



The Lemann Center at Stanford: A Decade of Accomplishments and A Vision for the Next Ten Years

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Table of Contents

Message from the Lemann Center Faculty
Introduction
Building Human Capital
Preparing Future Innovation, Academic, and Policy Leaders8
People12
"Topics in Brazilian Education" Course23
Innovation25
New Technologies in Science Education25
Dados para um Debate Democrático em Educação (D3e)27
Innovation in Teacher Education33
The Recruitment Project44
Research
Educational Policy45
Learning Sciences
Outreach
Lemann Center Networks54
State and Municipal Partnerships54
Partnerships with Federal Agencies55
University Partnerships
Third-Sector Partnerships
Other Outreach Activities
Impact of the Lemann Center on the Stanford Graduate School of Education and the University at Large64
Lessons Learned from the First Ten Years
Lessons about Human Resources65
Lessons about How a U.S. University Can Help Develop Innovative Programs in Brazil
Lessons about Successfully Engaging Brazilian Academics67
Envisaging the Next Ten Years (2022-2031)
APPENDIX A: List of Research Publications73
EDUCATIONAL POLICY
LEARNING SCIENCES77
Appendix B: "Topics on Brazilian Education" Course82
Appendix C: The Lemann Center as an Exemplar of Stanford's Interaction with the World



Message from the Lemann Center Faculty

As Co-Directors of the Lemann Center for Entrepreneurship and Innovation in Brazilian Education we are pleased and proud to present this report, which reviews the Center's first ten years of operations. The Lemann Center was established in 2012 with the mission of supporting improvement in Brazil's education system. In the decade since we have accomplished more than we originally imagined. We have graduated dozens of MA and PhD degrees, and we have welcomed more than 100 short -and longer- term visitors from Brazil to the Center. We have produced a large and growing body of research on many of the daunting challenges facing Brazil's education system. We have launched partnerships and projects that allow us to engage directly in the struggle to improve performance in Brazilian schools and classrooms. We are proud of what we have accomplished in the past ten years, and we look forward to building on the work that we have done to further strengthen our impact in the years to come.

As we look back over the past decade, we wish to express our deep gratitude to Jorge Paulo and Susanna Lemann and to the Lemann Foundation for providing the resources that underlie the Center's success. We also wish to thank the leadership of Stanford and specifically the Graduate School of Education and our colleagues. They have provided additional financial assistance and academic guidance to our Brazilian students. Moreover, they have over and over affirmed the value and importance of the Lemann Center and its mission. We are grateful to our many partners in Brazil, (too many to name) whose readiness to join us in our projects has contributed greatly to the relevance and impact of our research and outreach. We also wish to thank our students, alumni, and visitors for their commitment to the Center's mission, and for their participation in our projects, courses, and seminars. Their presence with us and their ongoing engagement with the Center creates and sustains the vibrant intellectual community that constitutes the essential foundation of the Center.

Finally, we would like to thank the Lemann Center's Administrator, Cristina Antunes, whose tireless efforts to support the members of our community and keep the Center running smoothly and make all of our other work possible.

Eric Bettinger Martin Carnoy David Plank

Introduction

This report summarizes the accomplishments of the first ten years of Stanford University's Lemann Center for Entrepreneurship and Innovation in Brazilian Education and takes a forward look at plans for the Center's next ten years. Both the past decade and the next decade represent a unique relationship between a major U.S. university's graduate school of education, an important Brazilian foundation, and local efforts to improve the public educational system of the largest country in Latin America through developing expertise, research, and innovation.

From its inception, the purpose of the Lemann Center has been to attract the brightest minds from all fields to support educational improvement in Brazil; to build networks of researchers and other partners whose training, sense of community, and shared vision of the future will make them trailblazers of change in Brazilian education; and to work closely with public officials at the federal, state, and municipal levels, with academic colleagues, with the Lemann Foundation, and with innovators in Brazil to develop and test new approaches to meeting educational challenges that can not only serve Brazilian education but act as examples for the rest of the world. The Center's underlying philosophy is that policymakers and practitioners should ground new policies and practices on the foundation of hard evidence and rigorous analysis, and that improvement strategies cannot target only schools, but must address the entire ecosystem of institutions that promote the well-being of young people. Practices that have proven successful in other countries must be adapted to reflect cultural, social, and economic conditions in Brazil, and their adoption and implementation must be evaluated locally.

