

# The Maker Movement and how it Can Effectively Change Education in Brazil

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## Abstract

The aim of this study is to show the context of Brazilian education and the insertion of an emerging trend, the maker movement, in education. It is described the theoretical roots of the movement and connections are drawn with a related interview and attendance to a lecture on Maker Culture and Education. It is presented points of tension between "making" as a way of a more creative form of teaching and formal education practices. Some difficulties that making instructors encounter are shown as they come across teachers of other subjects and their challenge in making learning in schools reach interdisciplinarity. It is explored whether the novelty attributed to the maker movement really matters to students' learning and a reflection on potential pedagogical impacts on teaching and learning is drawn. As a conclusion, it is believed that making classes can dramatically change the course of education in Brazil.

**Keywords:** Maker Movement; Trend; Education; Interdisciplinarity

## 1. Introduction

The Maker Movement is a worldwide trend, once it is part of a culture named Do-it-Yourself, or simply DIY. It is considerably modern in Brazil and it is assumed that ordinary people can build, fix, shift and produce a great variety of goods and objects and all the processes are developed with their own hands, collaboratively and respecting the principles of sustainability.

The present work is about the Maker Movement and its impact in Brazil, more specifically in the city of Rio de Janeiro, which has happened somewhat recently, when compared to the rest of the world.

Martin affirms that the Maker Movement is an increasing movement organized by hobbyists, thinkers engineers and many artists devoted to inventively designing concrete objects for both, entertainment and useful ends [1]. The idea and its name can be traced to the 2005 founding of Make magazine and the first faire in 2006. In Brazil its appearance is recent, and when it comes to education it is innovative.

The same author emphasizes that the basic handmade activities have grown out much more and have gone to of longstanding hobbies and crafts, such as woodworking, sewing, and electronics. These activities have been reinvigorated and opened in recent years through the introduction of digital fabrication

tools and online networks that make it easier to share, critique, and compare ideas, designs, and project information.

Therefore, the idea that lies behind the Maker Movement is to create and develop new things (material or digital) using new tools, such as, 3D printer in open spaces, workplaces or labs [2].

The objective of the present study is to show how the Maker Movement has been introduced in primary schools and how it has helped and changed the traditional method of education and discuss its benefits to young people's education through their journey to job market.

As innovative educators, instructors and researchers, it is essential to be up-to-date on current trends and novelties and how they might impact education. Based on data collected from a professional in the field, the present study focuses on the potential wide-range adoption of technologies currently used for learning and their contribution to the formation of future professionals within the next few years.

### 1.1 The Maker Movement: Its Adoption Worldwide By Makers and Their Main Ideas

Social movements do not commonly derive from one point or one man's idea, but happen as multiple sub-developments in a great variety of ways. This is also applicable to the Maker Movement

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that has evolved in multiple forms such as public studios and laboratories, where people can make hardworks (sometimes paying a small fee) and these forms have been named differently.

Some specific terms and hubs for the Maker Movement, such as FabLabs initiatives, hackerspaces and makerspaces are places in which the maker practice takes place. On one hand, these terms are sometimes used as synonyms with each other, and on the other, fundamental differences among their concepts (concerning business model; non-profit vs. commercial) and main activities (fabrication, programming, and the role of digital tools) have stood out.

Some people may not accept the term “Maker Movement” because they could consider it an exaggeration for a recent development to be treated as a social movement. In spite of all the different terms and definitions that can be given to the Maker Movement, it does not have a “corporate identity” and is not always viewed as belonging together, and some might not regard the Maker Movement as a social movement. It is used as a cultural term in this paper. The following paragraphs describe the “Maker Movement Manifesto” because it is an important set of rules that help understand and describe the purpose of the movement and justifies its cultural feature.

In the “Maker Movement Manifesto”, Mark Hatch lists the following nine principles for the Maker Movement, whose ideas will essentially guide this study [3]:

- **MAKE** – Making is fundamental to what it means to be a human. We must make, create, and express ourselves to feel whole.
- **SHARE** – Sharing what you have made and what you know about making with others is the method by which a maker’s feeling of wholeness is achieved.
- **GIVE** – There are a few things more selfless and satisfying than giving away something you have made.
- **LEARN** – You must learn to make. You must always seek to learn about your making.
- **TOOL UP** – You must have access to the right tools for the project at hand. Invest in and develop local access to the tools you need to do the making you want to do.
- **PLAY** – Be playful with what you are making, and you will be surprised, excited, and proud of what you discover.
- **PARTICIPATE** – Join the Maker Movement and reach out to those around you who are discovering the joy of making.
- **SUPPORT** – This is a movement, and it requires emotional, intellectual, financial, political, and institutional support. The best hope for improving the world is us, and we are responsible for making a better future.
- **CHANGE** – Embrace the change that will naturally occur as you go through the maker journey. [...]” (pp. 1 ff).

