Fabio Toledo

NEURAL EDUCATION

Knowledge Revolution in the Era of Connections

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NEURAL EDUCATION
KNOWLEDGE REVOLUTION IN A CONNECTED WORLD

This book was created with much kindness and care for my readers. Although it has gone through a thorough review, it may still not be without faults, such as typos. Any doubt, criticism or suggestion, including of conceptual nature, please send us through our Facebook Fan Page (www.facebook.com/fabiotoledonaweb) or our website (www.fabiotoledonaweb.com.br) for possible corrections or clarifications.

I dedicate this book to God, my family, my mentors and all the educators.

Prologue

I met Fabio Toledo in 2016, during the presentation of an innovative proposal for technology applied to education. The partnership has strengthened and was so successful that today all branches of the Anglo-Americano School have Technological Intelligence as a permanent subject, from Early Childhood Education to the 8th year of Elementary Education.

Since ancient times, when man was faced with the element that would change the history of civilizations forever – fire -, we went through a number of important changes and discoveries that promoted development and the conservation of human race to this day. However, the first of them is still considered the vital discovery.

The twentieth century saw the rising of a priceless asset, which, such as fire, has been expanding and applied in many different areas, transforming for good the way we see systems, the world, our peers: technology.

With a little creativity, we can imagine the accidents and trouble early men faced until they could master and use their new "tool" productively. Likewise, we have been facing inconceivable obstacles because of the difficulty in dealing with the benefits and risks posed by technology. From key scientific discoveries to frauds and drastic changes in our interpersonal relationships, this emergence has been the source of studies, due to the pursuit of an increasingly profitable use of such technology.

This is the approach you will find in Neural Education. The book points to the relevance of ethical, sustainable connections, interaction between individuals and the construction of solid relationships. A vision that becomes crucial in a society immersed in the currently cold and distant universe of technological knowledge. This work will surely provide the reader with a comprehensive view of the urgent need for social and

technological integration, an invaluable experience of enrichment and growth!

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She holds a degree in Education, specialized in psycho pedagogy and with an over 30 years' experience in primary education. She worked as a teacher, counselor, coordinator and principal.

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Chapter 1

Current Scenario and Future Challenges

1.1. Technological Scenario

The universe of automation and robotics is so fascinating and exciting that, before invading industries, cities and homes, connected technology has invaded the movies. Who could possibly forget the adventures of WALL-E? We have gotten so excited about the plot that many of us have not even noticed that the robot was part of a powerful automation system, after all its acronym stands for Waste Allocation Load Lifter Earth-class. And what about Baymax and its powerful programming in Big Hero? And can you remember the fight between Atom and Zeus in *Real Steel*, the technology involved, as well as the nostalgia perceived when we saw the sparring acting in shadow mode? Or yet when we discovered the history of Bumblebee on Earth, before acting with the other Transformers against the Autobots, and of the Age of Extinction portrayed in the movie?

On the other hand, characters such as Sonny, in the I, Robot movie, or Avengers' Ultron and the robots in Star Wars make us think about other aspects related to automation and robotization. Ultimately, it reflects the modern concern that we could all be replaced by robots.

But, no, they are not only in the movies. Robots have been replacing people in Reality Shows. There are many robot fights being broadcast on TVs around the globe, such as the BattleBots.

Cars, which have long been manufactured by robots, can now go airborne to avoid traffic jams, others stretch and turn into actual robots, or become flying cabs deployed in the Middle East by major international companies.

And what about the first fully automated logistics warehouses held by large companies in China and the United States? Hundreds of self-loading robots are in charge of shipping those loads to the trucks.

There are other robots in charge of going to places that could pose us great risk, such as anti-bomb robots.

And how about robotic pets? Ants, dragonflies, dolphins, leopards and much more. They have been used for spying purposes, to rescue people and in exploration services.

Nanotechnology also advances by leaps. Soon enough, nanorobts will be running through our circulatory system to clear clogged veins, for example.

That is the future of medicine, where robotic arms have been used for long in surgeries.

And we cannot forget we are in the Age of Connected Devices, the Internet of Things (IoTs), which allow the interaction between devices and between them and humans. Such technology is invading smart cities and houses.

Take a look at our homes. It goes unnoticed, but video games connect to TVs and stream movies. Smartphones do not only transfer data, but can be mirrored on TVs and car media systems and, in some cases, they also work as a remote control. Video games are increasingly interactive and integrated. Connected TVs allow us to enjoy many online services.

And technology is not only used for entertainment. Have you heard of LED lights that play music and change color by means of commands sent by mobile apps? Automated curtains, intelligent health monitoring and alarm systems, intelligent home appliances such as refrigerators equipped with inventory management systems and self-powering washing machines that start automatically when electricity is cheaper - IoT technologies are invading our homes.

Within the scope of renewable energy sources, we can already install solar panels to generate energy and resell it to utility companies. We will, after all, become prosumers. We can also save energy thanks to motion sensors installed in hallways and through remote utility sub-metering systems. In addition to monitoring parts of homes, businesses and industries through smart sockets, circuit breakers, faucets and valves, such devices can be turned on and off remotely using a smartphone.

Not to mention smart cities - electrical systems are already capable of using sensors and circuit breakers to detect flaws and auto-configure, avoiding disconnecting the energy supply from thousands of customers. All that in a matter of seconds. Thousands of smart meters are installed throughout Brazil and allow the remote metering and disconnection of energy supply.

In Europe, there are many fully smart cities, which have garbage collection systems that use sensors to identify which dumps are full and clogged culverts, public lights that are triggered at night only when it detects passers-by and on-road vehicle monitoring systems that can warn drivers about required maintenance reviews and display personalized ads, panic

buttons installed by the city governments to be activated to call the police and other emergency services, parking meters with recharging stations, among others

And there is a wide range of services following the IoT trend. A good example are crypto-coins, which uses Blockchain technologies (a kind of intelligent encrypted ledger) to spread over the world. The progress is so huge that they are already listed in the stock exchange markets.

Facial recognition cameras have invaded China and other countries. Other than providing security, they have been raising a concern as for if we are not within a huge reality show.

It is possible to transfer data through the electricity network and through the human body. There are many pilot projects and studies in Europe and Asia in this regard.

But would there be a dark side of it? Yes, in fact, there is. IoT technologies enable access and proliferate addiction in banned games, pornography and tutorials on how to become a hacker, steal power, pirate TV signal, WiFi, credit card data, create firearms and cause many other damages.

And how about the Deep Web?

It is composed of many private networks that do not communicate with each other. That is why this part of the web is not found by search engines, such as Google. Therefore, it remains hidden.

And what are people doing there? As far as we can tell, no good can come from it. It facilitates access to drugs and illegal services, products, software and music and to things so terrible that are not worth mentioning here.

Wow, it is like sci-fi, we could say. But it is not! And how have these things gone unnoticed? Because technology moves very fast, but also quietly. Confidentiality is a requirement in processes that involve technological innovation. When the wide audience notices, it is because it has gone viral.

Anyway, technology is all around and it will develop much more over the years. It is changing the world and deeply affecting human behavior. It is a one-way road and we cannot stop it.

1.2. The new Digital Natives

Is technology the evil of the 21st century?

I say we take a break before addressing the issue to think about this text named "The Rock", by Antônia Pereira (APON).

The Rock

A stumbling rock for distracted minds,
a weapon for the beasts,
a building block for a builder,
a place to rest for a
tired old peasant.
For boys, it was a toy,
For Drummond, a muse,
David used it to kill Goliath...
Finally;
it became art by the hands of the carver.
In all cases,
it was not the rock's fault.
But rather the men's.

Such as in the case of the rock, the problem is not technology *per se,* but rather what is done to it. The way it is deployed and employed.

And what should we do with the Digital Natives?

Urgent is the need to drive the technological potential of future generations towards an ethical and productive path. Those who were born and will be born in an increasingly digital and interactive world.

They will be soon attending schools, colleges and universities. It is our role to prepare them to not get lost on the way or be replaced by robots or automation systems. We need to translate a critical-constructive thinking into actions. To be able to create new technologies and channel technological advances wisely, by developing entrepreneurial and socio-emotional skills and multiple intelligences. And, of course, their learning environment must not only be in line with reality, but also provide methodologies that allows them to build knowledge and expand beyond the boundaries of their schools walls.

In the twenty-first century we need wise and well-prepared human beings, capable of building their future

and that of the next generations with boldness, while maintaining high ethical standards and a deep sense of responsibility. Our teaching institutions must contribute actively in this process.

We cannot pretend that nothing is happening, let alone escaping from such responsibility!

1.3. Neural Education

As we have seen, as days go by, the world is more modern, technological, interactive, globalized, lively and competitive. In modern society in which we live, technology has provoked great changes and is transforming the world into a huge global village. Information crosses the planet in a matter of milliseconds. Traditional models, including business models, have become obsolete. The world reinvents itself by leaps!

In this scenario, education institutions have taken on a crucial role and need to reinvent themselves, as old pedagogical practices have become insufficient to meet

today's demands. They need to adjust the scope and their teaching methods to the reality of the 21st century.

It is not enough to prepare students for university; they must rather be prepared for life and for the future! It is necessary to seek new assets to transform methodologies and other pedagogical aspects, adapting them to the latest demands. New reflections and attitudes are needed in the education industry.

Among others, schools, colleges and universities must encourage students to acquire knowledge, develop talents, innovations and foster the students' multiple intelligences. It is not about a new trend, but rather an urgent requirement, a gap to be filled immediately. Neural Education arises precisely to meet such demand.

Other than making reference to neuroscience applied to learning, the concept of Neural Education concerns educational systems that reinvent and continuously improve their methods, becoming increasingly effective, by learning from the multisensory stimuli coming from reality, from trends of the modern world and its stakeholders, with whom they are connected, just as neurons do in our sensory system during synaptic processes.

The approach therefore reflects the need to implement a continuous Research, Development & Innovation (RD&I) cycle, involving both intra and interinstitutional aspects and fully and multi-levelly engaging all stakeholders in the educational environment, each one according to their own skills, such as early childhood education institutions, elementary, middle and higher education institutions, partner companies, government agencies, among other bodies responsible for implementing public policies, guidelines, standards and learning methodologies, as well as their managers and pedagogical teams.

The scope of Neural Education is timeless and wide, as it advocates learning and continuously evolving on the basis of an ongoing analysis of stakeholders and the surrounding environment and covers not only technological aspects, but rather any relevant signs coming from any market players and many fields of knowledge. Nevertheless, it is important to establish premises that will guide the subjects that will be addressed in this book.

This book will address, but not limitedly to, aspects related to the Era of Connections and the Knowledge

Revolution through which we are and will continue to go over the 21st century, as far as I can tell.

1.4. The Knowledge Crisis

The inertia of some national stakeholders, even those in the education industry, regarding the changes provoked by the dynamics of the modern world has been causing serious consequences, which may be further intensified if nothing is done about it.

Changes in the global scenario require adapting the citizens' knowledge to the global demands. Otherwise, we will have individuals excluded from opportunities, incapable of overcoming challenges imposed by modern life and professionals with skills and abilities incompatible with market demands. This would cause a serious crisis: the knowledge crisis.

Would we be talking about something futuristic or the crisis is already here? Are graduates prepared to deal with the challenges and opportunities of the modern world? Recruitment and selection departments are having

their jobs cut out thanks to the "baggage" that these professionals carry with them since elementary school? How have these professionals dealt with technology? How have they managed conflicts and crises? How are their interpersonal relationships going?

In considering the above issues, we may conclude that the crisis is already in place. It has just not become evident enough for us to perceive its severity.

Education institutions have a key role in their students' knowledge building process and in preparing them for life and the modern labor market. One must ensure that the academic qualification process, since elementary school, includes aspects that will guide the development of the students according to the demands of modern life

But what would these aspects be?

This will be addressed more thoroughly throughout the book, but the discussions begin as we try to define the word "*knowledge*".

According to the Merriam-Webster dictionary, "know" means "to have an understanding, to have

knowledge, to be acquainted or familiar with". It is ultimately about wisdom.

On the other hand, the word "wisdom", according to the same above-mentioned source, concerns "accumulated philosophical or scientific learning" or "a wise attitude, belief, or course of action". It also means "to have experience of".

Not exhaustively, the definitions above bring some relevant information for our discussion. It is not enough to acquire knowledge. One must stay tuned to new sources of knowledge, to know what to do with it and to manage attitudes during the acquisition process and while using it. And there is more! Effective knowledge building requires experience, application and truly experiencing the associated process. Theory must be combined with practice.

What is not applied is more likely to be forgotten or not used in full. The brain itself takes care of erasing it from our memory. Consequently, new opportunities are no longer exploited and the human potential is prevented from being developed and maximized.

Regardless of the demands of the modern world, one notices that the content-driven educational model does not meet the basic demands of the above definitions.

If we add to these definitions some needs of the current scenario, we will see that students must be trained for both the current and future labor market, which is more and more technological, automated and robotized.

Although many professions have disappeared, new ones are arising every single day. A few years ago, for example, we were not familiar with professions such as Digital Influencers or Drone Pilots. Based on the current reality and trends of the modern world, what will be the professions of the future? What knowledge, skills and abilities will be required from tomorrow's professionals? What will be the role of education institutions?

We are amid the knowledge revolution: we will need to build it in an effective and sustainable manner. It is the only way to avoid the crisis that may arise sooner than we thought.

1.5. The Era of Connections

In my humble opinion, we are experiencing the transition from the Digital Era to the Era of Connections, the Connected World Age.

The Digital Era, also known as the Technological or Information Age, refers to the period of great technological developments and the sharing of large volumes of data and resources that we have been living since the end of the 20th century. It is gradually giving way to an era where connections have become at least as important as technology or information itself.

Without attempting to establish theories, but based on my personal observation, I believe that in the modern world everything is multisensorially connected under four categories that involve devices (or things, if you prefer) and people:

- ✓ Intrapersonal;
- ✓ Interpersonal;
- ✓ Internet of Things (IoT);
- ✓ Environmental.

Multisensoriality is necessary because we must perceive reality under the many aspects of human intelligence, such as existential, natural, interpersonal, intrapersonal and technological, and not only under those with which we have greater affinity, as discussed below.