To achieve these goals, the Lemann Center has focused on training, building networks, performing cutting-edge research, and launching long-term innovative projects aimed at transforming Brazilian education. In this report, we first summarize our activities in these four areas since 2011, then turn to the future to discuss what we hope to accomplish in the next ten years.

The Center officially began operations in the academic year 2012-13, although the Lemann Foundation had given Stanford Graduate School of Education a total of four fellowships for Brazilian students in academic years 2010-2011 and 2011-2012. Our first MA student, Izabel Costa de Fonseca, was admitted in 2010, and two more MA students, Luana Marotta, and Raquel Guimarães, were admitted in 2011. Our first PhD student, Tássia Sousa Cruz, was also admitted in 2011. At its founding, the Center had four directors: Eric Bettinger, Paulo Blikstein, Martin Carnoy, and David Plank, all with many years of experience in Brazil, and all involved with research in Brazil covering the areas of science education, the economics of education, and the politics of education. Further, an earlier generation of educational leaders in Brazil had been trained in the International and Comparative Education program in Stanford's Graduate School of Education in the 1970s and 1980s. The first Brazilians were admitted in 1970 and 1971 and by the mid-1980s, the GSE had produced about 10 PhDs and several MA graduates who were Brazilians or other Latin Americans who ended up teaching in Brazilian universities. Therefore,



the GSE already had a well-established network in Brazil. This commitment of the directors to the training of a new generation of young Brazilians and to developing the evidence base for educational innovation and educational policymaking has been the major reason for the success of the Center's activities in 2012-2022.

A second major reason for the success of the Lemann Center has been a committed administrative staff, headed by Cristina Antunes, and an important group of researchers/teachers: Rachel Lotan, the retired director of the Stanford Teacher Education Program (STEP); our Senior Fellow, Tatiana Hochgreb, an expert in science education, who worked for many years with Paulo Blikstein but has, in recent years, played a very important role in the *Programa de Especializacão Docente* (PED) teacher education project and supporting our Learning Design and Technology MA students; Paulo Louzano, who stayed with us for a year as a visiting scholar and played a major role in designing the PED program; our post-doctoral students, who have not only been productive researchers, but have also worked with our MA and PhD students; our visiting professor, Kathryn Moeller, who was deeply involved with our students and visiting scholars; and a number of the postdoctoral fellows and visiting scholars, who have continued to help the Center in Brazil on a number of projects.

As we will report in the pages that follow, the achievements of the Lemann Center during this period have been many: we have trained an outstanding group of more than 60 students at the MA, PhD, and MA/MBA levels and developed a large network of devoted academics and policy makers through these academic programs and our visiting fellows program. In addition, more than fifty participants from Brazil attended the iSTEP teacher education seminar at Stanford over an eight-year period. We have developed an ambitious recruitment strategy for MA students and visiting scholar/student scholars aimed at increasing diversity in our pool of candidates, which has tripled applications to these programs. Our weekly, year-around seminar on Brazilian education now attracts 20-30 participants each week, in person and remotely. Our faculty and students continue to produce strong, timely, and cutting-edge research on Brazilian educational issues, much of which is published in excellent academic journals. Our major innovation projects, such as Dados para um Debate Democrático em Educação (D3e) and PED and our work on science education in Sobral (since 2018 led by Prof. Blikstein at Columbia University) and through PED (led by Tatiana Hochgreb) have continued to make major advances despite the difficulties caused by the Covid-19 pandemic. In collaboration with the Lemann Foundation, we have reached out to policy makers and educational innovators in Brazil through annual meetings held in São Paulo over an eight-year period and our participation in the Lemann Dialogue with the Foundation's other U.S. partner universities. And we continue to develop extensive partnerships in Brazil with state and local governments, NGOS, and academics through our innovation projects and research. The Lemann Center and its affiliated spinoff institutions, such as D3e and PED are viewed as trusted collaborators to be depended on to make quality contributions to whatever project we undertake with them.