However, Hatch, in his manifesto, emphasizes that it is only an initial sketch of the movement itself [3]. He states that in the spirit of making, he strongly suggests that people take this manifesto, make changes accordingly, and make it their own because that is the nature of making (p. 2).

The best way to avoid social exclusion is having a job, and the most successful way to get a job is to have good education

with the right training and experience. The Prime Minister of Great Britain points out in detail both the scale and nature of the problem [4]. Despite the economic differences between Great Britain and Brazil, they can be compared and for both countries and many others, a large number of adolescents lack support or guidance, and clear pathways to take them along the way to good jobs and career opportunities.

At the same time, employers are clamoring for skilled workers. These young people, commonly referred to as “opportunity youth,” struggle to enter the job market. However, with the right kind of help and assistance, they can access the high-quality education and skills training that lead to good jobs.

Increasing investments in opportunity youth is essential to helping them find a path to financial stability and economic involvement. Increasing their skills strengthens the country and sustains national economic growth.

Digital literacy in ‘making’ may be a new and major trend in the process of bringing powerful ideas, abilities, and expressive tools to children. Today, the range of accepted interdisciplinary knowledge has expanded to include not only programming, but also engineering and design (Astrachan, et al 2009; Yasar & Landau, [5,6]. Moreover, there are needs everywhere for educational approaches that encourage creativity and inventiveness.

In 1999, the National Research Council issued a report stating that technology was changing too fast for the ‘skill-based’ approach to be effective and instead called for a ‘fluency’ approach. They suggested that technological education be included for the development of adaptive, foundational skills in technology and computation, in particular intellectual capabilities in order to empower people to handle unintended and unexpected problems when they arise” (National Research Council, [7].

The costs of ignoring opportunity youth might be too high. By 2020, 65 percent of jobs will require some form of postsecondary education and training. Today’s opportunity youth can be the highly qualified workers of the future. This was written 25 years ago, but shows exactly how the job market demands different skills when they are to hire a new employee.

The way traditional education is set should be discussed because by learning only Mathematics, Physics, and Portuguese, students are not given tools to new demands of the job market. Blikstein adds that a quote often attributed to Seymour Papert, a South African-born American mathematician, computer scientist, and educator, who spent most of his career teaching and researching at MIT, states that if a teacher from the 16th century would time travel to the present, they would not have any problem in teaching a class nowadays [8]. Historical documents from that time testify that he could not be more precise. The Treviso Arithmetic, from 1478, teaches students how to do multiplication and division using ‘exactly’ the same paper-based algorithms still used today. Critical pedagogy Scholars, Freire in particular, criticized traditional educational approach and the decontextualization of curriculum [9,10]. Freire introduced the idea of a culturally

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meaningful curriculum construction, in which designers could take part and get inspiration from the local culture toward creating new themes with members of these cultures.

Freire also advocated for education as a form of empowerment, and argued that learners should go from the “consciousness of the real” to the “consciousness of the possible” as they perceive the “viable new alternatives” beyond limiting situations [9]. In other words, he declares that students should be taught how to think critically.

Therefore, students’ projects should be deeply connected with meaningful problems, either at a personal or community level, and designing solutions to those problems that would become both educational and empowering [11,12].

## 2. Methodology

The present study was made by an interview with a Product Designer, who works as an instructor and provides classes to children of primary school. A lecture on Maker Movement in a school was given and also helped to prepare and concatenate ideas to formulate the paper.

The previous idea was to visit a school and watch a class going through, but it was not possible because the school did not allow the entrance of strangers in its facilities. Neither was it possible to watch a maker class happen, nor could children be pictured. The interviewee and the lecturers have worked as instructors for 2 years, so they have a fair experience in working with children.