The Internet of Things has come to stay and concerns connected devices such as smartphones and automation and robotics platforms. Connecting devices to devices and to people through communication systems will generate an increasing volume of information and opportunities. One must channel the technological potential of students in a constructive manner.

Interpersonal connections are also more and more important, given the increasingly cooperative environment of the contemporary world. Proof of it is the emergence of businesses based on the creative and shared economy. Such connections are undergoing deep changes, particularly with the boom of social media. While many people like and share each other's lives, many others have missed opportunities and suffered losses because they are not able to deal with modern "relationship" technologies and tools that actually help us know people; building a

relationship requires much more than "knowing" someone. Undoubtedly, building sustainable relationships is one of the key factors that allows us to follow a path of success in the collaborative and shared environment in which we are currently inserted. Connecting with each other is crucial for us to apply our knowledge in a sustainable, empathetic, constructive, cooperative and synergistic manner.

In an ever-changing, increasingly competitive world where depression and anxiety have become the plagues of the century, avoiding self-sabotage, knowing how to manage crises, conflicts, adapting and balancing are key skills. Brazil is the country with the most cases of anxiety and depression, according to the World Health Organization. That is why intrapersonal connections are vital.

Intrapersonal connection with a focus on self-management, seeking self-knowledge and management of thoughts, emotions and attitudes, enables the development of skills, talents and hallmarks, which are increasingly required nowadays; what you can do and that no one would ever do as well as you do, at least not in the same way you would do it.

And we must not forget the environmental connection! In the increasingly dynamic world in which we live, we must be connected to the environment, attuned to the reality and trends of the market and modern life, to be able to enhance the benefits of opportunities provided by the 21st century and to overcome its challenges. This needs to be done using a multi-sensory approach and through active listening, which allows us to establish an efficient dialogue.

Finally, knowing is not enough to ensure the future: one must act and connect in the present, assertively!

Connecting, as meant here, is deeper than it seems. It concerns the need for interoperability, for relationship and not just the possibility of doing so. There is no point in having two devices connected to each other by a communication network if they do not speak the same language, use the same communication protocol, if they do not understand each other. It is not enough to know people to build links and opportunities, we need to interact, create relationships, in a world where trust is everything. What use is knowing the trends of the modern

world if nothing is done to take advantage of the opportunities that are offered?

Connection is no passive agent, including with regard to self-consciousness. We need to be able to manage conflicts and crises, have the flexibility to adapt to sudden changes, know our own skills, strengths and weaknesses, and "hack" ourselves with the goal of keep reinventing ourselves in this increasingly demanding, innovative, challenging and opportunity-rich world.

The Era of Connection implies making connections (partnerships) that allow sharing assets in a win-win manner, to allow us to achieve our goals and maximize opportunities.

Speaking of technology, one notices the increasingly frequent sharing of:

- ✓ Device infrastructures: This is what mobile apps do when they share features (touch screen, processing, local storage, GPS, accelerometer, gyroscope, Bluetooth, etc.) in the same smartphone, for example, or in smart TVs;

- ✓ Communication infrastructures: WhatsApp and other similar apps share the users' Internet to send messages;

- ✓ Data storage infrastructures: Services such as Dropbox and Onedrive allow users to save data in the "cloud" by sharing data storage media;

- ✓ Assets: Uber shares the private driver's vehicle and Airbnb shares their users' properties;

- ✓ Services: The DescolaAi platform allows users to exchange unused objects; Livra Libro is a book exchange platform and FazoQue.com help people exchange professional services;

- ✓ Programming: In the Open Source Era, it is increasingly common to see developers share programming algorithms, including at a professional level;

- ✓ Images, audios and videos: More and more multimedia sharing databases are available, some of them free of charge, such as Pixabay and Freepik.

In the interpersonal scope, in addition to the items described above, after all there are people directly or indirectly involved in all of them, there are many more connection opportunities, as they can establish affective and trust bonds, for example. Such bonds are like "bridges" that give access to a range of sharing opportunities such as support, knowledge, ideas, network, business and much more. This varies, among other factors, depending on the depth of the bond and commitment among individuals.

The challenge is to never close any doors and build as many two-way bridges as possible, through the development of social and emotional aspects. And equally or more importantly is to keep them open, allowing multiple and mutual navigation routes.

We should remind that this type of "bridge" is only built by means of connections and interoperable

relationships. Simply knowing someone does not ensure the confidence required to build that bridge because there are no emotional bonds linking them. Referring someone's services, for example, to your ring of friends can effectively open doors, after all everyone seeks recommendations of reliable people. On the other hand, such recommendation requires a great deal of trust, as it may affect your own image, if something goes wrong.

And don't get it wrong! Solid interpersonal bridges are not built on money and power, nor on the desire to use or to take advantage of someone else. These types of link will certainly fall apart at some point, since they have no foundation or support. We must seek ethical, responsible and truthful connections. Sustainable connections cannot be negotiated. Have you ever seen someone buy love, respect, affection, admiration, trust, or gratitude? That is the way to build sustainable and mutual bonds!

And beware of where you connect! Now if you will allow me: all connections are allowed, but not all of them are convenient or legitimate! Ethics, responsibility, mindfulness and truth are essential attributes in establishing secure and sustainable connections.

Another challenge is to pinpoint "blocked roads". Bridges are not always opened both ways, even if we want to believe it. Sometimes, it only runs one way. In some cases, for example, being referred to by someone can close doors, rather than open, even if the person making such recommendation thinks otherwise and acts with the best of intentions.

Life has no organization chart. Everyone needs everyone. Someone's degree of subordination over someone else is relative. It might be misleading, as it depends on the environment in which we are inserted and a series of other circumstances. The coach of a soccer team might lead the director of the company in which he works, for example. And there is more!

Intrapersonal connection is the widest, as it allows connection to a universe of opportunities, to our potentials, skills and talents.

Other than enabling interpersonal connections, it allows us to acquire new knowledge; it opens doors to countless fields of knowledge and much more. This is possible, among others, through self-knowledge, the continuous pursuit of knowledge and development of our

multiple intelligences, a theory that will be further discussed.

The development of our multiple intelligences allows us to expand the possibilities of environmental connections, because it makes us really see new possibilities, as we understand thoroughly what is happening in the environment in which we are inserted.

After all, it is not enough to be connected to the environment in a multisensorial manner: we must interoperate with it, be able to accurately interpret the signals that we are receiving through the many stimuli we constantly receive from this increasingly dynamic world. We do this by, among others, developing our multiple intelligences and communication, which is key for the establishment of efficient dialogues.

Of course, connecting requires boldness, as it requires us to leave our comfort zones. It concerns everything that does not frighten us as we are used to dealing with it. We must hack ourselves**!**

In short, connections are critical in the increasingly more collaborative modern world. And, as observed, connecting may be more complex than it seems at first sight. Therefore, we must learn to connect wisely since childhood and this process must be consistently assisted. No pun intended, but to follow a path of success in the Era of Connections, it is important to have the courage to

connect, and to know where and how to do it wisely, in an ethical, responsible and sustainable way!

1.6. And how about the Knowledge Revolution?

The Knowledge Revolution is a reflection of the transition from the Digital Era to the Era of Connections and may change everything we though we knew. After all, as explained, this process directly affects human behavior, as well as other aspects related to knowledge and wisdom.

According to a report prepared by the Exame Magazine[1] based on the analysis and translation of a report produced by the World Economic Forum[2] named The Future of Jobs: The Future of Jobs, Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution", 35% of the most demanded professional

[1] **Source: https://exame.abril.com.br/carreira/10-competencias-que-todo-professional-vai-precisar-ate-2020/**
[2] **http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf**

skills should change. Such changes are justified in the context of the so-called Fourth Industrial Revolution: the era of advanced robotics, automation in transportation, artificial intelligence **and** automatic learning. Yes, over the next four years these socio-economic, geopolitical, and demographic issues will have a direct impact on the labor world: whether in the emergence or disappearance of professions or in market-driven skills. Many of them are linked to actions that still cannot be taken by machines. The focus of the report is on the aspects in which we are still better than robots".

We need to be able to deal with the ever-changing environment. New needs, means of learning, skills, fields of knowledge and content will surely arise.

We must ensure that everyone is included in the "new" reality!

In the Era of Connections, passivity must give place to leadership, to the courage of leaving the comfort zone and making things happen, to the boldness of connecting. Here, more important than knowing is the way we apply knowledge and cooperate.

Knowing how to do, developing our own way of adding value, has become vital. That requires practice, experience, action, wisdom. We need a hands-on approach in order to maximize knowledge-related opportunities.

Finally, with the Knowledge Revolution comes the need to review concepts, given the rupture of paradigms related to connections and knowledge. Knowing is no longer enough. Each one must identify and develop their unique ways of acquiring new knowledge and applying them wisely and efficiently. Above all, identifying synergies and knowing how to cooperate is crucial.

The knowledge revolution will make us realize that everything we thought we knew can fall apart at any moment. We need to stay tuned, learn on an ongoing basis, know how to communicate and make sustainable connections that enable "bridges" that allow us to reach fertile ground for cooperation and knowledge.

1.7. The Profile of a 21st Century Professional

According to a report prepared by the Exame Magazine[3], based on the analysis and translation of a report produced by the World Economic Forum[4], "The Future of Jobs: The Future of Jobs, Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution," which addresses several aspects related to the knowledge revolution in the above-mentioned Era of connections, every professional in the modern world must have at least 10 skills:

- ✓ Complex issue resolution;
- ✓ Critical thinking;
- ✓ Creativity;
- ✓ People management;

[3] **Source: https://exame.abril.com.br/carreira/10-competencias-que-todo-professional-vai-precisar-ate-2020/**
[4] **http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf**

- ✓ Coordination: coordinate their own actions according to other people's actions
- ✓ Emotional Intelligence;
- ✓ Judging and decision-making capacities;
- ✓ Service orientation;
- ✓ Negotiation;
- ✓ Cognitive flexibility: ability to create or use different sets of rules to combine or gather things in different manners.

The above information is quite relevant, but note that two of such characteristics are worth highlighting, as they have also been pointed out by Mireia Heras from the Spanish IESE Business School: flexibility and adaptation capacity. After all, in the dynamic environment experienced in the Era of Connections, constant changes are the only certainty we have. With that in mind, another event should be highlighted.

At about the same time as the publication of the above-mentioned report, the Silicon Valley gave rise to a new concept called *growth hackers*. It would be linked to a new professional profile aimed at permanently helping the company to grow.

This logic applies not only to this "type" of professional, but rather to everyone! Employers and employees must unite and grow together. Companies are made up of people, grouped into areas or divisions. No one knows these areas better than people working there. Each one needs to pay attention to improvement opportunities. Everyone stands to gain from it!

The market needs these *growth hackers*. Professionals who are able to identify opportunities to generate solutions and revenues and who add value through creative and analytical positions more than just technique, who understand the business as a whole and are willing to actively participate in its continuous reinvention process, essential in the highly competitive and dynamic market of the 21st century.

How about thinking constantly as an entrepreneur and from the perspective of the business owner?

Thinking about how a company can save, innovate, expand and become more profitable. And before aiming the company as a whole, focusing on your area of expertise. All the activities of a company, no matter how simple they might seem, are of great importance and contribute actively to its success.

It is a two-way street, since employees tend to be acknowledged, and even financially rewarded, for their ideas and projects put into practice, adding value to the company. After all, in such case, it is not about just asking for a financial reward for a one-time event, but clearly showing where the reward money will come from, and that this is a win/win situation for both the employee and the employer!

In order to meet the future demands, we will need to become *Neural*.

Neural are entrepreneurial and innovative individuals, capable of connecting in a multisensorial way to everything and everyone and interpreting all signals and feedbacks received. People who challenge themselves to leave their comfort zones and evolve from multiple perspectives, in a continuous and proactive manner and who have the courage to help others to do the same.

Selfless and socially responsible human beings who do not compete with others, but rather lead themselves in a restless pursuit of moral, spiritual and intellectual wisdom and evolution.

In analyzing the above statements, we will see that the skills required from tomorrow's professionals are closely related to entrepreneurship.

We need to clarify and demystify the word "entrepreneur".

According to the dictionary, an "entrepreneur" means "a person who starts a business and is willing to take risks" or it yet carries an additional connotation of far-sightedness and innovation. We can see that an "entrepreneur" is associated to the idea of a "go-getter", someone who implements projects that will generate changes and innovations. The concept goes beyond a person who undertakes any kind of business activity and applies to the personal, academic, professional and corporate lives of all of us.

Therefore, we can conclude the subject with two statements:

- ✓ **The market of the future wants entrepreneurs, innovative and connected professionals, regardless of the role they perform: business owners, managers or employees.**

- ✓ **In the modern world, highest-paid professionals will not be those who work hard, but those who add more value to the market.**

Chapter 2

The Challenges of Economic Feasibility of Private Education

2.1. The Tragedy of the Commons

The Tragedy of the Commons is a concept made popular by the ecologist Garrett Hardin in his article "The Tragedy of the Commons", published in Science magazine in 1968, based on the past work of the mathematician and economist William Forster Lloyd.

It describes a situation in which individuals, based exclusively on their own interests and with free access to specific resources, which are shared with other members of a community, harm others by spoiling such resources in an unsustainable way, under the misconception that they are infinite and that there are no negative consequences of its use.

The vicious circle generated by other individuals progressively adopting such unsustainable practice causes the depletion of resources.

In order to illustrate the concept, imagine a vast farm with many crops, intended to supply an entire community. There, sustainability practices are adopted and food is proven to be better than in the competition.

The company running it was the joy and pride of the local community. It generated jobs and many improvements.

As for the consumption policy, there were clear rules. Each member had access to a specific amount of fruits and vegetables from the field, upon the payment of a pre-established price.

Everything was apparently going well, even though some reprehensible practices began to take place. Although the members were not allowed to consume without paying, some took advantage of the absence of fences and ostensive surveillance to enter the garden and deliberately harvest food for their own consumption. This was a continuous and massive practice, even among children, led by the adults. However, as there were only few people doing it, the losses were not that significant and were absorbed by other payers.