We have acknowledged in every one of our annual reports and acknowledge here in our ten-year summary that the Lemann Center's partnership with the Lemann Foundation is fundamental to the continuing evolution of the Center as a potential engine for transformation in Brazilian

education. Although the Center's main objective is to develop Brazil's future educational leaders and change agents, its activities go beyond training graduate students. For example, we have worked hard to incorporate the Center's graduates and visiting scholars into an effective network of agents and partners for educational change in Brazil, while at the same time working with policy makers to influence the direction of Brazilian educational reform and investment. We have contributed to the shaping of several ongoing educational reforms in Brazil, including the Base Nacional Comum Curricular [note: the Lemann Center's piece on the BNCC is the top item on both Google and Yahoo]; the debate on FUNDEB; the debate on full-day schools; the implementation of Khan Academy variants in Brazil; the growing use of text messages to empower parents and students; and the *Ensino Médio* reform. We have also developed innovative programs to transform teacher training and science and math education. The partnership between the Stanford Lemann Center and the Lemann Foundation continues to be absolutely essential to the success of these ventures, and it should serve as a model for many of the other fellowship programs that the Foundation sponsors.





















Building Human Capital

Preparing Future Innovation, Academic, and Policy Leaders

At the inception of Stanford's Lemann Center, Jorge Paulo Lemann articulated a vision of investing in human capital as a key to a strong public sector in Brazil. The Lemann Foundation gave life to this idea by investing in a center designed to train the next generation of educational innovators, researchers, and teachers. Not only has the Lemann Center executed this charge, but more importantly our students and alumni now dedicate their careers to improving Brazilian education.

The original gift to the Lemann Center in 2012 was modest in this regard, budgeting for two MA students annually, one MBA/MA student to be admitted bi-annually, and five or six PhD students over a ten-year period. In setting these goals, it was understood that the number of MBA/MA students depended on Brazilians who were also interested in pursuing an MA in education being admitted to the MBA program at the Stanford Graduate School of Business. In addition, the budget provided for two visiting scholars annually and eight teacher-educators to attend an annual one-week iSTEP teacher education workshop. Subsequently, in 2014, for two years, the Fundação República added two additional fellowships annually for MA students, and, in 2015, a new gift from the Lemann Foundation provided for a total of twelve additional MA fellowships, two additional MBA/MA fellowships, and 24 additional visiting scholars/visiting student scholars over a six-year period. Throughout this entire ten-year period, the Stanford GSE has consistently recognized the important work that the Center is doing and has contributed partial funding for up to three MA students annually and has contributed a considerable portion of funding for Lemann PhD students through teaching assistantships. All in all, then, the combined gifts were designed to finance 36 MA students, 5-6 PhD students, 7 MBA/MA students, 44 visiting scholars/visiting student scholars, and 80 teacher educators who would be rigorously trained in a one-week workshop.

To what degree did the Lemann Center reach these numerical goals? We estimate that a total of about 48 Lemann fellowship MA students have graduated from the Stanford GSE. About 10 of these have gone on to pursue PhD programs at Stanford (4) or elsewhere (UFMG, USP, Columbia, Edinburgh, University of British Columbia, Kobe University), but the vast majority of our MA graduates have accepted policy-oriented positions in government, research organizations, and NGOs. Former MA students are playing leading roles in Brazil's Ministry of Education, numerous NGOs, and foundations, and in state and municipal *Secretarias de Educação*.

