

Teacher training and self-sustaining network training as a strategy for teaching and more hands-on learning.

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SUMMARY

Educational transformation is becoming more urgent every day. The investment in a more active, dynamic and close-to-the-student education, enabling learning, integral, effective and meaningful, aligns with social and educational needs. Thereby, based on partnerships and successful experiences of technology teachers, with proposals more hands-on learning, the São Bernardo do Campo Department of Education (SP), a municipal public network that serves about 90 thousand students, saw teacher training as a way to make the process of building knowledge author, critical and engaging.

Key words

Integral Training; Creative Learning; Maker Education.

1. INTRODUCTION

For some time teaching has lacked a focus on learning. The importance of teaching with stable strategies and standardized resources gains another perspective in times of collaboration, ubiquity, permanent authorship, and the advent of doing. Consistent with such a need to transform the educational act, there is the urgency of society to form citizens capable of acting and responding to the everyday technological (r)evolution.

In this scenario set and revalidated daily, the process of teaching and learning urges for transformations capable of walking side by side with such needs. However, beyond the simple technical instrumentalization and merely procedural learning, contemporary society requires skills beyond the mechanical act of doing. In this sense, the new National Curricular Common Base - BNCC (Brazil, 2017) proposes to look at the integrality of the subject in its cognitive dimensions, social and emotional, aiming at the formation of citizens capable of acting in an active way in society, making and redoing at the same speed with which advances and transformations occur.

Thus, understanding that the school must take on the responsibility of acting directly in this formation and for that is necessary to initiate the transformation from its fundamental bases, starting to the promotion of a closer education and centered in the student, this proposal presents the initiative of an educational network to transform, through teacher training, the educational strategies, aiming to impact the learning. Elects as a general objective, the need of "creating a growing and self-sustaining training network that reflects and builds strategies capable of making teaching and learning more active, creative and hands-on".

1.1 Creative Learning and Hands-On Learning

"The student of the public school, on the outskirts of a big city or the student who has no parents with higher education, the student who does not have this perspective, which is the great majority of Brazilian students, the only incentive he has to stay in school is that the school is interesting, that he is doing things that he likes, and that he sees meaning in school, he sees meaning in being there. So if we only give this student the basics, the rice with beans of education, we are making this student, or if he more easily disconnects from school or he gives up or even that physically he is in school, but he is not engaged, is not motivated, he is not there in body and soul. [...]"

Paulo Blikstein - Transformar 2015

In the way of become the education more closer and meaningful to the student, we find in the presumption of Active Learning Methodologies the necessary basis to make the educational process functional and interesting. From this perspective, learning gains prominence in relation to teaching; the collaboration, authorship and autonomy become requirements and the student becomes the center of the process, with teacher mediation and peer construction as indispensable relationships.

Among the approaches that align with the Active Learning Methodologies, we highlight the principles that guide Creative Learning and the activities that make the Maker movement. This choice is based on the contributions of the approach impacting learning, directly influencing the subject's formation. Starting with Seymour Papert's early studies of constructionism and enhanced by the MediaLab team, MIT (Massachusetts Institute of Technology), Mitchel Resnick's contributions (2014) and the 4 P's of creative learning (Projects, Passion, Peers and Play), the activities based on this approach promote the "spiral learning", making the process meaningful, growing and contextualized to the students. In activities based on this perspective students are encouraged and stimulated to think and create solutions to surrounding problems, anchored in everyday situations or departing from them, making the most of available resources, experimenting with several hypotheses until finding a satisfactory, either with the work involving the robotics, unplugged proposals (non-technological), programming languages or hand activities in the mass.

Another expressive contribution coming from proposals that respect the process fostered by the spiral learning is the development of computational thinking (CT). Despite the recurrent association with computer-related activities, computational thinking can and should

be instigated from the earliest years of basic education through unplugged activities, but that provides for the development of logical reasoning, macro understanding, problem solving, and amplitude of possibilities from the pillars that support the PC, such as decomposition, pattern recognition, abstraction and algorithms.

With this, we believe in the need to make teaching more practical, active and creative, placing the student in the spotlight and as the author and protagonist of the learning process, with relevant activities and triggering more complex structures, even though a simple proposal. We also believe that this is the way for the formation of citizens capable of acting in society contributing to it and not only consuming its advances. In order to do so, we believe that every action must first go through teacher education, so that the development of activities in this perspective goes beyond the current modism and based on theoretical and founded convictions.

2. DESCRIPTION

2.1 Educational Scenario

The São Bernardo do Campo city, located in the metropolitan region of São Paulo, Brazil, has an estimated population of 833,240 inhabitants, subdivided into urban areas, concentrating most of the population and rural area. The educational network serves about 86 thousand students, in the modalities of Early Childhood Education, Elementary School (1st to 5th year), Special Education and EJA (Youth and Adult Education).