The reasons to steal food? There were many. Some of them did it out of necessity, some because they thought they were "smart" because they wanted to spend their money on other services, others would steal for ideological reasons. Everyone had their own reasons to justify the wrongdoing, but they had something in common: they did not realize the true value of the farm.

As there were no severe consequences for offenders, at least not perceived from the outside, more and more individuals started using the same practice, and little by little the culture of harvesting without planting or paying was established. As a consequence, losses have been growing and increasing the price of food.

Some individuals, however, still believed it! They would never avail themselves of the illicit practices they heard were becoming more and more frequent. They acted like this not only because they did not "need" it, some of them even needed more than those who were doing wrong, but because they believed that paying for the service and receiving what was theirs was the right thing to do. They would pay diligently, even if they had to sacrifice themselves.

On the other hand, other individuals began to see the plantation as just another company and began to demand discounts to stick to the deal. That was a choice of the managing company, even if it had to let go of their own way to manage the field, of its hallmarks. Not all costs incurred by the losses and discounts were passed on to the price. Most of it led to a reduction of operating costs.

Over time, the situation has become increasingly unbearable.

The crop management company, in addition to not being able to raise its clients to unite on their behalf and ask the authorities to take action, was unable to manage the discount policy and to suppress the anger by the fact that food prices were higher and higher and the quality was decreasing.

But, after all, why did the quality of food decline, some might wonder? Among other reasons, because the company's practices have become obsolete, the unprofessional and unrestrained access to the crops and the rough handling of food by the offenders, the end of the innovation policy and the increasingly scarce maintenance budget, since the income generated by those who were still paying was further declining, including because of the discount policy.

In order not to get more upset, regular consumers gradually withdrew from the project and began to buy food in other neighborhoods. Over time, the garden became unfeasible, even though the management got indebted to inject capital into the venture, in an attempt to save it.

The project literally stopped reaping the fruits and left behind, in addition to bankrupt and unmotivated managers, another large unproductive field.

But why is that important in this book?

2.2. A Tropicalized Concept

Is the above story somehow similar to what happens in the Brazilian private education industry?

There seems to have been, in some cases, a misunderstanding that someone's default will be absorbed by other good payers without significantly affecting the private education institution.

Unfortunately, education institutions throughout Brazil have to operate with high and persistent default rates. After paying one or a few tuition fees, the student is permitted by law to keep studying the whole year and then move on to another education institution.

The lack of empathy and the lack of knowledge of many in relation to the current legislation, as well as the apparent

absence of clear and effective social actions and public policies to deal with the challenge presented can generate a sense of inequality of duties, causing disorder in the market, a vicious circle provoked by rise of new adopters of the default practice, evasion of paying students, high teacher turnover rate and decreased quality of the education institution, which ends up losing its hallmarks and its unique way of educating, given the need to reduce costs, investments, services and innovations as a consequence of lost revenues.

Increased losses and the consequent reduction of revenues and funds earmarked for operating costs, innovation and retention may lead the institution to financial unfeasibility.

The reduction in the perceived quality and the competitive edge of services, caused by the above-exposed vicious circle, can cause damages, sometimes irreparable, to the image and revenues of educational institutions, as it, among others, reduces their client's portfolio and the perceived fair price, which is what the customer believes that the service is worth, leading to a possible widespread and unsustainable discount policy.

2.3. Hidden Causes

Notwithstanding the legal provisions in force and ethical issues involved, there are other sometimes hidden causes that may be contributing actively to the worsening of the situation described in the previous points.

There is a flawed interpretation according to which education methods are the same or very similar in all education institutions. This happens, among others, because parents do not perceive the benefit and the sense of engagement among students, which makes them want and need to stay in such institution until the end of their school career in order to follow a successful personal, academic and professional path, both now and in the future.

Consequently, there is no reason to afford additional financial sacrifices to keep the child enrolled in a specific education institution.

The values added by schools and colleges, in addition to the mandatory curricular guidelines, are often not perceived and this has to change.

Given the low rate of positive feedback from students and unperceived short-term benefits - the benefits generated by the elementary school are not immediate but rather long-term (admission exams, university, profession) - parents are likely to be led to believe that all educational institutions offer equal services and that there are no relevant innovations and hallmarks offered by schools in which their kids study.

Colleges, schools and universities have been seen by some students, and even by teachers, as a hostile but compulsory environment, in which they do not feel inserted and motivated to participate, among other reasons because their teaching methods do not fit the reality and demands of the modern world and its stakeholders (students, parents, teachers, among others).

Some education institutions adopt reactive approaches, acting as mediator of conflicts. The compulsory interaction of the students' parents with the education institutions is naturally negative. Parents seek schools mostly to complain, among others, about relationships, lack of interest and performance of their children, about teachers' attitudes and tuition fees and other expenses. And maybe what is even worse than

receiving negative feedbacks is the lack of any feedback, which is reflected into the parents going to courts or to the competition. Many clients do not complain, they just think and act.

Focused on solving their daily problems, many institutions fail to report, and even realize, their actions with a positive impact. And when they do so, sometimes the frequency and the actions themselves are not enough to generate engagement and perceived added value.

Another cause for concern is that complaints have become even more intense and resounding with the emergence of groups on social media. Many situations are distorted and escalated, as they are exposed and commented in the heat of events and amid the accumulation of negative feelings generated by past problems that have not been properly solved or that often have not even been exposed. They often result in collective actions, image impacts and may even be featured in the press. Worse still, when situations are clarified or resolved, even if successfully, a positive feedback is hardly reposted to the other members of the group by the claimant, or at least not in the same way,

with the same intensity and impact with which they were reported

It should also be noted that many of the parents' negative feedbacks come from their children or in their absence. Students are likely to report only adverse situations, such as learning difficulties and relationship problems. Students do not always show their achievements with pride.

And how about the teachers? Do they feel like they belong to the education institution? Do they feel motivated to keep teaching in such institution? Do they perceive gains, other than their salaries, including with regard to intellectual aspects? Do they feel safe about their jobs and income? Do they feel capable of making a difference, within the scope of the policies set by the school, of adopting their own way of teaching? How is the teacher turnover? Have they been trained to deal with the needs, challenges and opportunities of the 21st century?

2.4. The Persistent Default

Now that we have discussed relevant aspects directly or indirectly associated with the causes of the tragedy of the commons applied to private education in Brazil, a very important aspect will be addressed again: the persistent default.

Persistent default is not always caused by a situation of vulnerability. Sometimes the capital is earmarked for other priorities, not to mention waste and other superfluous items.

And what leads consumers to review their way of managing and prioritizing their consumption patterns?

Generally, the answer is consequences!

And not all of them are legal consequences. Yes, if someone does not pay the pay-tv operator, for example, the service is suspended immediately. But many people are likely to compromise to reestablish it as soon as possible. But why? Wouldn't it be easier to look for another operator or use broadcast TV? Everyone has a broadcast service available, right? Aren't they all the same thing?

It is not about the broadcast service *per se*, but about the unique content and the increments offered, such as the possibility to access it from anywhere, at any time and through mobile devices, for example. This is clearly perceived by consumers, after all, TV operators, other than constantly innovating with value-adding services that the customer needs, make consumers perceive it through the use of the service provided and through an intense, continuous and efficient communication process.

Companies use to invest heavily in services and processes that help retain customers. But why?

To put it simply, because retaining customers is much cheaper than attracting new ones. Attracting new customers is usually a very expensive activity. According to Philip Kotler, one of the world's top marketing experts, "attracting a new customer costs five to seven times more than retaining a current one".

Pay-Tv companies use to be efficient in their customer retention processes. And not to mention that they are part of a highly competitive market and they have to deal with a disloyal and illegal competitor: pirate TV.

Please note that advertising something is not enough! This 'something' has to truly exist and add value. And more than that, the innovation cycle must be continuous. Nevertheless, the customer has to understand the added value, see it as a distinguishing feature. And that requires an efficient positive communication system.

And how does that apply to the private education market?

2.5. It is not enough to add value: value has to be perceived

In the face of the lack of public policies that could stop a vicious circle, we need to have efficient and innovative private actions to fight the causes of the current challenges and to break the undesired paradigm.

Parents always seek what they believe is best for their children and are likely to compromise to ensure that such goal is met.

If the benefit perceived by the students regarding services offered by the education institution is high, prioritizing that specific education institution over other products and services will be merely a consequence.

It is necessary to create a feeling of belonging among students, we want them to engage, to perceive value. The sense of loss of having to leave the education institution prematurely, caused by what will not be learnt and by the friendly environment that will hardly be found elsewhere.

This tends to generate a bond strong enough to make them want to stay in such institution until the end of the academic career and that they will miss if they leave.

Such feeling may and must be aroused in teachers. This can all be sparked, among others, by:

- ✓ A modern, smart, customized learning environment, compatible with the reality of the 21st century, ensuring that students will absorb the contents to be taught. Such environment may be composed of platforms, spaces, didactic resources and smart ways to

maximize learning opportunities and interaction;

- ✓ Training rounds that continually empower educators by engaging and enabling them to cope with the challenges of the modern world and to maximize the opportunities and resources available, including technology;

- ✓ Activities that help students balance theory and practice, apply the content they have learnt, arouse their interest and facilitate their understanding;

- ✓ Subjects added to the program to arouse their interest, skills, develop their multiple intelligences and prepare them to succeed in modern life and the current and future labor market.

- ✓ A permanent and efficient Research, Development & Innovation policy.

- ✓ Effective retention and communication policies

Finally, education institutions definitely need to invest in innovations that, besides adding value, generate the perception of added value and consequent retention of students, parents and teachers.

Perceived added value must be strong enough to make those parents believe the price to be paid for education services provided by the educational institution to their children is fair and earmark their available income to pay for such services. Likewise, these institutions need to awake in teachers the feelings of security, empowerment and belonging, as well as the certainty that they can grow and contribute actively to the growth of the schools in which they work.

2.6. Encouraging and motivating are requirements!

Children and teenagers need to be motivated and excited to go to school, college and university. If that is not the case, something is wrong! We need to identify the causes and to fight the students' lack of interest or low performance.

If learning is cool, why would the learning environment be different? Probably, both the student and the education institution have not yet found and applied their own way of learning.

Curiosity excites, motivates, and triggers creativity and thirst for knowledge. Purely theoretical classes hardly arouse these feelings; after all, they come from personal exploration and not from what is exposed by third parties. These feelings need to be sharpened, become habits, a culture.

Remember how excited children in early childhood education get after experiencing the world of discoveries that education institutions offer them? And why does that get lost on the way?

Among other reasons, perhaps because the empowerment of autonomous discovery, even if assisted, has been replaced by the obligation to accept preconceived theories that we do not know why we have to study and where to apply them.

The extract below, from the book *The Agent of the Galaxies*, which I wrote, comes in handy right now.

"Parents, teachers and other individuals, even without the intention, sometimes kill the creativity of children. Children tend to be naturally curious and imaginative until someone takes it away from them. If a child draws a cow that produces chocolate milk, he/she will be immediately censured; so that rising creativity will be slowly destroyed. In order not to be frowned upon by skeptical adults, the child feels blocked and no longer expresses creativity.

Let's see, for example, how a two, three year-old toddler dances freely, in their own way, without bothering if someone is watching or what they might be thinking!

So are rules not that important?

Yes, they are. Children and teenagers need boundaries, rules, they need to learn to respect others, know what is right and what is wrong, becoming citizens able to live in society. However, this can be done without shutting off their creative potential, their autonomy, independence, individuality and identity.

More than just theory, children and teenagers must deal with practice: it will be the experiences, successes and mistakes and the make-it-happen that will enable maturity and construction of knowledge.

Getting their hands on is what motivates, engages, excites and even leverages the sales of products and services aimed at children and teenagers.

Years ago the play dough helped many children shape their ideas in a practical way. Later in the 70's, it went through an upgrade and became a viscous, moist and soft substance, manufactured by Mattel and called Slime. It was sold in a preconceived can, ready for use, and could be stretched and shaped. It drew the attention of many children at the time, but it really boomed just years later.

But why did it boom just now and not back in the 70's? Is it because the market was not ready?

That is not the case. In my opinion, as the father of two children who are part of the target audience, what made the product become popular was the fact that it now used a maker approach (hands on). In other words, it means that it can now be made by the children themselves, it is no longer a store-bought product.

Children and teenagers want to get their hands dirty! They want to be makers. This encourages and motivates them.

Let us see another practical example.

Inspired in the maker culture, which we will discuss later, in 2018 Nintendo launched the Nintendo Labo, a new line of cardboard accessories for Nintendo Switch. The idea is to, out of simplicity, inspire creativity and give the user the opportunity to develop and apply technology in different ways. Fishing rod, piano, house, robots, remote control, here is just a few examples of the possible cardboard sets. They include a software that allows integration to the Switch console.

The possibilities for integration are many and, according to interviews with executives of the company, Nintendo Labo can open doors to code and for the creation of other kits, customized by the users themselves. Nintendo, in tune with the reality and latest trends, initiates a dialogue with a new generation of kids: the makers!

Another relevant aspect is the need to raise awareness among students about why they should learn. **We do not study out of obligation, but rather because it is worth it! True knowledge dignifies, empowers! It is a priceless asset in the modern world, so students should not deny it, on the contrary, they should be encouraged to learn more than they are taught in the school environment.**

In fact, according to a recent survey, those who study more tend to be happier and have a longer life. The study "What Are the Social Benefits of Education[5]?" was prepared by the OECD (Organisation for Economic Co-

[5] Source: http://www.oecd.org/education/skills-beyond-school/EDIF%202013--N%C2%B010%20(eng)--v9%20FINAL%20bis.pdf

operation and Development), bringing together 15 member countries.

Studying is crucial if we want to achieve what we want, our personal and professional goals. It helps us live better, understand ourselves and the reality around us. It develops our knowledge, skills, autonomy and independence. It makes us happy, after all, the feeling of overcoming, evolving, changing is unique!

Knowledge is the most precious treasure we can conquer!

Many people long for wealth, but authentic "knowledge", what comes from true learning, obtained through experiences and practice, is much more important, for it will never be taken away from us.

