging and encourages collaborative work, capable of processing complex calculations in real time, portable with a huge autonomy, and quick to set up. So, students can use many sensors in an app, search online protocols and develop communication skills.

Firstly, students have used the app FizziQ (sensor: colorimeter) in different leaves of the school garden. Some hypotheses are shared in the small group. The app allows you to make reports and graphics about % of colors and intensity. Secondly, the group of students collected a sample of the leaves measured and extracted the photosynthetic pigments in the scientific laboratory. In conclusion, each group showed its result to the whole class in a plenary discussion.

The same students' created protocol was repeated in spring. So, students explored the colors of the leaves in different species in different periods of the year. Data collected and organized in online databases online was shared.

Sharing this work among students at different schools in a network of schools is a good way to develop leadership skills, because they make decisions about the protocol they want to follow and create a report to share the results, but also advantages and disadvantages of their work.

2.4. Sustainable development: teaching and learning paths for civic education

Education can only take on a leading role as a tool of sustainable transformation of the environment, economy, and society. Following the introduction of civic education, which crosses the various disciplines of the curriculum and is compulsory in Italy at all levels of education, the National Association of Science Teachers (ANISN) organized a training course in collaboration with the National Scientific Degree Plan and with secondary schools in Pavia district. The guiding

[5] Percorsi per le Competenze Trasversali e l'Orientamento (PCTO).

theme was: Sustainable Development Goals (SDGs) in Education. The course objectives were:

- design and share learning paths with a sustainable and interdisciplinary perspective;
- IBSE methodology based on the use of the laboratory;
- support teachers in the construction of the Civic Education curriculum with original and innovative ideas and suggestions.

The methodology was based on:

- online training meetings with university professors, teachers, and business experts;
- presentation and sharing of educational itineraries.

The course proposes some Didactic Learning Units (DLU)[6], created by teachers at secondary school, which developed and deepened some aspects of Chemistry and Biology linked to the thematic nuclei proposed by the Guidelines for civic education. The DLU are accompanied by a video lesson, methodological sheets, and operational resources thanks to which each teacher can create, with their own classes, awareness, and responsibility paths on proposed issues, as well as evaluating the results.

2.5. Theater for geological science

The experience leverages on experiences described in Pelfini (2019). The choice of theater as a teaching methodology responds to the need to include the greatest number of pupils, and this is possible at every level of education.

The stage action allows you to get involved by putting yourself in the shoes of the other and this allows everyone to discover themselves because the verbal language is given by a reference script and therefore depersonalizes us. The whole non-verbal part instead allows us to manifest ourselves in a perspective of adherence or detachment from the character.

During the experience it was possible to observe very shy pupils enter the role and show more and more confidence on the stage, a communicative competence which then helped them in other sectors.

And various forms of disability or educational need can be managed in the staging because the skills needed to set up the show are so diversified and varied that everyone can participate by noting the talent they are gifted with, either technological or artistic, or of a narrative nature or linked to one or another stage part.

Precisely because everyone is emotionally and operationally involved in the realization of the theatrical scene, the class group is consolidated, and all together

[6] *Unità didattica di apprendimento* (UDA).

participate in the success of the result. All the skills that allow you to introduce the spirit of the group are represented in full.

2.6. Theater and literature between past and present

From January to March 2019, two classes in the 12th year of school, worked in groups for an in-depth study, research and production of multimedia material related to the tragedies of Aeschylus, Sophocles, and Euripides according to the following phases:

- interactive teacher-led flipped classroom lessons with the presentation of the authors, their works, and poetics;
- the students simulated a theatrical performance by read expressively passages from some tragedies (Lesesne, 2006);
- the students were divided into groups of five with the task of producing a video or an in-depth work on a tragedy and/or a tragedian. They were tasked with finding ideas and connections, over the centuries, with other authors and with the world of cinema. This very demanding, but also highly creative and engaging, phase was carried out in the afternoon at the homes of some students and, for external shots, also in the parks or in the streets of the area where they lived. All students demonstrated extraordinary gifts of creativity, originality, and autonomy both in the management and in the realization of the final product. They demonstrated that they were able to work in a team, to organize their work in an optimal way. Everyone, respecting the deadline, contributed with what they knew how to do best, and, at the same time, they consolidated other skills by collaborating with their teammates and everyone's role was decisive;
- on set days, each group presented their work to the class, answering questions and debating. This phase was very stimulating and appreciated by all students because it generated a sort of competition in terms of originality in the way participants conducted their research, to find suitable and engaging cinematographic and musical combinations The students, properly stimulated in the development of a technical competence and in the adoption of new technologies (Gerson, 2020), independently chose cutting-edge hardware and software tools.