In schools that have Elementary School and Special Education, the work focused on the curricular integration of the technologies is carried out from the *Aluno.com* program, guided by the technologies section (SE 124). This section, in addition to the respective bosses, is composed of 120 Teachers of Support to the Pedagogical Projects - Technology (PAPP TEC) who works in schools, establishing the essential partnership for the healthy relationship between class teachers, students and technological resources. The program manages resources such as Technological Education and Robotics Kits (Lego), computer labs deployed since 2002 and mobile devices (netbooks) from an adapted version of the UCA project.

In spite of the recent investments in the technological spaces, all the mentioned materials undergo too much the action of the time and the use, demanding different strategies for the continuity of the projects developed. Even so, even with the presented scenario, the program shows maturity of development and results consolidated over time, returning quality productions and significant impact on learning.

2.2 Teacher training and alternative resources as a focus. Student involvement and learning as a result.

In view of the scenario described and in order to subsidize the work of the PAPP, within the budgetary possibilities available, the responsible sectors of the Secretariat of Education(SE) sought ways to highlight the specific actions that stood out in the network and stimulate conditions for such actions to structure, expansion and equity among those involved.

Initially, the partnership established between the Brazilian Network of Creative Learning (RBAC) and the Municipal Education Network of São Bernardo do Campo, made it possible to carry out articulated actions that promoted conditions for the initial objective. Among the actions carried out, we would like to highlight the cooperation of Prof. Dr. Leo Burd (MIT) who spoke for the teachers and the visit of the researcher Andrew Sliwinski (MIT) to know and contribute with the works developed with Scratch, both in 2017.

Still about the partnership between the networks, the PAPP participation in events organized by the RBAC, such as the Scratch Brazil Conference in 2017, the "Education of the Future" space at Campus Party 2018 and the Festival of Invention and Creativity (FIC USP) 2017 / 2018 contributed in a unique way to the training process. The Secretariat of Education saw in the partnership the opportunity to promote the formative deepening, to involve and motivate the PAPP directly.

In response to the teachers' interest, the Secretariat of Education has made significant efforts to provide conditions for the maintenance of the training process, enabling internal events, punctual and permanent training (study groups, courses and workshops) to exchange experiences and others.

Figure 2.2.1 PAPP training in maker activities



These trainings were offered during 2018 in various spaces of the city, such as computer labs, classrooms, training centers, theaters and others. The permanent request for training investment justified such a structure.

"I started as PAPP in May of this year and soon afterwards I had the opportunity to participate in the study group on design thinking and creative learning with the trainers. I feel that working with creative learning is still very challenging for me, it brings me some doubts and insecurities. I see the need for training and mainly socialization of practices, for my work to be developed with greater security and autonomy." PAPP 35

"We believe that it is necessary to offer training to those who are interested in starting the work with creative learning, but starting with the basic concepts so that later they can develop projects with autonomy and security." PAPP 42

The initial actions were aimed directly at the PAPP group, in different structures aiming to meet the objectives of the groupings. Among the main formats, we highlight:

- **Study Groups in Creative Learning and Maker Activities:** Structured in 40 hours of duration distributed in 5 months and 15 participants. The proposal contemplated theoretical deepening, methodological reflection and practical experiences.
- **Courses and workshops:** Structured from 8 to 15 hours, the workshops had a thematic variety (Scratch, Beginner Arduino, Makers Activities, Alternative Robotics, Building Blocks Robots, Deployed Activities) that met the needs of the group and met the aluno.com program.
- **Rapid workshops at events:** During the Scratch Day, Invention and Creativity Festival, Education Seminar and Intermunicipal Congress, a series of quick workshops on varied themes was held that attracted and aroused the interest of the PAPP and the schools teachers.

In a procedural way the PAPP were introducing the makers concepts approached in the formations in daily practices within the schools. The initiative gave us the opportunity for the formative deployment of classroom teachers, broadening the network of those interested in the subject and bringing to the classroom the possibilities of work. This experience proved quite challenging and rewarding, as they point out:

"The proposal was to present the material to be worked with the students in a large group and then together with the class (each teacher with his students). The way it was done showed the initiative of the majority of the students before a new or unfamiliar situation. While the reaction of the teachers' group was a "certain fear" when they came across something they did not bring to their routine." PAPP 15

"All teachers became involved in the activity and evaluated the Creative Learning Workshop, Paper Circuit, as possible to be realized with the students, a playful learning where play and learning is accomplished with challenges, creative, curious and a way to the construction of knowledge." PAPP 08