And there is more! It allows us to achieve what we want, as many times as necessary, on our own merits, in this life that sometimes looks like a big wheel-shaped arena.

It is not by chance that the bible tells that King Solomon chose wisdom and has trodden a path of success.

It is important to count on professional help in this awareness process. Pedagogues, psychologists, but also professionals from the labor market. The immersion of children and teenagers in the professional environment, other than awakening talents and skills, helps them understand the reason for everything. This can be done through frequent lectures on the many present and future professions, as well by addressing their curiosities, challenges, opportunities and academic requirements. Certainly, many parents would be happy to give a word. In-company visits, conducted in a safe and productive manner, can also be useful. Theory must be connected to practice to foster motivation.

Human being is curious by nature. One needs to know why something has to be learnt so we are encouraged to do so. Besides, it is necessary to guide the constructive logical process of the students through challenging projects that require problem-solving skills.

We must not forget the aspects of real life as well. Lectures and cases that convey messages of resilience, based on real-life stories, are motivating.

And how about the dialogue between teachers and students? Unpretentious, unbiased but wise conversations can help more than you could imagine.

There is much to be said about the solutions proposed here, which will be discussed below. The purpose of talking about solutions here was to arouse your curiosity and show that this book is not intended to be about utopias, but rather about tangible and implementable actions that show that learning should not be imposed but rather desired.

This is achieved, among others, through dialogue, personalization, discovery, targeting potentials, raising awareness and, of course, providing students with a learning environment compatible with their realities, in which they feel comfortable, inserted, empowered, as they belong to something, aware of their rights and duties, but also of the opportunities that would make it all worthwhile!

Chapter 3

Targeting Intelligences

3.1. The Risks of a Misled Autonomous Learning Process

Assuming that children are able to naturally learn, for example in their social and familiar environments, what is essential for verbal and written communication, why do they need to study their mother tongue for so many years throughout their academic careers?

Among other reasons, because the incremental development of communication skills, under the guidance of qualified education professionals, facilitates the inclusion, interaction and development of individuals in society.

By mastering our mother tongue, we are able to express ourselves correctly in different ways, transforming our ideas and opinions into texts, lectures and audiovisual projects.

We could say that such knowledge is of paramount importance to our evolution from multiple perspectives, because it maximizes our opportunities and chances of treading a path of success in both personal and professional life. That therefore justifies the need for such

subject to be present in national school curricula for so many years.

But nothing has changed over time?

In modern times, this subject enable us to interact efficiently with other people and even with technological devices (increasingly more advanced and present)?

In addition to Linguistic Intelligence, would it not be necessary to develop other types of intelligence so students can deal better with the challenges and opportunities of the 21st century?

3.2. Theory of Multiple Intelligences

In the 80s, a team of researchers led by Howard Gardner, a renowned and award-winning psychologist, Professor of Cognition and Education at Harvard University and Neurology at Boston University, developed the Multiple Intelligences Theory.

He states that a child who is good at mathematics is not necessarily smarter than another who may have

developed higher skills related to other types of intelligence.

We need to see beyond the mathematical universe, after all, there are many other fields of knowledge!

Gardner described nine types of intelligence, which explains why many people are better at certain fields than others:

Naturalistic: is related to the comprehension and interaction (e.g.: cultivation and conservation) of nature and its elements, such as plants and animals.

Musical: has to do with the comprehension and interaction with sounds, as well as the generation, creation and interpretation of melodies and sounds, through musical instruments and vocally.

Existential: common in many philosophers, psychologists and spiritual leaders, it concerns the sensitivity and ability to reflect on the meaning of life and the universe under the material and spiritual perspectives.

Intrapersonal: it concerns self-knowledge, acceptance and self-love, transcending multiple fields of knowledge.

Interpersonal: the way we relate to others is the main focus of this intelligence, including features such as empathy, sociability, communication, among others.

Logical-mathematical: related to the ability to deal with quantitative, logical and geometric aspects, among others.

Bodily-kinesthetic: it concerns motor skills, the body-mind relationship, the ability to deal with body movements in an accurate manner.

Spatial: those who perceive and interact with the world in an accurate visual and spatial manner have this intelligence better developed.

Linguistics: is more evident in individuals who easily absorb linguistics contents and who express themselves verbally and in writing, it involves learning, interpretation and application of communication (both written and oral) in a clear, objective and articulated way.

Although we are more prone to deal with one or some types of intelligence, we must seek to develop all of them. After all, through them it is possible to connect to reality in a multisensory way, in order to understand effectively and learn from what is happening around us.

The more we develop our multiple intelligences, the more we become "generalists" and able to seek and seize the synergy opportunities offered in the modern world. Synergies, to speak business, is the opportunity to add even more value to our projects and ideas, through, among others, the complementary collaboration of other people, teams, projects, processes, situations and companies.

Schools, colleges and universities play a key role in the development of the students' multiple intelligences, because their environments are conducive to the development of multiple intelligences. During the education and growing process, students have an even greater opportunity for the development of many intelligences.

But the above listed 9 intelligences are the only ones to be developed in the academic environment?

What has changed since Gardner's first publication on the matter?

3.3. Digital illiterates and Misconnected Individuals

The emergence of connectivity, the Internet, interactive technologies and automation has provoked many disruptions of paradigms in society. Traditional media such as newspapers, radio and TV has lost and keep losing space for social media. Traditional libraries are falling into disuse thanks to the convenience offered by Google and other search engines. Businesses that have been stable for many years, such as video rental companies, have lost space to an increasingly connected digital universe.

And what has happened to people who are not ready to face this new reality?

They are becoming "digital illiterates", or maybe more than that: they are "misconnected."

That is how we could call, for example, individuals who waive the right to fully live real interactions by escaping from reality through the virtual world and digital addiction.

Theorists with no practice, experience or works. People who just enjoy the life of others without fully living their own's. People who have memorized and shared sayings without understanding their essence, as they may have never experienced or gone through situations that they seem to think they are good enough to "judge."

Citizens that may be clever in some ways, but are definitely not very wise. People who allow themselves to be manipulated to the point of posting increasingly poor, intolerant, judgmental content, perhaps even inconsistent with their own values. And what could we say about *haters*? The word says it all.

Teenagers and adults who do not measure the consequences of their actions by "sharing" without checking the accuracy of sources and the quality of the content.

Many human beings who have unlearnt to relate to one another and to live in society, thanks to the misuse of current technology, such as social media, which, in theory, surprise, surprise, were designed to bring people together.

There are also individuals who have learned to shorten words (belittling our mother tongue) to a point that, even if involuntarily, adopt such practice to communicate even in a professional environment. As a result, they lose opportunities and give up the right to learn, think, form an opinion, produce, evolve, achieve a trajectory of sustainable success.

Obsessed with their smartphones, tablets and computers, they are developing such vicious technological, academic and behavioral habits by “liking” and “following” other people’s lives to the point that they leave their own lives behind, wasting opportunities that may never come back. Driven by the illusion of perfect lives posted by their "friends", they spend their lives unhappy because they do not live the same "reality", no matter how unrealistic such realities might be from a rational point of view.

From where we stand, this is also the reality of many parents who, equipped with many theories and empty words, advise their children on the misuse of technology without setting an example. Such actions do not usually succeed, after all, their attitudes, observed by

children and teenagers on a daily basis, do not match their "wise" advice.

Not to mention the creation and management of spurious, unproductive, illegal, immoral, destructive and unsustainable businesses and technologies. This subject would certainly be enough to another book.

One should also note the emergence of illnesses brought on by the excessive use of technology, which go beyond addiction, such as hearing impairment, spinal problems and cybersickness.

And who is there to blame? Technology and business of the modern world?

Technology, as well as other assets of the modern world, have good and bad sides. They can be used constructively or destructively. Mastering fire was perhaps one of the greatest achievements of mankind, which helps us cook and forge metals. Nevertheless, it also caused and keep causing many catastrophes.

As it would be the case with a misguided autonomous learning of the linguistic intelligence, the misguided development of technological, entrepreneurial

and socio-emotional intelligences has brought serious implications for society.

Something has to be done to reverse this scenario, and education institutions play a key role.

3.4. The Solution to be avoided

Many schools have been offering "robotics workshops". Is teaching how to "create robots" enough to apply the content studied by students and to meet the needs of the modern life and labor market?

Robotics is just part of the technologies with which students must deal in the 21st century. To name a few, just look at the massification of mobile applications, games and automation and their related opportunities.

Besides, it is not just about learning how to create new technologies, but rather targeting the students' technological potential, so that they can use them to materialise everything they have learnt, through the practical application and by increasing the efficiency of

any projects in which they are involved, be it within the personal, academic or professional scopes.

The challenge is not in learning specific techniques and tools, but in the efficient development of intelligences that make them understand the logic of things, to make simple the future development of any techniques and the application of knowledge. And above all, students must be encouraged to apply contents wisely, autonomously, synergistically, cooperatively and efficiently.

This includes subjects such as innovation, entrepreneurship and social-emotional intelligence, which must be learned in an integrated manner.

Because workshops are usually purely technical and elective courses, the services offered in such format do not reach all students. Consequently, their benefits tend not to be applied collectively in the school environment.

It is not enough to train only a few students. It requires collective learning and the transfer of knowledge to all educators of the education institutions, through a continuous, efficient and personalized training round, not only to those who will teach the workshop, but in such a

way that they could all apply the content of the courses in a practical way.

It should also be noted that one-off extracurricular activities, taught by third parties, other than inefficient in meeting the present demands, can pose significant risks for the education institution and the proponent, depending on how they are implemented and the contracts signed between the parties, such as:

- ✓ Possibility of lawsuits, demanding employment links and compensation for damages;

- ✓ Accountability before students and parents for incidents caused by third parties, such as didactic flaws or promised deliveries, accidents and illegal or inappropriate actions;

There is no sugar coating! Who wish to be a prominent player in the competitive market of the 21st century must stand out efficiently and professionally.

3.5. Technological, Entrepreneurial and Socio-emotional Intelligences

To meet the demands of the modern world, other types of intelligence (or subtypes of the intelligences described above), must be developed, in addition to those described by Gardner. But which are them?

In the 21st century it is necessary to educate students to deal with new technologies, their emotions, other individuals and with other aspects related to the opportunities and challenges of their everyday, academic and professional lives, always in a constructive manner. All this can and should be used to apply what they have learnt in classroom, in the many academic courses they study.

The road to success in the modern world passes by Technological, Entrepreneurial and Socio-emotional Intelligence. Such intelligences must be developed. This can be done effectively, notwithstanding other forms of insertion, through the inclusion of one or more specific courses in the school program.

Chapter 4

Technological Intelligence

4.1. Why learning how to create new technologies?

Many forecasts of specialized consultancy firms predict that in a few years thousands of jobs will be replaced by automation systems and robots.

Is that a reason for concern?

Yes, from an ethical point of view, for example; it is not enough to create new technologies, it is necessary to apply them wisely. And also for digital illiterates who just follow established processes, who do their jobs as robots, without even thinking about it, perhaps it is also unsettling.

The survivors of the future market will be those professionals who have not been "robotized". Flexible, entrepreneurial, socially educated professionals who reinvent themselves all the time, perform their tasks wisely and innovatively, react smartly and constructively, proposing and implementing solutions to unexpected events, crises and challenges and who are able to turn ideas into action using minimally tangible, concrete

prototypes and new technologies applied in an ethical and sustainable way.

We are living the transition from a time where learning how to use pre-created technologies was enough, to another where everyone can create them and we will be required to do so.

Not until long ago, we used to learn how to use technologies as they came up and only when we needed them. Many people have learned how to type, use the computer and basic tools like the Office suite, for example. Today's children were born in the Era of Connections, they are digital natives! They learn how to use technologies by themselves, through tutorials, discussion groups and with colleagues, for example.

In addition, thanks to the emergence of Block chain Programming and 3D Printing, new technologies, products and services have been created by "lay" and increasingly young people. This trend should become massive in the coming years.

Therefore, there is no point in trying to teach children and teenagers to use technologies. They need to be taught to focus their technological potential, so they

can use them wisely and create with ethics and responsibility.

The huge technological potential of today's students should be focused on the creation of prototypes and experiments that facilitate the learning of the many subjects to be studied in classroom, such as Language and Mathematics, as well as the modern world's coding skills and technologies that will facilitate their insertion into the labor market.

Currently, there are many investors and managers who are not experts in the fields in which they operate. More than a PowerPoint presentation, one must transform ideas into proofs of concept through software, applications, animations, simulations, mock-ups, among others. The creation of technological prototypes (*hardware* and *software*) gives them the required safety to make strategic decisions in the companies where they work, as they materialize the projects that the employer wants to accomplish. Such an employer will probably be some student currently attending elementary school. How to succeed in the environment described above without knowing the basics of how to create new technologies?

Students should be motivated, excited, thrilled by technological knowledge.

4.2. Technological Intelligence as a School Subject

Accordingly, other than fighting harmful aspects, the subject *Technological Intelligence* should explore the beneficial and enabling aspects of technology, beyond the requirements of the academic universe and the labor market. Students should gradually learn how to design and develop hardware, even mechanically (2D and 3D) and electronically, and to code many types of software such as games, animations, robot programs and automation systems and mobile applications.

Knowledge is built through the creation of new technologies, combining theory and practice. Part of the world to be understood and experienced by students is directly related to technologies, so their participation in prototyping, assembly, programming and device

automation processes can be an ideal breeding ground for education and discovery.

We need to focus on learning and not just on the transmission of information. Learning by doing is crucial to ensure the success of this challenge.

Applying creatively what they learn in classes such as Languages, History, Geography, Science and many others, makes it easier to absorb content. Creating multidisciplinary educational projects, games and animations, experiments and technological creations promotes learning and arouses the interest of students in subjects that they might not even like, for example, because they have a hard time figuring out how to apply the content learned and relating it to everyday situations.

We need to empower students with knowledge by developing their ability to conduct research by themselves in an autonomous, ethical and efficient manner, as well as to motivate them to learn more than what they are taught. Learning by research excites, motivates, empowers, opens doors for more and more knowledge. Of course, mentors should be available to follow up the process and answer, whether directly or indirectly, to the students' questions.