This in-depth workshop experience on literature and theater helped to enhance participants' leadership, making them aware of, and creative protagonists in taking on, tasks and responsibilities towards themselves, their peers and the teachers involved.

2.7. A class site as a tool for reading, reflecting, writing, coding, community building, and leadership development

The high school experience with a site serving students' needs at the school level has shown a pattern of acceptance similar to the one described in Taylor (2018),

with a shift from a one class knowledge and persuasion, to site deployment during the first year. The successive three years were dedicated to the implementation phase. The experience spread to all the classes taught by the author at all grades from K9 to K13. Each class site was used by the class members alone with a steady increase in students' participation, self-determination of the learning path, agency, and awareness of talents. A class of 15 students generated more than 24 thousand page views. The following two years showed a confirmation phase with the students in the previously mentioned class, since they left school, continuing to use the above-mentioned site as a reference for their undergraduate studies and first professional experiences, generating more than 6 thousand page views. They, acting as leaders, accepted the teacher's invitation to act as role models and near mentors for enrolled students.

A site-based approach was used in outreach activities at the local level involving teachers, educators, and informatics professionals.

At the international level, the approach allowed for teacher-led crowdsourcing of educational resources and assessment activities (Giordano, 2015). The last three years, once the pedagogical and technological practices were accepted by the school and the local community, were characterized by an increase of student agency and self-determination. This allowed for a steady decline of the involvement of the author, with a better balance between care for the students and self-care (Rose & Adams, 2014).

Student-centered, constructivist pedagogies rooted in pedagogy of care were actioned through a great amount of quality time devoted to the effort. The site allowed for collective leadership (Sergi et al., 2012; McCauley & Palus, 2021) where all the individuals were considered active participants *in* leadership, but not containers *of* leadership. The class site allowed to enact actions in many domains of leadership practices in education up to senior public servant (Leithwood, 2012; Leithwood, 2021; Gerson, 2020):

- concretizing change actions which characterize leadership as opposed to management which focuses on the *status quo*;
- sharing short, medium, and long-term goals. The shared vision can be used in a longitudinal way outside class time and space;
- nurturing a high-performance expectation from the self, the members of the group and the members of the whole community. The high-performance aspirations are simply: develop your talents to your best;
- building relationships, developing people, creating "networked collaborations" beyond the class and outside the own organization, building a collaborative culture. Each member of the learning community contributes with questions, answers, activities, resources, technologies reflections and best practices;
- building a sense of internal accountability through setting reachable demands, i.e., in the Vygotsky's zone of proximal development (Borthick, 2003), and meeting this expectation for the self, the group and the whole community;

- openness to inclusion by "challenging their own perceptions", looking for and listening to the perspectives of others;
- nurturing a sense of organizational stewardship in all participants, by reinforcing a trust- and value-based culture.

3. Discussion

From the above experiences it is evident that, as Freire put it, «education is an act of love». Building an inclusive learning community is the best way, both inside and outside the classroom, guiding students to express themselves. The community building process is intended among peers with a distributed leadership model. Guidelines and best practices, summarizing two years of community reflections (Maiorana, 2020), for developing leadership are:

- encourage a climate of trust and self-awareness of the unique talent each one brings to the community. With an inquiry-based approach, a good icebreaker activity could be a reflection on "Who fails the most: the ones who do nothing, or the ones who act striving for excellence?", in other words, please don't be afraid of mistakes! Encouraging self-reflection on accomplishments during the learning path should be suggested as frequently as possible;
- prefer a project-based approach. Letting learners choose their projects fosters intrinsic motivation (OECD, 2021);
- let the project be as inclusive as possible, i.e., propose activities involving different talents and let the students choose. Encourage the effectiveness of this practice applied to humanities, scientific and technical projects. Combining humanitarian efforts helps to increase motivation (Hislop & Ellis, 2017);
- favor a participatory culture where the learners produce their artifact. Theater, usually considered a high culture domain, has been successfully leveraged in science, too;
- support the activities of the community with guidelines and research-based methods by reflecting on the process to arrive at the product. Examples in this direction can be found from transmedial, multimedia and instructional principles (Mayer, 2020) to bibliographic, information retrieval and fact checking (McGrew, 2020); reflecting on the importance of proper citations to support and highlight personal work naturally leads to self-triggered plagiarism avoidance by the students themselves. Sharing age-appropriate reading on social science theories like the pedagogical approach proposed by Freire (Freire, 2013), nowadays revitalized in Ko (Ko et al., 2021). Social theories in computing have been reported in Cristaldi (2022), too.