A questionnaire was applied to the interviewee which contains demographic data about the students and also information on the classes, facilities, tools used during the classes, assistance and relevant data concerning parents’ income, gender, neighborhood and ethnicity.

The lecture took place in Rio de Janeiro and was provided by 2 designers and a primary school teacher, who uses the maker movement to transform her classes in a better place for children to learn. The main contribution to this study was provided by one of the instructor-designer who works assisting children as the interviewee does. She presented some pictures of her classes in which children were doing their tasks and she gave full explanation on how the classes came about.

## 3. Results

The interviewee provided lots of pieces of information which are relevant and match the lecturer’s speech about maker classes. The interviewee works for a school whose partner structures all the classes according to the age and children’s level of understanding. Firstly, it is important to say that excellence in education in Brazil is a privilege for few people, mostly who live in the south of the city and another neighborhood which is called Barra da Tijuca. These are upscale parts of the city, where people who live have a higher per capita income [13].

Secondly, education in Rio de Janeiro is provided by the government, but public schools are not as good as private institutions, lacking infrastructure to hold a maker class. As

a result, few schools offer maker classes and some use these classes as a marketing strategy to catch parents’ eyes selling innovation.

This might have been one of the reasons outsiders are not allowed to enter the school the interviewee works because they might have considered that a stranger could be a threat and acquire information of their system of education and use it as a strategic advantage.

The partner of the school provides training to the designers for them to provide classes, they prepare materials, content to classes, instructions and guidelines that must be followed.

It is the partner’s responsibility is to promote pedagogical alignment, provide consulting under a troublesome situation and support to any issue either the school or the instructors might encounter. It was possible to notice that the instructor and the school had different perspectives when it comes to describe maker classes. The instructor is committed to giving away her best class, engaging students in projects and using the making to promote interaction among the students and among the other subjects students have to take. The school, as an enterprise, wants to catch more and more customers, students in this case. Thus, they see the maker movement as an opportunity to make profit, so they use them as a marketing strategy upon the premise to be educating adolescents to the 21st century providing innovation and computer literacy.

There were no complaints about the facilities, infrastructure in the classes. The students feel satisfied in attending the classes, they bring cardboard, scrap and electrical components to make their projects. The classes have an hour and thirty minutes long and happen at every two weeks. They are engaged to collaborate with each other instead of competing. As seen in the second section of this paper, the Manifesto implies that making is open to changes and opportunities of learning by exchanging knowledge.

Therefore, the making has become a field of study that connects and combines hand practice with control and maintenance of mental and corporeal abilities. It consists of a group of activities that help children, adolescents and adults achieve knowledge and mental easiness per se.

Given that, this subject should be part of a High School curriculum for its contribution to teenagers’ mental development, their learning to be more cooperative rather than competitive and the promotion of stress relief with lots of enjoyment during the classes. This measure ought to be applied during their whole school cycle, so the teacher or instructor would have more time to work step-by-step and the classes should develop interdisciplinarity.

Accordingly, adolescents are human beings under evolvment and making is an important tool to their maturity and mental growth. Young people, especially teenagers, have much energy and it is advisable that they spend it creating new things [14].

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One reason is that it improves many mental functions and liberate hormones that contribute to empower their minds and provide well-being. Another motive is that, in this phase, they are about to become adults and possibly much of the information they catch will probably be applied in their adulthood, so, introducing good habits, might significantly increase the number of creative adults. It takes some time to one create a habit; therefore, the classes should happen weekly providing time to fix thinking critically as a habit.

Furthermore, the role a making class plays also has to do with socialization. The instructor must incentivize cooperation instead of competition in a school. One pitfall on competitions is that they are compelling, but, in the meantime, they can overextend students, make the less skilled ones drop out classes and isolate. For this reason, the teacher should introduce activities to have them work together in school, so adolescents can realize the all human beings need one another. By living in a highly competitive society, learning to work in groups is essential and making classes can be used successfully on this purpose [15].

Finally, it is common to find people overwhelmed by stressful routines and, among adolescents, it is not different. This can be troublesome as they realize that they are growing and their responsibilities are increasing, as well. Therefore, enjoying their weekly making classes during their education may help them shrink much of this tension. As a result, good experiences make them create pleasant memories and thinking, which contribute to rise self-esteem and well-being. Ultimately, learning to handle stress is essential and is a continuous process to everyone. Making mistakes is part of the process of learning and helps adolescents to be more resilient, in other words, it makes them become mentally and physically sound and prepared for the rest of their lives.