There are still many other benefits that can be exploited. A sad example of this is that nothing could be more common nowadays than seeing young people and adults at home or in restaurants accessing their smartphones and even communicating with each other through social media, instead of interacting face-to-face.

The discipline allows bringing families together using technologies similar to those that have been keeping them apart. This can be done in regular classes or at specific events where parents and relatives of the students have the opportunity to interact with projects developed by them or to learn how to create new technologies such as games, applications and automation experiments, along with their children.

Garage workshops, where many people have learned how to build kites and other experiments with their parents, have upgraded. It is time for kids and parents to code together, gathering the parent's wisdom and the kid's natural proneness to technology. These exchanges of experiences and learning can help to strengthen family bonds, besides generating many other benefits to participants.

We cannot forget other aspects related to early childhood education. Teaching how to create new technologies to such age range may be too early. First, it is necessary to develop the motor technological coordination of children, allowing them to use the computer efficiently through its peripherals such as the mouse and keyboard, followed by the development of spatial technological notions and computational logic with the aid of macro algorithms and coding.

4.3. Development Degree and Technological Maturity of Education Institutions

Presently, the development degree and technological maturity of national education institutions can be classified as follows:

I. Reluctant: The institution is technology-averse and only adopts technology where it

is extremely essential, as in the administration.

II. Newcomer: Technology is applied on an incidental basis and only by a few managers and professors with more technological affinity.

III. Intending: Education managers fully use technology in their activities. The institution makes passive investments in devices such as electronic boards and tablets, but not all teachers are able to optimize their use.

IV. Advanced: Technology is successfully deployed in classroom and fully used by managers, teachers and students. This contributes actively to the improvement of the institution's processes and to making classes more dynamic and experimental.

V. Maker: The education institution adopts cutting-edge technology and is able to create

> and manage customized professional technological solutions, either on its own or outsourcing it. All teachers and managers have at least notions on how to create games, animations and regularly conduct or guide lessons and Maker projects under the STEAM methodology. If necessary, they can count on a team of experts to assist them.

How is your institution's development degree and technological maturity?

It is not enough to teach students how to create new technologies! You have to set the example. Students and their parents are watching you!

Chapter 5

Entrepreneurial Intelligence

5.1. The Entrepreneurial Scenario

The way we communicate has changed dramatically over the years. It is less and less verbal and more technological and behavioral.

The labor market has changed as well. In the modern professional environment, in addition to academic skills, behavioral aspects are important to ensure a successful career.

Everyone wants to stand out. Standing out has never been as important as it is today, given the increased competitiveness.

Collecting certificates is not enough! Forming opinions, communicating, arguing and knowing how to apply ideas is a requirement.

And probably entrepreneurship has never been so easily accessed, profitable and encouraged, both in personal and professional lives, as it is in modern times. Just look at current public policies such as the implementation of the simplified tax system and the emergence of support agencies such as SEBRAE, and you already have a good example thereof. Another example is

the massification of small and medium-sized franchise business, such as small traditional bakeries and the offer of apps in the Apple Store and the Play Store.

5.2. Collaborative Economy

There are many new concepts emerging and facilitating the dissemination of entrepreneurship in the modern world. Massification of the shared economy is a good example of it.

According to SEBRAE, "Collaborative (shared or network, as it is also known) economy is a movement that puts in place a new perception of the world. It represents the understanding that, in the face of ever-worsening social and environmental issues, sharing will inevitably replace accumulation. It is therefore a **strength that affects the way we live and particularly the way we do business**".

The buzzword is sharing, bonding. Making win-win partnerships by sharing and exchanging services and

goods, either to save time or money or generate new revenues or opportunities.

It seems to be something outdated, it reminds us of the barter system of the colonies, but nowadays, there are many people who once again feel happy to exchange objects, products and services.

For example, someone bakes delicious cakes and makes one for somebody else's birthday, who, in turn, is a good caterer and will deliver a nice menu on another date, on the birthday of the first person. There are many online platforms allowing the exchange of similar services and offering rides, for example. Consumers who have invested in the installation of solar generation systems in their properties for their own use may already resell the energy surplus to the electricity utility company with whom they have a contract, through an appropriate metering and using the existing power grid.

And what about the massification of alternative transportation services, such as UBER, where vehicles are shared, and hosting services such as Airbnb, where the same is done with houses, apartments and single rooms. And even more interestingly: Many vehicles used as UBER are rented from third parties under specific

contractual clauses that allow them to be used for such purpose, as well as houses made available on Airbnb. It is a win-win system, involving many happy stakeholders.

Finally, although some cases might still be controversial and are still issues to be addressed, such as regarding the regulation of these services and the payment of taxes on barter transactions, it is believed that they will soon be solved and that the shared economy will be increasingly more encouraged.

5.3. Creative Economy

According to SEBRAE, "Creative economy is the set of businesses based on intellectual and cultural capital and creativity that generates economic value. It comprises the cycles of creation, production and distribution of goods and services that use creativity, culture and intellectual capital as primary inputs". The concept was first created by John Howkins in his book "The Creative Economy".

A very relevant area of the creative economy, associated with the integrated development of technological and entrepreneurial intelligences, is the APPs & Games industry and Brazil is one of the largest potential markets in the world.

According to PWC, one of the world's most renowned market consultancies firms, "the global media and entertainment market will grow at an annual average of 4.2 percent over the next five years and by 2021 it will reach US$ 2.23 trillion. In Brazil, the turnover of the media & entertainment industry is expected to reach US$ 43.7 billion by 2021".

It also points out that Brazil "has become a major player in the mobile gaming market, with an estimated annual growth of 26% and projected revenue of US$ 712 million in 2021."

The international interest and the demand for professionals is such that in 2018 Canada started a process to hire Brazilian professionals, through the Québec Economic Development Agency, for the game industry. Among them were programmers and graphic artists with an average salary of 6,000 Canadian dollars per month.

5.4. Startups

According to entrepreneur and writer Steve Blank, whose concept seems to be the most widely accepted in the market, a startup "is a group of people looking for a repeatable and scalable business model working in conditions of extreme uncertainty."

Please note that this definition brings some important features:

- ✓ Extreme uncertainty: will it work?
- ✓ Repeatable: can I sell the same product to many customers (DVD vs. Pay-per-view)?
- ✓ Scalable: growing and earning more and more without increasing operating costs in the same proportion as the revenue grows.
- ✓ And above all, let's make it clear: the business needs to be feasible.

It should be noted, therefore, that startups are high-risk and innovation-driven companies, while also fast-

growing and very profitable when they succeed, given the unique value they might add. It is not by accident that WhatsApp was sold for US$ 16 billion to Facebook only 5 years after its creation and with a team of just over 50 employees.

Information Technology (IT) is the foundation of the vast majority of this type of company and directly influences their scalability potential.

Startups are usually created by daring young people, eager for challenges. They are technological entrepreneurs and innovators who have made great business discoveries.

The most noteworthy example is the Silicon Valley, a startup hub in the United States that gave rise to world giants like Google and Facebook. Other examples of successful startups are Paypal, Buscapé, Easy Taxi and Click Bus.

5.5. Why should we learn to be entrepreneurs?

Entrepreneurship and project management concepts are essential to everyone, whether they be students, employees, managers or entrepreneurs. They are key to tomorrow's professionals, as discussed in the first chapter of this book. After all, everyone is constantly dealing with projects that will ultimately lead to changes. That is why all students should learn such concepts from a young age in education institutions.

Project management is closely related to entrepreneurship, after all, it deals with the creation and management of projects. There is a number of international methodologies and frameworks that gather best practices in this regard, such as PMI, PRINCE2 and 6SIGMA. Of course, they need to be adapted to the reality of the education institutions and age groups, as we will see below. For now, it is important to highlight that they have already agreed with the need to be present in schools and colleges, as can be noted below.

Project Management Institute (PMI) is an international non-profit institution that brings together

project management professionals. PMI Portugal has decided to gather a team of 18 volunteers to translate three books from English into Portuguese aimed at teaching project management for children: "The Ultimate Tree House Project", "The Amazing Science Fair Project" and "The Scariest Haunted House Project Ever". Written by the New Zealand's author Gary Nelson, they are aimed at children from the ages of 8 to 12 and combine adventure with project management.

But why should we teach entrepreneurship and project management techniques and tools to children?

In reality, this would not be the ultimate goal, but rather to disseminate the entrepreneurial logic among students, making it a habit. The same applies to project management, which is present in the attitudes and thoughts of those who make it happen!

The "I'm on it" spirit is slowly dying. Just go to a supermarket and ask something to a clerk and you will see things getting confusing. As if they wanted to get rid of the "inconvenient" as soon as possible, we often hear "I don't know this one, you should ask John Doe there, who is in charge of the area". Wouldn't the client prefer a clerk

who would assume the responsibility, even if the process had to be followed up by another professional?

Therefore, it is not about techniques and tools, but about the urgent need to focus entrepreneurial potential and behaviors and make them a habit in children and teenagers, as they will lead them to a successful trajectory in their daily academic and professional lives, through things such as:

- ✓ Discipline and focus: required in everything we want to do with efficiency;
- ✓ Setting goals: there is no way to reach something if you don't know what you're aiming;
- ✓ Strategy: it is key to define how and the best way to get there;
- ✓ Forward-looking spirit: to anticipate trends and future needs is crucial even in the personal planning that we should all do;

- ✓ Principles of Finance: notions of capital value and how to generate it, asset management, basic cash flow, return on investment;

- ✓ Creativity and innovation: having ideas and apply them.

- ✓ Communication: expressing points of views in an unbiased, clear, concise and constructive manner;

- ✓ Resilience: capacity to adapt, recover and stand up in face of challenges and changes;

- ✓ Empathy: the ability to share the feelings of another;

- ✓ Leadership: the leader must be elected, lead by example, serve, mediate, empower, delegate, put issues into perspective, materialize things that seemed to be impossible, be generalist and have multiple intelligences developed;

- ✓ Self-motivation: one cannot rely simply on external positive drives to move forward;

- ✓ Pro-activity: the ability to anticipate situations.

The above items do not apply to our everyday lives?

They sure do, and there's more! The sooner we start cultivating such habits in our lives, the faster we will reap their benefits. And it is not enough to learn concepts: one should rather teach entrepreneurship in a practical way, through experience, the frequent and evolutionary creation of entrepreneurial projects.

In this process, at least as important as knowing how to employ tools and methods, in a way adapted to the educational follow-up involved, such as PDCA, 5W2H and Design Thinking, is to really understand what are they used for, putting them into practice and, as appropriate, to adopt logic in the analysis and decision-making processes, in a natural way, from the simplest to the most complex.

Tools and knowledge are not enough; they need to be used wisely. And this comprehension is intimate, unique. Practice allows learning by experience, problem solving, trial and error and also by example. Let me share a practical and personal example.

When I was 14, I was a young apprentice at SENAI. That is where I became an electrician, a profession that my father had exercised for many years, before he became a businessperson. He was one of my main mentors, my source of inspiration, to whom I am infinitely grateful for the teachings through example and of whom I am very proud.

At SENAI I learned important techniques, even in practice, but I can say that my father inspired me to use what I learned, both ethically and wisely. I am going to tell one of the countless episodes that come to mind at the moment.

My father, whenever he did any fixing in the house, called me to watch him from a safe distance. Sometimes I didn't even want to be there, but I did. On those occasions, there was this game he would play with me. When executing a task, he would ask what he needed: a screwdriver, pliers, an electrical tape?

I usually got it wrong and I found that very boring. But my father taught me to never give up. Eventually I started getting it right and even anticipating his needs. When I graduated, I became an efficient assistant to my father in those jobs.

Without even realizing it, I had developed entrepreneurial behaviors that I keep using all the time, such as pro-activity, active listening and curiosity, which encourage me to continuously innovate in my projects. When I realized how important they were in my life and how I stood out because of them, I tried to develop them more and more.

Anyway, more than just techniques, it is necessary to awaken and develop the entrepreneurial and inventor spirit that we all have within us. After all, everyone has knowledge and ideas, but not all of them become something concrete.

Moreover, besides teaching entrepreneurship in practice, it is necessary to focus the students' entrepreneurial potential, so that this is done in an ethical and responsible manner.

Respect and love for others and the social role of individuals are subjects that must be addressed in the education process of children and teenagers. Helping and empathizing is rewarding, in a sort of social entrepreneurship. One must be good, no matter what. I honestly believe that whatever we do comes back to us, sooner or later, either positively or negatively.

Entrepreneurship can play a role in this regard, not only through the concepts of Sustainability, Corporate Social Responsibility, Third Sector and Social Entrepreneurship, but also through its principles, even if partially and in a controlled environment, emphasizing that everyone has in actively contributing to a more fair society and clean and healthy environment.

Corporate Social Responsibility is how private companies convert part of their profits into social benefits. The Third Sector is essentially composed of private non-profit organizations that provide public services. On the other hand, Social Entrepreneurship, according to SEBRAE, is defined as "actions aimed at changing a reality by establishing measures and strategies that generate social return and create a positive environment. Today's social entrepreneurs seek to implement sustainable

measures in communities in order to reconcile technological advances and other progress with a healthy environment and good living conditions for all. The idea is simple: to use management techniques, innovation, creativity, sustainability and other skills for the purpose of maximizing capital in a community, neighborhood, city or country".

Finally, the concepts we exposed here can and should contribute to the students' knowing other realities and developing responsible, altruistic and sustainable entrepreneurial behaviors.

5.6. Why social-emotional education?

Social-emotional skills bring together skills developed through both intrapersonal and interpersonal intelligences.

The development and application of technological and entrepreneurial intelligences need to be conducted wisely and unselfishly, as well as the personal, academic

and future professional lives of students. For such, social-emotional education is crucial.

The same "knowledge" that now destroys may be used to build, it all depends on how it is applied.

Just look around you, and you'll see great experts and brilliant scholars who still need to be educated, both socially and emotionally. Although unintentionally, they sabotage their personal, academic and professional trajectories because they have not yet learned to build relationships and self-manage. Brilliant and imposing as the sun, but just as lonely, because no one dares to get close to them.