The more everyone in the learning community is emotionally and operationally involved in the realization of the projects, the better the class group is consolidated, and all together participate in the success of the educational experience.

Conclusions

We have summarized decades of teaching experiences through the lens of leadership development. After reporting a rich and diverse set of educational experiences, the work has presented guidelines and best practices for leadership development inside learning and professional CoP.

We envisage a key role of the Scientix community, in particular in reducing the number of young people neither employed nor in education and training. The socio-economic disadvantaged students could be supported with scholarships covering their undergraduate studies. Meanwhile, the supported students, guided by the teachers, will serve as mentors and role models in the school sharpening their leadership.

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Appendix

N	A	GL	# students						Place	T	PLP	ELP
			F	M	SE	S	E	G				
1	12 13 18 19	7, 12	60	40	10	5	10	5	IC Piombino Dese (PD)	FO	Math and Science	Math and Science
2	8 9	2, 3	60	40	1	2	NA	NA	Avellino - IC Mercogliano-	FO	History, Geography, Civic education, Italian, Art	History, Geography, Civic education, Italian, Art, Technology
3	16 17	12	20	80	5	0	1	0	ISIS Follonica-Follonica (Gr)	F	Inorganic chemistry, Physics	Chemistry, Biology, Physics, Informatics
4	50	NA	30	20	NA	0	0	0	Pavia	F	Science	Chemistry, Biology
5	17 18	12	50	50	5	10	5	5	MIUR	F	Science, Physics, Math, English, History, Economy, Literature, Religion, Philosophy	Science
6	17 18	12	74	26	2,5	13	0	8	IIS C. Marchesi–Mascalucia	F	Italian, Latin, Ancient Greek, History, Philosophy, Art History, Religion	Ancient Greek
7	14 19	9-13	15	80	30	10	0	8	IISS Vaccarini (CT)	F	English, Math, Informatics, Computer Systems, Electronic	Technology Informatics
	22	16	90	10	NA	3	0	8	Catania University	F	Statistics, Humanistic domain, Stage, Thesis preparation	Informatics for tourism management, Bibliographic research, Programming, Database, Electronic sheet
	NA	NA	NA	NA	NA	NA	NA	NA	ITiCSE International Working group	O	STEAM	Computer Science
	30	NA	63	37	NA	NA	NA	NA	Catania University	O	STEAM	Programming, Pedagogies, Technologies
	40	NA	40	60	NA	NA	NA	NA	Catania University	F	STEAM	Assistive technologies

TABLE 2: LEARNER'S DEMOGRAPHIC INFORMATION[7]

[7] Legend: A (Age): students' age; GL: Grade level: K-16; %F: % of Female; %M: % of Male; % SE: % of students with Socio-Economic difficulties; %S: % of Special education needs students; %E: % of students with different ethnicity; %G: % of gifted students; Place of the experience; T

N	#I	#C	SD	ED
	authors-4 teachers-14 K12 students	4	7/6/2021	18/6/2021
1	2 authors+SEN teacher+2 university students+UNICEF voluntary service+2 teachers	1	3/2021	5/2021
2	2	2	10/2021	Dec 2021
3	50	100	9/2019	9/2020
4	6	4	1/6/2021	30/6/2021
5	3	4	1/10/2016	30/6/2017
6	2	2	1/2019	3/2019
7	1	5	2016	2019
	10	1	2014	2015
	7	NA	2014	2015
	1	1	9/2017	6/2017

TABLE 3: CONTEXT OF THE EDUCATIONAL EXPERIENCES[8]

(Type): F (Formal); O: outreach or non-formal; PLP: Previous Learning Path; ELP: Experience Learning Path.

[8] Legend: #E: number of educators; #C: number of classes; SD: Start date; ED: End date.