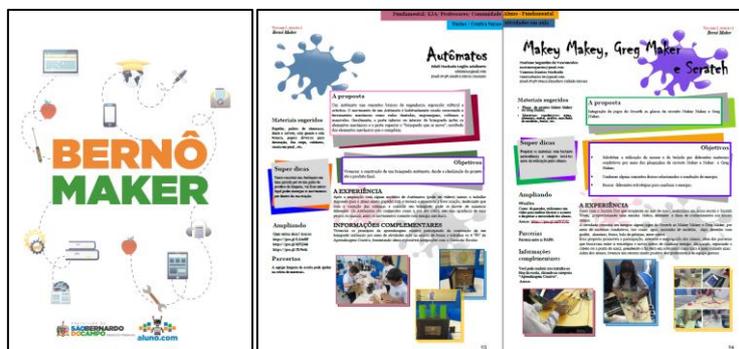
Image 2.2.2 Teacher Training in Maker Activities in Schools



The process praised for practical proposals illustrated by the theory, presenting a range of possibilities to the PAPP and teachers. As an example of success used in several situations were faster workshops of teacher sensitization, with short challenges, such as the creation of creative badges and cards illuminated with movements.

Different themes and strategies were used, according to the group profile, the time, space and resources available. In a way, it does not hear resistance from the participants, because in the PAPP group as well as in the group of teachers in general, the formative proposals arrived as possible methodological contributions to be replicated and adapted to the pragmatic curriculum. This openness and lightness increased interest and remove the obligatoriness, increasing the number of people interested in knowing the hands-on activities. Still, the increase in the organization of adapted spaces in schools, for work with hands-on and robotic activity, with prototyping boards was shown as a positive point.

One of the most impressive results of this investment materializes in the first edition of the magazine "Bernô Maker". The proposal has become a publication that systematizes the development work with the students and the spread of teacher training in the school units, as well as being projected as a socializing instrument and of constant formation, from the local experiences and contexts.



Magazine's Link: <https://drive.google.com/drive/folders/1b1pzEwTNEU-8J2LfEnkxga4B-O2GJXVG>

As in a continuous cycle, each positive response increased the need for proposals that answered the interest of the teachers. In addition to the structuring of training conditions and the promotion of exchanges and collaborative growth, the need to invest resources to qualify and expand working conditions became urgent and necessary. Thus, the launch of the "Creative Learning Program - Maker

Education " with the allocation of resources in the 2019 budget reserve for the 180 schools in the municipal network, despite being timid, aims to promote conditions to expand spaces, resources and materials that can enhance the proposals based activities.

3. CONCLUSIONS

3.1 Results and ample value

The need for educational change is urgent and no longer new in the present times, but actions that disregard the basis and arrive at teachers in a formatted way, without observing and involving the actors responsible for transformation tend to become public policies distant and unrelated to the needs of the classroom.

The experience of the Educational Network of São Bernardo do Campo has shown us that the valorization and promotion of training based on the interest and the need for teaching, the sharing between peers and the organization of socializing actions has the potential to promote a growing network in search of a formative web and collaborative knowledge. The impact on the classroom, student involvement and partnerships with teachers shows how the strategy adopted by the network can promote the required educational transformation, forming a self-sustaining network that values external partnerships and grows in an organic and effective way.

In this experience, the partnership established broadly, considering the involvement and the educational needs expressed by the interest, the responsibility and openness of the education secretariat in welcoming such manifestations and making feasible conditions of the external partners as possibilities, creating bridges and building networks of collaboration.

3.2 Relevance of the Theme

Strategy-based learning that places students at the center of the educational process and promotes conditions for the development of skills capable of forming the citizen in its entirety, gives back to society subjects who are able to look at the range of challenges presented each day and can act on them more than technical development, but also social and emotional aspects.

The role of education in this scenario is undoubtedly relevant, and it is up to the school to make the decision to seek conditions in the formation of these individuals. Considering the theme of the conference "What role does Maker Education play in a world with growing social and environmental challenges?" And looking at the various projects and activities that come from this formative process, we realize that there is an alignment between the reflections promoted with work and the social urgency in this area.

As an example, we can highlight activities such as:

- **Analysis and filtration of water:** Creation of devices for analysis of the water of the local dam and solution of filtration ([folder](#)).
- **Vegetable Garden Project:** Creation of monitoring solution for vegetable garden of the school ([folder](#)).
- **Accessibility Project:** society, kindness and diversity. Study and propose solutions for some Social Inclusions ([site](#)).

Thus, we understand that among the range of possibilities worked up to then, several proposals seek to align with social contextualization, taking emerging needs, among them, social and environmental challenges as propellers for the development of current and significant proposals.

4. BIOGRAPHY

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