It is not wise to develop the human intellect without doing the same with their emotions. Alone, isolated on an island of mismanaged feelings and attitudes, we will hardly get where we want or at least not in the most efficient and satisfactory way.

As we were discussing on the Era of Connections, we need to know where and how to connect and do it wisely, ethically, responsibly, and sustainably.

Partnerships and synergies, these are the buzzwords in the entrepreneurial and corporate worlds.

Those who, more than understand, manage to successfully apply them, have an easier path ahead. Both expressions have something in common. They imply more than just knowledge, they imply relating to someone. And that is no easy task. If it was, the divorce rate would not be as high as it is.

The task can be complicated, because before we learn to relate to someone, we must learn to relate to ourselves. Good news is that social-emotional intelligence can be developed, even in children.

Respect for others is something that, although it might seem simple, has become a "viral" problem, especially if we analyze the content on social media, for example, regarding political and religious differences. I believe that we are currently experiencing a crisis in that regard. Direct or subliminal messages indicate something like: “I respect your opinion, as long as it is mine’s as well” and that has to change.

Schools, colleges and universities, rather than learning arenas, should be seen as, and are in fact, interaction spaces. It is the place to make acquaintance with people with many backgrounds and opinions, with

whom we might disagree, but whom we must respect. That is good ground for social-emotional development.

But what if we do not develop like this? The outcome seems obvious. Evidence of this is the currently available amount of self-help books, psychologists focused on the development of social-emotional issues.

There are more and more people feeling lost, not knowing where to go and who to seek to follow the path of others, hoping to find any “guru”. Following someone's orders blindly is much easier than making decisions and taking responsibility for one’s own actions. At least, there is someone to blame.

More and more people are becoming Ph.D.’s in first semesters, migrating from one career to another, without finishing what they have started, in a late pursuit of their own skills. It would have been much easier if they and their talents were awakened, developed and guided in their basic education institutions, using a calm, continuous and progressive approach.

Discovering someone's "vocation" is not an easy task and requires time and active listening. These choices can have a significant impact on one's future and may

extend throughout life. Unfortunately, no one is getting any younger and it is common to find people regretting their past choices, which were often based on emotion rather than reason or on the expectations of others. People who are not happy in their professional lives, who feel ashamed of what they do or of how little they have "evolved." Discouraged and stagnant both in personal and professional life, these people are just surviving, and not truly living the beautiful life that God has gave them.

Self-sabotage is a silent enemy that has to be fought. It can destroy us, such as the "bridges" created by our relationships, which could be the way to go to pursue future cooperation.

And how about altruism and empathy?

Betrayals, disagreements, unsettled issues. There are many ways to justify breaking up relationships, whether with friends, partners or family members. I would dare say, based on my experience and interactions with the listeners of my weekly radio column *Success requires Attitude*, that some, if not many, of these cases are caused by something that we could define as "the syndrome of modern electronic devices".

Back when electronics were not so affordable and widely available, people valued them more. I remember how difficult it was to get a landline telephone. People would even sell land plots to get one!

At that time, when someone noticed a malfunction in an electronic device, what would they usually do?

They would try and fix it! Even by themselves. My father seemed to have superpowers. There were no toys that he couldn't fix. We were used to seeing adults crouching behind a washing machine or other household appliances. And the VW beetle? And when they couldn't fix it by themselves, what would they do? They would look for someone who could.

People were proud to show off their old appliances. They were well taken care of, they would shine, they would smell like new!

Then came modernity. Everything got cheaper, easier to get and more technological. And no one is interest in fixing anything. Something has broken? Throw it out and get a new one. That is the new market rule, simple like that!

There is no point in discussing such rule in this book, but should we treat people like we treat our electronic devices?

Unfortunately, some people seem to have adopted this “throw it away” rule in their family lives as well.

All families have ups and downs, but we must strive to "fix" what it takes in relationships, be they personal, academic or professional. Disposal seems to be the easiest choice, but it is certainly not the most sustainable. It breaks bonds, bridges, there are always consequences.

No one is supposed to stay in a relationship forever. That is not what this is about. What we need is to learn to let things cool down before making any decision. Reflecting upon the facts and only act after calming down and thinking about the causes and consequences a thousand times.

And could it not be taught to children and teenagers? I am sure it could and it would avoid many, many tears.

Let’s take a look at another current issue, before wrapping it up: competition.

The problem is not competition *per se*, but rather the levels it reaches. Competition can be healthy, for example, if externalized as a simple playful opposition, or destructive, when it involves harmful feelings that might include anger and envy.

The school environment is a fertile ground for the propagation of destructive competition, given the existing cultural, social, ideological and religious differences, among others.

This book has discussed cooperation thoroughly and how it helps in our path towards success. However, how can we cooperate in cases involving a destructive level of competition? One must understand and be aware of the fact that we need each other, that hostility should not be encouraged and that competition should be just healthy and smart.

In the market, having competitors is extremely healthy, as long as such competition is not destructive. It is indeed a source of development, after all everyone can learn from somebody else's mistakes and successes, besides keeping us vigilant.

Students should be encouraged to understand that competitors are not enemies and that cooperating can be a great competitive edge.

It is also important to show that we should not compare ourselves with others, but rather with our own selves, in different times, seeking to constantly evolve. There will always be someone better or worse than us according to certain criteria, but there is no way to compare different individuals. That would not make any sense. After all, we are all different from each other and we live different realities. We were born in different places and in different families, we lived under different circumstances, we had different challenges, we had different opportunities. How could we compare what is unique?

Anyway, this subject could bring about many other books. Our goal is not to dig deeper into it, but to prove the importance of developing social-emotional intelligence in students early in educational institutions, strengthening their growing-up processes. In this regard, the considerations in this item and throughout the book seem to be enough.

5.7. Entrepreneurial and Social-Emotional Intelligence as a Subject

Based on the arguments discussed above, developing Entrepreneurial and Social-Emotional Intelligences in educational institutions is becoming more and more necessary.

As in the case of Technological Intelligence, this must also be carried out by including at least one specific subject into the school program.

And which would be the content to be taught to students?

The subject should address theoretical and practical aspects related to the creation and management of responsible and innovative entrepreneurial projects.

On an annual basis, students should create innovative entrepreneurship projects, from conception to practical implementation, adapting them to each age group.

For example, students should be encouraged to brainstorm ideas, to concatenate them, to mature them, to

transform them into projects, to present and develop them in practice.

The result can come in the form of academic and scientific actions such as science fairs intended to present applications, games, robots and automated models developed by students under the guidance of their teachers.

Holding specific events, such as fairs where students and parents could sell products and services, whether technological or not, developed individually or jointly with the families, is another achievable possibility. The occasion can be seized to rent toys, sell arts and crafts and snacks, applications, among others.

Another alternative or complementary way to increase students' engagement would be to set Junior Idea Incubators and Junior Companies, depending on the age group and legal provisions in force.

It is also important to emphasize the importance of subjects such as Technological Intelligence in universities.

Many students enrolled in courses such as pedagogy, law, psychology, dentistry, among others, have great chances to innovate, starting their own businesses.

Starting a business without any idea of how to prototype ideas and how to manage projects and business can make the task harder than it could be.

Another very important aspect is to create an interactive, engaging environment, compatible with the students' reality, during the implementation of entrepreneurial projects in education institutions. Besides stimulating collective learning and teamwork, this action encourages sociability and integration among students.

The implementation of project management tools and entrepreneurship should be done through templates, dashboards and checklists. As long as adapted to each age group, these resources facilitate the understanding and make the application of techniques more friendly.

Such tools must be approached in a planned and progressive way using progressive projects that, little by little, will insert students into the entrepreneurial universe.

As for the social-emotional aspect, in addition to the method proposed above, it is important to approach the related issues in practice, as the needs arise during the project.

Of course, it is very important to plan the progressive insertion of the discussion of social-emotional issues. This can and should be addressed through cases, stories, readings and countless multimedia resources such as dynamics, debates, animations, novels and series developed for that purpose and that will allow the interaction between students.

However, a real entrepreneurial environment involving students and teachers with different profiles and opinions will raise important questions that need to be addressed and dealt with in a timely manner. Thus, responsible entrepreneurship can be an important ally to the development of the students' social-emotional intelligence.

By managing entrepreneurial projects wisely and responsibly, students learn about teamwork, respect and acceptance of other opinions and constructive criticism, other than dealing with challenging situations, expressing their points of view in a clear, concise and constructive manner, without offenses or discrimination, managing feelings and attitudes, and dealing with frustrations naturally, after all, not every project is successful, but this can't stop us. We must learn from both successes and

mistakes, including those committed by third parties - which we will learn from benchmarking. The world's greatest entrepreneurs have suffered major setbacks before achieving success. In fact, it is from our mistakes that we learn the most, if we are mature enough to do so.

Creating and managing entrepreneurial projects in the academic environment helps to overcome intolerance and realize that we need each other and that all of us have a lot to add and aspects to improve. It teaches us not to look only for faults, but rather for virtues and synergy opportunities.

It also allows us to see the importance of connections, sharing, partnerships, as we realize that in the school of life we must learn from each other, because people are not necessarily smarter than others, but they have different levels of each intelligence. We also find that people with opinions different from ours are often more "necessary" to us than those who think alike because they lead us to reflect on whether we are indeed on the right track or whether we have correctly mapped all associated risks and challenges. Finally, we realize how essential is the constant pursuit of value-adding and sustainable connections, as well as their maintenance.

Mentors, together with professionals in the field of psychology, pedagogy and others who are deemed necessary, should work together, in a planned and "on demand" manner, on social and emotional aspects such as acceptance, self-knowledge, crisis and conflict management, self-management, empathy, persistence, confidence building, the habit of celebrating positive achievements and cataloging and managing lessons, among others.

It is also necessary to establish a structure and clear processes that allow the continuous mentoring, follow-up and management of the students' social and emotional development process. Failure to comply with this requirement can put all work to waste. After all, if we do not measure, we cannot control and there is no way to ensure the implementation of an efficient and continuous evolutionary cycle.

Finally, it should be noted that all managers and teachers in education institutions also need to be taught project management techniques. Project management training is given to all employees in many large companies in Europe, such as EDF Energy, one of the largest energy companies in the UK (the most competitive

energy market in the world), which has its own project management framework: the EEPW (EDF Energy Project Way).

As we said, we must teach by example. If schools do not apply the techniques they teach to improve their own processes, reduce costs and optimize resources, why would students do it? And the implementation process is likely to be very promising. There are many more opportunities, including business opportunities, than you could possibly think at first.

Preaching "Do as I say, not as I do" fools no one anymore. If it has ever fooled, for that matter.

Finally, another crucial aspect is to work on the student's communication skills. This is key, as we have discussed, to be successful in our actions in the Era of Connections.

The process needs to be compatible with the modern environment. Therefore, it should involve written, verbal, non-verbal and audiovisual communication, among others. In a world with a growing number of writers and *youtubers*, it is advisable to work both the literary and non-literary language, in addition to

multimedia content production for the Internet. In addition, another suggestion is to address fundamentals of advertising and marketing, including digital marketing.

Finally, the subject should convey multidisciplinary concepts that allow students to prepare themselves to succeed in the 21st century.

Chapter 6

Maker Culture, STEAM Methodology and Gamification

6.1 Maker culture associated to the STEAM methodology

Why do we learn a certain concept in classroom if we will never use it in the real world?

This is something that you might have already wondered.

Content-focused and theoretical methodologies discourage learning, as the students have a hard time trying to make those concepts more tangible.

A new possible approach is the Project-Based Learning (PBL) model. It is a teaching method in which students acquire knowledge and skills, in practice and through cooperation, by seeking solutions for a question, problem or challenge and by building projects. This engaging method allows an effective educational process thanks to its investigative potential and the possibility of building knowledge by the kids putting their hands on.

Its association with Peer Instruction methods, combined with Just In Time Learning allows social interaction and learning outside the classroom, including

in an anticipated manner, always under the guidance of a teacher.

The maker culture applied to education aims at disseminating in schools, colleges and universities the complementation of theoretical learning with practice, by developing projects in which students can get their hands on. Such projects are implemented in makerspaces, which are areas designed with a nice infrastructure and architecture in such a way to arouse curiosity, experimentation, interaction, teamwork and to develop the students' creativity through experiments and maker projects, in a safe and efficient manner. They can be technological, entrepreneurial or academic.

It should be noted that the Maker culture is not against teaching theory. On the contrary! The goal is to facilitate the learning process and effective absorption through the application of the content that was previously taught.

STEAM is an acronym for Science, Technology, Engineering, Arts and Mathematics and concerns an integrated methodology that allows educating by creating multidisciplinary projects that bring together concepts from the fields of sciences, technology, engineering, arts

and mathematics. They are created in *STEAM* spaces, labs or in multifunctional makerspaces.

The implementation of the Maker culture, in accordance with the logic exposed above and in a targeted manner, along with the STEAM methodology, may become an important ally to maximize students' learning, through the practical application of theories, by creating projects and specific educational and technological experiments.

Despite the apparent limitation of subjects with which we can work, based on the meaning of the letters that make up the acronym *STEAM*, the association of this concept with activities under the Technological Intelligence subject allows to create projects and experiments that will be relevant to any discipline. After all, all content can be materialized, whether through the development of games, animations, applications, mechanical prototypes (2D and 3D), automation or other technologies.

It is important to make it clear that creating new technologies is not something that only benefits exact sciences subjects! This is a fallacious line of thought, although endorsed by some people, who lack the

knowledge, do not feel capable or do not want to invest time to create projects in their fields of work!

Without addressing the subject further, in order to design a game or animation, for example, it is necessary to write a script, right? This involves the fields of arts and linguistics, among others. It seems clear that developing animations and quiz games, for example, applies to all fields of knowledge?

I will take the opportunity to highlight that fun and entertainment are also present in the *maker* world and are part of the learning process, making it much more pleasant.

Learning by doing is part of modern education. Creating and implementing maker projects under the STEAM methodology helps students to absorb academic contents, because, other than combining theory and practice, it allows them to apply specific knowledge from multiple subjects in an integrated manner. The purpose of it is to target the technological and entrepreneurial potential of students. For this reason, this model is widely used in schools, colleges and universities in North America, Europe, among others.