We admitted 12 Brazilian PhD students during this period, of whom 11 have been partially funded by the Lemann Center, with substantial additional funding coming from the GSE in the form of research and teaching assistantships and, for one student, from CAPES. Seven of these PhD students have graduated. Five others are currently enrolled, of whom three are slated to finish in 2022. The scholarly work of our PhD graduates is already having a positive impact on the quality of Brazilian educational research and on educational policy in Brazil. Tássia Cruz completed her PhD in August 2015 and returned to Brazil. She is currently working as a professor in the public policy department of FGV Rio and as Director of Research for the policy program there. Before her present post, she was academic director of our policy center, D3e, in Brasilia. Our second graduate, Luana Marotta, is at the Inter-American Development Bank, doing evaluations of Brazilian education programs. Nina Cunha is also working in Washington, DC at a non-profit organization working on educational issues in Brazil. Izabel Fonseca completed her PhD in August 2019 and is now back in Brazil applying for jobs. Leonardo Rosa completed his degree in August 2019, worked in the Lemann Center as a Postdoctoral Fellow until 2021, and is now a postdoc at INSPER. Filipe Recch completed in August 2020, was a Postdoctoral Fellow at the Lemann Center in 2020-January 2022 (partially funded by Instituto Unibanco) and is now helping to run the new Lemann Center at Oxford University. Luis Grochocki (sponsored by CAPES), also completed in August 2020, and is now in a high position at INEP in Brasília.

Three of the remaining students, Ana Trindade, Barbara Born, and Raquel Coelho are scheduled to complete in 2022. In the past two years, two new Brazilian PhD students, Heitor Santos (2020) and Gabriel Marcondes Koraicho (2021), were admitted into the ICE and Economics of Education programs respectively.

We also exceeded our goals in terms of the funding of MBA/MA students. In total, we provided some funding to about 9 MBA students. Two of our first MBA Lemann Fellows (Joice Toyota from Stanford and Erica Butow from the Haas School of Business at Berkeley) are leading major initiatives in Brazil, as described in the 2017 Annual Report. Allison Hirata (2016) works in the Bay Area, but on projects related to start-ups in Brazil. Livia Palomo (2017) and Isadora Yamura (2018) work for U.S. companies doing little if any work related to Brazil. Lucas Giannini (2018) is now back in Brazil heading Fundação Behring. We also funded one of our Lemann MA graduates (2018-19), Ana Paula Pereira, who began pursuing an MBA degree at Stanford in the fall quarter, 2019, but was recruited to serve as CEO in the Instituto Sonho Grande, and provided partial funding for Paula Minardi Fonseca, and Bruno Bueno Correa Martins, who both graduated in 2021. As mentioned, one of our principal goals is to train future leaders in education, and the effectiveness of investing in MBAs has been very mixed. However, the large impacts (or potential impact) that students like Joice Toyota, Erica Butow, Ana Paula Pereira, and Lucas Giannini are making seem to justify the investments. While not every student is working to improve conditions in Brazil, those who do have significant impacts. In the last few years, we became more careful in how much scholarship money we allocate to these most recent students, focusing on students with strong commitments to return or to contribute to Brazil post-graduation.

Perhaps the most unexpectedly high yield part of the Center's human capital investment over the past few years has been the program of visiting scholars and sandwich PhDs. Both groups come to the Center with clearly defined research projects and participate extensively in Center activities. Many of these scholars work with our faculty and regularly present in the Lemann Center seminar series. Both groups stay at the Center for relatively short periods but remain



forever marked by the experience. After they return to Brazil, they are much more aware of and involved in the Center's research and policy initiatives. As such, they constitute an invaluable part of the Lemann Center network. Despite the absence of visiting scholars during most of the calendar year 2020 and much of 2021, we have hosted 54 visiting scholars/visiting student scholars, plus two visiting policy scholars, Alexandre Nascimento and Jair Ribeiro, a visiting fellow, Mariaugusta Rosa Rocha, and an entrepreneur in residence, Eduardo Mufarej.

The second gift from the Lemann Foundation included funding for post-doctoral fellows, and the Lemann Center has supported five such postdocs since 2015. These include Rebecca Tarlau, a University of California PhD in political economy, and two of our own PhDs, Leonardo Rosa, and Filipe Recch. Two additional postdocs, Rodrigo Barbosa e Silva and Anna Carolina Muller Queiroz, have helped to advise and mentor our students in the area of educational technology and innovation, which became particularly important after Paulo Blikstein left Stanford to take a position at Columbia University. Queiroz remains at Stanford, where she leads educational virtual reality (VR) projects and has helped to coordinate the Center's diversity and recruitment efforts; Rodrigo has returned to Paraná, where he has most recently helped to develop a training program on technology and innovation for functionaries in the state government. Leonardo is a post-doc at INSPER and continues to work with us on research projects; Filipe is now at the Lemann Center at Oxford; and Rebecca Tarlau is an Associate Professor of Education and Labor and Employment Relations at Penn State University, where she continues to do research on Brazil.

