

## Letter from the 2019 IEEE TCLT Early Career Award Winner

Ig Ibert Bittencourt, *Member, IEEE*

In 2019, I was the first Latin-American researcher to be honored with the important award from IEEE “Early Career Researcher Award in Learning Technologies”. Such award is presented annually to a leading early career researcher as an acknowledgement of the impact and significance of their research work in the area of Learning Technologies. Currently, I am an Associate Professor at Federal University of Alagoas (Brazil) and Co-Director of the Center of Excellence for Social Technologies and my career pathways can be organized in three categories: i) scientific research on Artificial Intelligence in Education; ii) Public Policy in Basic Education; iii) Social Entrepreneurship in Education.

My interest on Education started when I was in high school and taught math and physics to some friends. Then, when I was in Higher School, I decided to create a startup with two other friends focused on simulating a jury trial and law students could act with the role of a lawyer, prosecutor or judge. Since my friends and I were not able to develop such solution, I decided to do a master and PhD in Artificial Intelligence in Education. Thus, my research career has been dedicated to Artificial Intelligence in Education (AIED), working on the design, development and experimentation of educational technologies. In particular, I am investigating Gamified Intelligent Tutoring Systems by observing the construction (with ontologies and co-designing with teachers), use (in Basic Education) and its impact (on flow, engagement, and learning). I am doing interdisciplinary research by using computational solutions and psychological theories to know how to provide a better learning experience, on which I have as a grand research challenge How the design and use of Intelligent Educational Systems can promote an Optimal Learning Experience? The problem of optimal learning experience is its foundations on Flow Theory which has been researched in the field of Positive Psychology. I am tackling such problem in two different ways: i) investigating learning scenarios on which students can achieve the optimal learning experience: some of the results we achieved in our research was regarding supporting teachers to design and maintain gamified learning tasks. We proposed an authoring tool (called T-Partner) to support instructors making informed pedagogical decisions to manage their online course. T-Partner promotes the cooperation between artificial and human intelligences, and we designed two versions (lightweight and heavyweight) of the T-Partner. We evaluated both versions and they equally benefit teachers to make to pedagogical decision-making. Two other studies were about competitive scenarios, in the first one we proposed a peer assessment model where gamification elements are used to engage students. We verified that the average grade given by students to an essay are equivalent to those given by experts, but the time and costs to complete the assessments were largely reduced. Additionally, the

use of gamification helped to increase the use of the system. The second one was about the design of a gamified task to observe flow state in collaborative, competitive and collaborative competition tasks. The results suggested that both competition and collaboration applied alone has no effect on flow experience. On the other hand, the collaborative competition scenario had significant effect on flow; ii) understanding how stereotype threat has impacted learning performance in gamified tasks: some of the investigation we did was whether gender stereotype threat in online gamified educational scenarios influences different psychological mediators. In one of the studies we conducted a three-stage survey where participants were asked indirectly about their anxiety, then they were redirected to a hypothetical online gamified system to solve a logic quiz. Afterward, their anxiety was assessed one more time in order to find out how much it had changed. We found evidence indicating the male-stereotyped environment affected participants’ anxiety. We also reproduced the aforementioned study by observing aggressivity and flow. The results indicated that male-stereotyped environment increase the level of aggressivity and no significant effect about flow on women in stereotyped.

Beyond my career as a researcher, I have had interesting results to bridge the gap between science and innovation. I co-founded four startups and cooperated with other to transfer technologies. Some of the companies are: i) MeuTutor (currently eyeduc) which was the first gamified educational platform launched in Brazil and more than 300 thousand students used our solutions. In 2015, MeuTutor was considered the most innovative educational company of Brazil (Rio-Info); ii) eNeuron Cognitive Computing was founded in 2018 and it develops Machine Learning solutions to education. The main solution is called Plataforma Analise (launched in 2019) that automatically correct essays. Until the moment, the platform analyzed around 250 thousand essays and it is expected to analyze around 1 million until 2022. In the past 8 years of social entrepreneurship, it was generated around 50 direct and 200 indirect employments. In addition, such companies invested on research and innovation around US\$ 1 million.

Over the past 6 years, I am involved with public policies in education. My first experience was in 2015 and I was a member of a commission to map creative and innovative schools in Brazil. In 2017, I was the PI of a policy from Ministry of Education to redesign the evaluation and acquisition of educational technologies in Brazil. We designed an evidence-based policy and a distributed and decentralized process to evaluate technologies in three dimensions: technological, pedagogical and accessibility. Based on our involvement, in 2019 we supported Lemman Foundation and CIEB to design the evaluation process of the BNDES Connected Education Program. Currently, my team and I are supporting the State of São Paulo (SEDUC) to design a process to evaluate and acquire educational technologies. Another public policy we are supporting the Ministry of Education and National Fund for Educational Development (FNDE) since 2018 is the National Program of Textbook (PLND). In PNLD policy, we developed the technology responsible for the selection of the books (2018 – 2023) and we are designing the policy for the acquisition of digital textbooks and Digital Educational Resources.

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Finally, I believe we need a paradigm shift in a way we can build a bridge between social relevant practices with scientific approaches to better understand how to improve and positively transform the world. I am strongly committed to collaboratively involve, engage, and work with different stakeholders of the ecosystem of Education to shape the 21st Century and I believe this award is showing that my team and I are on the right direction.

For those young researchers interested on dedicating their lives to science, I have three tips for you: First, do what you love and what you believe, otherwise the challenges on the road and demotivate you. Secondly, focus on giving your best on the journey because this is all you can somehow control. Thirdly, have fun.



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