However, we need to go further, integrating aspects of the modern world into the scope of projects.

Applied learning with projects involving simulations of current market technologies such as the Internet of Things (IoT), supervisory automation systems (SCADA), Smart technologies (cities, houses and companies, appliances, transportation, utilities, intelligent health care systems, among others) and cloud storage, among others, allows to gradually awaken skills and develop talents associated to multiple intelligences and different fields of knowledge.

Modern concepts and technological resources such as gamification, big data, Artificial Intelligence, nanotechnology, prototyping and 3D projection and shared economy, increasingly present in our reality, need to be present in classrooms as well.

These are all ways to align the students' knowledge with the trends and market needs and the technological environment of the 21st century. Understanding how things are done and work is essential to arouse curiosity, self-learning and to encourage students to understand the logic of things. Reverse engineering, if ethically applied, and curiosity are critical if we want an intelligent, efficient

and sustainable innovation, as it avoids unnecessary rework by using what has already been done well and spending time on what matters: perfecting and innovating.

These aspects, combined with applied entrepreneurship and the development of students' social-emotional intelligence, contribute to drive their technological and entrepreneurial potential and to train citizens with a critical, analytical and constructive mindset, as well as to prepare them for life and for the modern world.

It should be noted that there are many non-technological approaches for maker and steam projects. This book focuses on such aspect due to the integration and comprehensiveness of the technological approach in view of the multiple subjects and pressing needs of the Era of Connections.

In short, more than a trend, we are facing a reality that has come to revolutionize the education of this and the future generations and that has come to stay. There is a reason for this is a culture, rather than a temporary fashion, a fad. They encourage students to adapt to different realities, face challenges naturally, innovate, and

constantly seek solutions to present and future problems and needs.

6.2. Gamification

Will digital-born students, who are more and more inserted into dynamic, fun and attractive environments offered by the connected and globalized world, have their learning capacity maximized upon the use of boring and obsolete tools?

The game industry is a billion-dollar business worldwide. It represents much more than the gross internal revenue of many countries. A large portion of these resources is tied to games for mobile devices. The eSports world is huge. Millions of people participate and watch the games, whether online, on TV or in crowded stadiums.

Games are part of the daily lives of a significant amount, if not the most, of students attending education institutions. So why don't we gamify education?

Gamification is the use of games or game development techniques in different contexts. It is increasingly present in companies, with the purpose of making these platforms friendlier. For example, telephone and energy utility companies use systems that monitor remotely managed devices. These platforms have synoptic dashboards that, like in games, use lined colors and drawings to demonstrate stretches or individual consumer units under power outage or lack of telephone signal. This allows greater agility in diagnosing and solving problems.

In the field of education, gamification aims to engage students and make classes more productive for both students and teachers. To this end, depending on how the subject of Technological Intelligence was implemented in the education institution, students and teachers may develop interactive 2D, 3D and technological games that combine games and animations with automation systems.

In addition to being used to make concepts more tangible and integrate them through experiments and projects, including of multidisciplinary nature, they can be used to make classes more dynamic, innovative and effective.

And what about automating school activities, which are now made on notebooks and explained on blackboards (even if they are white!)? And there is more! How about recording the performance of students and correcting any flaws before they are submitted to any exam? Would it be possible?

Game-like exercises and animations are much more likely to arouse the interest than traditional testing methods, but we need to go beyond. We need to use Business Intelligence and big data techniques to process such data and transform it into useful information to the education institutions, allowing them to manage the learning process proactively and disseminate best practices.

In short, the academic environment is a fertile ground for gamification, which needs to be fully explored.

6.3. Integration of Models

The integration of the maker culture and the STEAM methodology to gamification may allow the

ongoing and gradual development of self-learning, empowerment, entrepreuneurship, resilience and the constant pursuit of innovation and continuous reinvention among students. Besides, it is a way of awakening their skills, developing and focusing their talents and potentials.

Developing projects also allows the gradual teaching of entrepreneurship and project management techniques, as well as how to address and manage social and emotional aspects.

All of this is useful not only for academic purposes, but also in everyday life and in the job market.

It is not only makerspaces and STEAM spaces that will be more friendly and interactive upon the adoption of gamification, but also the classrooms. Using or developing multidisciplinary educational games with the aim of facilitate learning, making the process more playful and dynamic, in such a way to allow students to experience in practice what they have learned in specific subjects, maximizes their opportunities to absorb knowledge.

6.4. Empowering Teachers

Education must be a means to the constant transformation of paradigms, contributing to educate critical citizens, aware of their role in society. The teacher has a crucial role in this process.

They are responsible for encouraging learning by experience, targeting and guiding the search for knowledge and contributing to the development process of the students' multiple intelligences, skills and competences, in accordance with the objectives described in the Law of Guidelines and Bases for National Education (LDB) and in the National Curricular Guidelines.

More than educators, we need mentors. Professionals who undergo a continuous training process, are instructed and work together with pedagogues, psychologists, technology developers, among other professionals, to teach through practice and example. They should advise, inspire, reveal talents and skills and target the potential of their students.

And it is not enough to train professionals to teach the courses of technological, entrepreneurial and socio-

emotional intelligence. All teachers must be trained under a technological, entrepreneurial and behavioral approach.

Teachers must be able to create or actively contribute to the development process of their own educational games, which will allow them to teach their content in a dynamic, user-friendly and personalized way.

Finally, teachers are the main agents of transformation in the continuous reinvention cycle of education institutions, advocated in Neural Education, preparing them for the challenges and opportunities of the 21st century.

Therefore, teachers must be continuously trained, encouraged, valued and empowered, within the limits of their roles and the legal aspects in force.

Chapter 7

Teaching Environment and Knowledge Building in Modern Times

7.1. Beyond Hardware

One needs to adapt the learning environment of schools, colleges and universities to make them more friendly and interactive and facilitate the construction of knowledge.

Smart classrooms, 3D printers, tablets, maker and STEAM spaces, as well as spaces for experimentation, high tech labs, whiteboards, 3D projection, modular classrooms with an immersive architecture. There are many new features to make learning more engaging.

I would not like to linger on such features, as they have been thoroughly addressed in many other books, but let us take a look around you: structural and cultural aspects, for example.

What good is it to set modern environments and super-equipped classrooms if the resources are not fully exploited?

What is the point of using a whiteboard, for example, as a sort of blackboard integrated with a projector? Without using its touch screen features, peripherals and multimedia devices. And it is not enough to provide training, teachers must engage and get used to fully using educational technologies.

The whole dynamics change, as well as the behaviors.

More than adopting hybrid teaching techniques, combining online and offline resources, and the Flipped Classroom approach, in which students are introduced to content before going to classroom, we need to change the teachers' mindsets and establish a culture based on practices and attitudes that enhance the use of such resources.

If the idea is to put an end to the passivity of students, who simply listen to the teacher's explanations, and empower them by encouraging participation and expanding the possibilities of searching for and building knowledge, the teacher must have highly-developed active listening skills, as well as other emotional abilities, in addition to being effectively eager and prepared to the increased level of doubts that will arise. Logic evolves the role of teachers, who, more than exhibiting content, are now mentors and mediators in the educational process.

How about, instead of exposing content created by third parties on online classes, empowering teachers and encouraging them to expose their own content? This can be done through interactive blogs and preparation of video-classes.

Setting up a nice video-class is not as complicated as it seems. Public speaking skills, a decent shooting

system and a nice space, for example, can be a good start. On one side, a white board, on the other, a TV showing slides. A good editing, performed by a responsible assistant and there you have it.

Things can improve little by little, installing multiple cameras and Chroma key resources, for example. This would happen automatically and would even be requested by teachers, if they felt engaged and at ease, believe me.

Will some of them resist? Sure. Will it be hard? Maybe. But start slowly, with those teachers who show to be willing. In this Youtube Era of ours, there might be more volunteers than you might think.

And here's another idea: why not encouraging teachers to bring their own hobbies and gifts to the classroom? Learning through music, games, animations and other playful resources makes classes much more dynamic and engaging.

That is how we slowly engage teachers, making them feel more comfortable and empowered.

7.2. Conviviality Environment

And what about students?

Why does the education institution set all the appliances and implement the aforementioned processes?

Is there any point in making the environment more interactive if the learning process keeps tied to the school's old methods of exposing content and fostering conviviality? And what if the students have a negative impression of their schools, colleges and universities?

Education institutions must be a conviviality environment that prepares students for life. Many of them even encourage students to remain there outside normal classroom hours, enjoying their spaces freely and responsibly in activities that go beyond formal learning, entering the terrain of social-emotional education.

Even if we do not choose not to go that far, it is possible to create interesting moments and environments for students, for example, by setting nice environments, with modern architecture in which, besides playing sports, they can plug their musical instruments, expose their ideas and artistic skills.

What would you say about creating a multidisciplinary team of monitors, including with a

technological and entrepreneurial background, that allow students to translate their gifts by providing advice to others? Or sports, theater, music, makers and entrepreneurial groups in which the students may practice their skills and talents, expand their knowledge and represent the institution in external contests? Or maybe a corporate TV, with terminals installed throughout the campus, broadcasting content created by the students themselves, for example?

Holding lectures and national and international benchmarking visits also make learning more enjoyable and practical, other than awakening skills, reflections and risks. When watching a surgical procedure involving humans or animals, someone may discover to be hematophobic to the point of being discouraged from following a career in medicine or veterinary medicine, for example.

And, of course, we need a trained, dedicated and engaged team to back it all up.

But this is a lot of work! Yes, it also leads to additional costs and implies the need to map, actively listen and raise awareness of all stakeholders.

But projects are analyzed according to their costs and difficulties or to their profitability and benefits?

Cheap or expensive projects can be feasible or not. It depends on the income generated, projected payback, among others.

You will need a business plan, applicable to your reality, to find the best solution.

As I said before, academic projects must be run in a professional manner. Otherwise...

Chapter 8

International Benchmarking

8.1. Academic Benchmarking

As argued, targeting and developing the students' technological, entrepreneurial and socio-emotional intelligences in the academic environment (schools, colleges and universities), gradually, is crucial to allow them to become key players in the modern world and build actively their future and a better world for all of us.

How have education institutions coped with such a reality?

Some of them have simply started teaching other languages and banned technology and entrepreneurship from their scopes, believing that they are doing their part to face the challenges of the new reality.

Some schools, colleges and universities, on the other hand, have introduced technology into their environments so desperately to meet the demands of increasing picky and attentive customers, that they have not taken the due time to properly plan and manage the changes. As a result, white boards are in disuse or have served as simple replacements for the good old blackboard. They were delivered to untrained,

unmotivated professionals who have not been made aware of the pressing need to update themselves and become mentors, rather than just teachers, to their students.

But fortunately there are many education institutions working to adapt their environments and methods to the reality of the 21st century!

Some Brazilian education institutions (private, federal, state and municipal) and education systems in countries such as Australia, Japan and the United States have already awakened to this new reality and inserted into their school programs, either on their own or in partnership with experts, subjects aimed at developing the technological, entrepreneurial and socio-emotional intelligences of their students.

Competent authorities are also waking up to this new reality. Proof of this is the fact that the National Senate's Committee on Education, Culture and Sport has recently approved a bill that changes the Law of Guidelines and Bases for National Education to provide for the presence of entrepreneurship in the curriculum of elementary, middle and high schools, as well as in higher education.

There is no way to deny it! Including such subjects in the curricula is not just a trend, but rather an unavoidable reality. The sooner schools implement them in their curricula, the sooner they will enjoy the benefits of such a measure.

All education institutions must wake up to the new reality imposed by the modern world, translated as the new demands of students and their parents, of their daily lives and the labor market. The way to do it is by inserting technological, entrepreneurial and socio-emotional education in their programs.

8.2. The Parallel Universe

The entrepreneurial and maker universe is a "real deal" and many market players have understood it and have restructured their business to act around it, possibly as enablers.

TV programs on entrepreneurship are all around. Until not so long ago, it engaged the now president of the

United States. The Apprentice and Shark Tank are examples of it.

In the second season, the TV show "The Robotics Class Gang", produced by Canal Futura in partnership with the Social Service of Industry (SESI), shows how robotics is taught in education institutions. Episodes can be watched on TV or online.

America's Greatest Makers was the first *reality show of makers* ever produced in the world. It went on air in 2016, in the TBS channel. Many teams of makers competed for a $1 million prize. Guest judges included, among others, Intel's CEO, Brian Krzanich. The program was produced by Mark Burnett, major producer of series such as Survivor, Shark Tank and The Voice.

Discovery Channel Brasil will also broadcast a reality show involving maker projects and it will have many experts of the makers' world participating as judges. The program was expected to be shot on the second half of 2018.

As we saw, companies such as Nintendo are also focusing on the maker world.

Robot fights are another attraction on international TVs.

According to an article published by UOL in 2018[6], a Brazilian team defeated a world champion in a robot fight in China and would bring the championship back home. The competition, called Clash Bots, is a reality show that airs on the iQiyi video platform, a sort of Chinese Netflix that belongs to Baidu and has over 500 million active users. The Brazilian team won a R$ 400,000.00 prize. The Clash Bots season had 13 episodes, with a significant audience in China. Until the episode before the season finale, the program had recorded 1.4 billion views. The premiere alone had 400 million viewers. Ogrobots was the only Brazilian team. Its seven members met in the Engineering course at the Federal University of Itajubá and formed the team when they all moved to different cities.

[6] Source: https://noticias.uol.com.br/tecnologia/noticias/redacao/2018/06/21/brasileiros-sao-campeoes-de-reality-show-de-luta-de-robos-na-china.htm

According to a post on the website of the PUC RJ Scientific Technical Center[7], "Minotauro, the main robot of the RioBotz robotics team, from the PUC RJ Scientific Technical Center (CTC / PUC-Rio), was the second placed in the season finale of the BattleBots program, which last episode of the third season aired on US TVs on October 5th. This is the second time that the team from Rio participates in the competition. The first time they were acknowledged as the 'most destructive robot' in the 2016 season. To reach second place, in a dispute with about 60 teams, RioBotz competed in eight fights, winning six of them".