#### 4. Discussion

The process of education has had little or nonsignificant changes through the years in Brazil. The educational system in Brazil is devoted to preparing adolescents to take an entrance exam and start their majors at a public institution. The educational system in Brazil is intricate because primary and secondary public schools perish, with a considerable loss when compared to private schools. The quality of education is a touchy topic because it encompasses social and ethnical inequalities. However, this is not the intention of this paper to discuss it in depth, but it cannot be left aside and not mentioned due to its impact in the learning process and Brazil social constitution. While basic education is poor and mainly attended by impoverished people, public universities provide high quality education, but to enter, a student needs to pass an entrance exam when they are to finish high school. Not only is the exam comprehensive in terms of content, but also hard to pass depending on the major chosen, which in Brazil, is usually decided before the students' entrance at a university.

Therefore, it is intuitive that the system cited above leads to the maintenance of social inequality, once only parents who can afford their children's education at a good school are able to fight for a vacancy at a public institution.

However, this is not the core of the proposed discussion in this paper, but the importance and relevance of including making classes in school curricula. It has been broadly discussed in this study that activities that make children create, empower them to be more ingenuous and prepare them to take better decisions and envision innovative solutions to a great range of problems.

Given that, some private schools, even driven oriented to develop a marketing strategy to gain more students, have given a first step towards innovation by introducing the Maker Movement as part of their curricula. These schools are helping their students develop a keen mind to innovation, technology and sustainability, which are key words for future generations. Yet, a relevant question is how all this process has been set up by those institutions. Modern education claims for diversity. In other words, new ways of teaching are necessary for youth, whose needs are very different from past generations. It is undeniable that children and adolescents are surrounded by technology, which makes them have a keen mind to other matters, other than traditional classes that seem to be uninteresting and out of context. In conclusion, it is believed that the knowledge schools provide is important, but it is mandatory that how subjects are taught need some reflection.

Another aspect that was possible to learn from the interviewee and the lecturer was that introducing making classes can be a pitfall. The difficulty lies in the fact that many teachers of other subjects are not open to use "making" as a tool to make students learn more. This means that, for example, a Mathematics teacher may not be open to join concepts taught in their classes to make a project with a making instructor to help students learn more by practicing it in their real lives. The interviewee and the lecturer affirmed that teachers of other subjects feel threatened by innovation because the students feel compelled by attending making classes. Consequently, the classes do not usually happen collaboratively, with little or no participation of other teachers in the process of learning. They stated that other teachers feel frustrated and for having been a teacher for years, These teachers are more conservative and end up taking making classes for granted.

Therefore, the main problem found by making instructors has been to find a way to build more interaction with other fields of study, which would certainly increase students' interest and learning. It is understood that changes may overwhelm people, specially those who have worked for decades doing the same duty. However, it is noticeable that the world has changed with the introduction of new technologies, concepts and needs of all kinds, which impacts the way education demands to be led. The job market puts employees under pressure; each time more and more qualified laborers are required and people who are encouraged to be multitaskers. As a result, schools have an important role in preparing students for a more dynamic life, with a greater variety of skills. In Brazil there is a guideline that sets the basis of what needs to be unitedly taught in schools. The knowledge norm that form schools' curricula, which, must be followed by any school in any State of the country. Making is not part of the basis yet but, should soon become part of it for the empowerment of students get by taking making classes and

learning to think critically and solve different problems using a huge range of methods.

## 5. Conclusion

This is a call for a change in the Brazilian educational system. Traditional education does not match the actual needs of students and the job market. The growth of technology, the necessity of a more sustainable society and the formation of collaborative communities need to be introduced to children and adolescents. The real role of schools is to teach people for life instead of providing content for students pass an entrance exam. Passing an exam to enter a university is essential for academic purposes, but life is much more than simply graduating and getting a degree.

Thus, making classes should be mandatory in school curricula due to its contribution to children's and adolescents' development. The teachers ought to be sensible while conducting the classes, in a way the students can take advantage of making projects and request the students to engage in cooperative activities rather than competitions. If all these steps are followed routinely, there will be a growing interest among educators in bringing making into education to enhance opportunities to engage in the practices of engineering, design and more broadly, to any field of study they want to follow.

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