And we could not forget major maker events, such as the European Maker Week and famous programming marathon, also known as Hackathons.

Globo launched in 2018 the fourth edition of its Hackathon,[8] a 33-hour programming marathon, involving 13 teams with 4 people each, whose goal is to develop an

[7] **http://www.ctc.puc-rio.br/minotauro-da-riobotzpuc-rio-e-vice-campeao-da-battlebots-programa-de-tv-dos-eua/**

[8] **Source: https://g1.globo.com/economia/tecnologia/hackathon/2018/noticia/hackathon-2018-conheca-os-projetos-dos-grupos-da-maratona-de-tecnologia.ghtml**

innovative project with the subject "The future of content production and distribution in journalism, sport and entertainment."

And there are many other *hackathons* around the world. They can be seen on websites such as:

- ✓ https://www.hackathon.com/
- ✓ https://hackevents.co/
- ✓ https://www.hackalist.org/
- ✓ https://starthack.ch/
- ✓ https://hackathonbrasil.com.br/home/

MIT also contributes to this process by providing free online programming tools and encouraging the international dissemination of the *Scratch Day*. According to the website, "Scratch Day is a global network of events where people gather to celebrate Scratch, the free coding platform and online community for kids. The Scratch Day events gather young people from the Scratch communities so they can share projects, learn from each other and welcome newcomers".

Well, this is a small sample of initiatives that have been implemented both in the maker and entrepreneurial universes.

By the way, the Neural Education initiative goes beyond the book! Let's exchange ideas! Scan the QR Code below and check out the weekly videos of Neural Education on Instagram: @fabiotoledonaweb_oficial

https://www.instagram.com/fabiotoledonaweb_oficial/

Chapter 9

Disruptive Innovations

9.1. Introduction

Disruptive innovation is one that may transform the *status quo*, the current status of the market. The theory was created by the Harvard Professor Clayton M. Chistensen, in 1997.

In this book, I would like to announce and talk about a potentially disruptive technology, created by the i9group, company that I idealized and found.

9.2. The World's First Gamified Smart Education Social Media?

The emergence and massification of educational systems have broken educational paradigms. Teaching institutions, which previously had their own teaching materials or used textbook, started to adopt integrated and multidisciplinary teaching systems, developed by specialized companies. Notwithstanding the advantages of such a partnership, some schools, colleges and

universities gradually abandoned, in an imperceptible and even unintentional way, their unique way of educating. That is part of the core business, the soul of those companies, therefore, it must be safeguarded!

And we must not forget that each student also has its own way of learning, just as each teacher has its own way of teaching, what makes them unique, maximizes their performance, prioritizes their talents, skills and hallmarks.

Another aspect to be observed is that the outset of globalization, digital revolution, Internet of Things (IoT), shared and creative economy, has caused many disruptions of paradigms in society and are part of the daily lives of students and teachers.

One needs to adapt the educational environment and didactic resources to the reality of both educators and their pupils! This includes offering increasingly interactive, collaborative, innovative, customized, technological, gamified, smarter, dynamic, friendly, flexible and efficient learning environments and systems.

You need to stand out in such a competitive market! It has become imperative to maximize the

performance of all stakeholders of the learning process, as well as to offer the best that teaching institutions have to their clients, what enhances their hallmarks, their unique way of doing things and what meets the needs of students, of daily life and the professional and academic market of the 21st century.

To help overcome this challenge, i9group has developed the i9learn: probably the world's first Gamified Smart Education Social Media!

An exclusive, innovative, restricted and controlled access social media, i9learn integrates the concepts of gamification, business intelligence, social interaction, collaborative creation and shared learning. Teaching and learning is now much easier and efficient!

i9learn allows teachers to teach on their own way! It is not intended to replace the teaching systems adopted by schools, colleges and universities, but rather to complement existing interactive didactic resources, enhancing the best that each teaching institution and pedagogical staff has to offer to its students!

I9learn offers students the opportunity to perform their activities in a dynamic, practical and playful manner,

through quizzes - there are even some RPG-like quizzes! And they can be supplemented by images and text answers.

They come in the academic or daily life format (about TV series, sports and games, for example) and are created by teachers and the students themselves! Daily life questions are intertwined with academic questions, making the process more pleasant.

Activities may be carried out from anywhere, using a smartphone, tablet or PC, or even in classroom, in the form of a teacher-mediated game!

Students have access to course materials on the teachers' profile, which takes the shape of a blog, with images, video classes and files for download. Likewise, knowledge can be shared among classmates thanks to each student's unique virtual notebook, where they create private or public posts.

Interaction with other students is also encouraged through quizzes involving students' curiosities and hobbies. Healthy competition is encouraged, in the form of rankings, simulations, duels, challenges and championships.

The answers are thoroughly and comparatively analyzed in real time by Big Data, Business Intelligence and Artificial Intelligence systems, associating it to specific contents, courses and quizzes.

This data is transformed into statistical reports and graphs that describe the students' individual and collective performance, enabling students, policymakers, and educators to take preventive actions before the real exams take place!

Additionally, using smart informative and automated notifications, it is possible to detect improvements and worsenings in groups or individual performances, as well as common mistakes, contents, low-assertiveness answers and quizzes, low levels of adherence to specific quizzes, among others.

Information is displayed as a social media feed, thanks to an interactive space that contains microblogs and dashboards. Other than allowing a detailed visualization of both students and group performances and academic follow-ups, the platform allows the sharing of ideas and knowledge, as well as the social interaction between educators and learners and learners with each other.

The system allows offering flipped classes, as well as publishing activities, textual explanations supported by image and video, didactic materials, among other specific academic contents to be consulted by the students.

i9learn offers the opportunity to education institutions create their own multidisciplinary knowledge database! As an evolutionary and exclusive tool, it can be even promoted and sold to other educational institutions, whether directly or through the i9group.

The platform environment is widely customizable. Education institutions can, for example, insert banners, stickers and logos. Besides, they can display announcements to students at the end of the quizzes, including, but not limited to, tips, warnings and schedules.

I9learn is accessed through an informative portal, an electronic magazine dedicated to education. Connected to social media, it will be gradually enhanced with interviews, cases, columns, coverage of events, inter and in-school tournaments and more!

Finally, i9learn empowers teachers, learners, and their parents by enabling a cooperative environment of

social interaction and dissemination of knowledge, as well as the possibility of targeting efforts to diagnose and correct any eventual learning shortfalls. Among other benefits, the platform:

- ✓ Empowers, engages and motivates students, teachers and their parents;
- ✓ Allows teaching on each one's own way and adapting students, customizing the learning process;
- ✓ Enables a more efficient management process, both of the teaching staff by the school coordination and of the students by their parents;
- ✓ Allows proactive actions aimed at correcting specific learning shortfalls, segmenting them by content and subtopic;
- ✓ Promotes the dissemination of best educational practices by comparing the performance of different teachers in similar situations;

- ✓ Offers the opportunity for education institutions to create their own multidisciplinary knowledge database, which can be commercialized or shared with other education institutions.

The next releases will bring even more innovations"

- ✓ Quizzes targeted to Elementary School students;
- ✓ RPG-like challenges and quizzes;
- ✓ Surveys and polls;
- ✓ 360 degrees evaluations;
- ✓ Distance learning platforms with online mentoring rooms;
- ✓ The i9Project Way platform, containing project management tools dedicated to education institutions;

- ✓ Smart work flow system to follow up any occurrences in the learning environment;
- ✓ Virtual booklet;
- ✓ Private message exchange system for students, parents, teachers and managers;
- ✓ Personalized electronic magazine;
- ✓ Newsletters;
- ✓ Academic calendar;
- ✓ School supplies list;
- ✓ E-commerce;
- ✓ And much more!

Well, I believe we have here a high-potential disruptive innovation. For this reason, renowned national education institutions such as Rede Anglo-Americano and

Colégio Teresiano (PUC-Rio) are already participating in the pilot project.

We will soon know if the we got that right!

Chapter 10

Testimonials on the Implementation of Technological and Entrepreneurial Education as a Subject

10.1. Implementation of Technological Education as a Subject in Colégio Teresiano CAP/PUC

By Patrícia Siffert

Instructional Technology Assistant for Colégio Teresiano CAP/PUC-RJ. An educator who has worked for over 10 years in the field of instructional technology. Participated in INTEDEQ, a State Research Project with young kids and adults, designed to train and insert youth in the labor market. Experience as a teacher and technology coordinator in the most prestigious private schools in Rio de Janeiro. Works with digital literacy, open and creative technologies, focusing on digital empowerment.

In 2018, we implemented the Technological Education subject in Colégio Teresiano, in a very bold and meaningful way. We dedicated classroom time to teach programming language to teach kids and teachers of each grade how to code. Technological Education covers programming language, game design, 3D prototyping,

robotics and Automation. In the first year we used Scratch, a programming tool developed by MIT, to learn about the concepts of programming and to teach the basics to students. We also developed projects based on the UN challenges, in which Elementary School students created awareness games about the issue. Middle school students participated in the 1st Hackathon held by the School, in partnership with i9group, in which they were challenged to create an animation to raise awareness about the use of water.

In the second half of 2018, we started learning with Arduino through Robolino, i9cities and currently with the open Arduino and protoboards to develop Social Entrepreneurship projects, which aim to create technologies to organize and seek solutions for social projects developed at school

Colégio Teresiano has employed technologies in regular and interdisciplinary projects for over 15 years. Technology is used as language and converses with the school program at all times in the organization, allowing the systematization and creation of new solutions. In our socio-educational proposal and in the pedagogical political project, technology must provide flexible, easy

and fast transferable results to a large number of individuals.

Virtual educational processes may give rise to new spaces for the exchange of ideas, knowledge and proposals, as well as to raise a sense of compassion and collective construction of a life-oriented culture.

Our commitment is to embrace technologies in all of our educational processes, promoting its democratization, the development of a critical awareness regarding its possibilities and limitations in favor of society as a whole.

We know that the consumption of technology has greatly influenced human behavior and its relations. The need to create technologies critically and creatively is emerging so that our kids know how to handle both the present and the future.

We were often sought after by many technology companies that used different programming languages, but few of them were willing to discuss openly their proposals and to promote changes. The training offered to our teachers and mentors teaches not only the basics of programming languages, but also educate the entire

school community within a digital culture that will help in every project we develop.

This year, we will start the Maker training using Scratch for Arduino, to create electronic models and other prototypes, which, among all proposals, is the one that most meets our purpose. The challenge is nonstop and that is what drives us. Mentors are the ones who are feeling closer to the pedagogical stages of the technological language, since they are experts in different fields of knowledge such as geography, mathematics, physics and sciences, and face the challenge of thinking this new language as a means to create technologies by inserting it into their programs.

As we are talking about technological literacy, we believe that learning must be an ongoing building, experiencing and testing process. Problem solving is one of the most important parts of the process. That is why the methodology employed by the school uses station rotation, which is commonly used in blended learning, so students can try out different work teams and different languages. We know that the labor market requires resilient and adaptable professionals who can face problems and overcome collective challenges. Technology

education has helped us experience and live these new times in full.

10.2. Implementation of Technological and Entrepreneurial Intelligence as a Subject in the Anglo-Americano Network

Luiz Augusto de Souza Conceição

Teacher of Mathematics, Physics and Technological Intelligence at *Colégio Anglo-Americano,* Resente/ RJ. With a degree in mathematics from the Federal University of Rio de Janeiro, Luiz has experience in Mathematics, with concentration in Geometry and in the use of Information and Communication Technologies applied to Mathematics and has worked as an IT assistant at the Foundation for the Administrative Development of the State of São Paulo (FUNDAP).

It is common sense that in a modern society where technological transformations are fast-paced, the field of computer technologies becomes vital. In that context, the school should be a space for debate and critical analysis of how this tool is used in society's daily life.

Nowadays, one cannot deny the transformation potential that technology can bring into the classroom, especially in Mathematics. Such conditions may represent the condition for change of the paradigms related to mathematics at school: in other words: we can stop teaching mathematics the old way.

Digital technologies can be seen as the catalyst for a paradigm shift. The Internet provides access to books, researches, cultures, etc. Such conditions have made it possible to change how we memorize things.

We believe it is important to use technology in Math classes and to realize its role in our society and how these technological assets are already part of our habits.

Therefore, ICTs have been affecting a variety of fields in our society, giving new meaning to a new context of education, both in the technological and social scopes. The potential of technological assets and their ability to change society are fairly

well-known and. Consequently, they also change the teaching and learning process, which leads us to conclude that, currently, using a computer should be considered as a student right. Today's students should then be prepared to deal with digital resources and technologies.

Our partnership with the i9group meets this need. Learning how to code is to study mathematical logic in a very exciting, up-to-date and fun way. In mathematics, which is the art of solving problems, learning how to code stimulates reasoning that will help solve problems of different degrees of difficulty. Skills such as creativity, curiosity, logical reasoning, reflection, interpretation, concentration and interaction are encouraged while coding; and we can say these are key skills not only to study mathematics, but rather a very large range of subjects. At times when children are digital natives and "breathe" technology, technology literacy classes contribute a lot to a modern and thorough education.

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Today's world is dynamic, connected and shared. That is why the pursuit of knowledge should go beyond the classroom and college admission. Combining theory with practice is a key principle to be applied nowadays. The way of education must keep up with the changes of the world and should not be limited to a simple content transfer. We must apply the Maker Culture and the STEAM methodology, developing the student's potentialities in a friendly and real life-like environment.

Thinking about it, among other initiatives, Fabio Toledo wrote this book, broadcasts radio columns and manages social media channels voluntarily, and has founded the i9group in 2014. It is an innovative startup company that offers the implementation of Technological and Entrepreneurial Intelligence as a subject in schools, besides other solutions and smart platforms aimed at the education industry, Fabio Toledo believes that education is crucial to forge a path of success.

In addition to his activities in the field of education, Toledo broadcasts the volunteer radio columns "Neural Education" and "Success Requires Attitude", broadcast on Instagram and dozens of radio stations in Brazil. He is a lecturer, EduTuber, author of international books, professor, international executive with an over 20-year experience and experts in innovation, smart technologies and the Internet of Things (IoT).
And there is more!

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