Another group of people trained by the Center comprises the 50 or so teacher educators from Brazil who attended iSTEP seminars over the past ten years. Although this number fell short of the figure planned in the original Lemann Foundation gift, this was the result of an agreement with the Foundation in 2015. Together, we at the Lemann Center and the Foundation came to the conclusion that the role that these visiting teacher educators played in reforming teacher education in Brazil fell far short of our joint expectations. We had hoped that the teacher educators would return to Brazil and begin to implement the lessons of the iSTEP program in their universities' teacher education programs. However, this only occurred in *Positivo*, a private university in Curitiba, Paraná. We decided that the Center would be better served to use the funds (\$40,000 annually) to invest in a start-up that trained teacher educators from interested Brazilian universities directly in Brazil using STEP methodology and then work with those universities to train teachers in nearby municipalities and states. The PED program has been a major success in Brazil. We describe it in detail below. So far (2022), PED has facilitated the training of 322 teacher educators who have been charged to go back and share their learnings with their university colleagues, even further extending the impact. By 2023, this number will reach 431 teacher educators.

In summary, the combined Lemann Foundation gifts benefited and benefited from almost 180 people in various types of education and training in programs at Stanford. These individuals almost universally consider their time at Stanford transformational. In addition, many visiting groups came to the Lemann Center for seminars organized around science education, educational policy, and various research studies, and Lemann Center-Lemann Foundation joint

seminars held in São Paulo, were attended by hundreds of people—they, too, got a taste of the Lemann Center approach to educational innovation and policy research. The students and visiting scholars who spend anywhere from a week to five years exposed to this Stanford Lemann Center approach to education have almost universally become integral members of the Stanford Lemann network, helping us work with a wide range of organizations to improve education.



People



Eric Bettinger Professor

Directors, Core Faculty

Eric Bettinger is Conley DeAngelis Family Professor of Education at the Stanford University School of Education. He is also a research associate in the program on education at the National Bureau of Economic Research. Bettinger is the Director of the Center for Educational Policy Analysis and a Co-Director at the Lemann Center for Brazilian Education at Stanford. His research interests include economics of education; student success and completion in college; the impacts of financial aid; teacher characteristics and student success in college; effects of voucher programs on both academic and non-academic outcomes.

Areas of interest: Economics of Education; Access and Equity; Higher Education; Quantitative Methods; Experiments in Social Sciences; Educational Policy.



Martin Carnoy Professor



David Plank Professor (Research)Emeritus

Martin Carnoy is Vida Jacks Professor of Education and Economics at Stanford University. He is co-director of the Lemann Center at Stanford, a former president of the Comparative and International Education Society, and a fellow of the National Academy of Education and of the International Academy of Education. He has written forty books and more than 150 articles on the economic value of education, on the political economy of educational policy, on educational production, and on higher education.

Areas of interest: International Comparative Education; Economics of Education; Applied Econometrics.

David Plank is a Professor (Research) Emeritus at the Stanford University School of Education, and Executive Director of Policy Analysis for California Education (PACE). He has also served as a consultant to national and international organizations including the World Bank, the United Nations Development Program (UNDP), the Organization for Economic Cooperation and Development (OECD), the United States Agency for International Development, the Ford Foundation, and also to governments in Africa and Latin America.

Areas of interest: Educational Policy; Policy Analysis and Implementation; Politics of Education.

Building Community

Senior Fellows

Postdoctoral Fellows



Paulo Blikstein Director (2011-18) and Senior Fellow



Robert Verhine Senior Fellow



Kathryn Moeller Senior Fellow



Tatiana Hochgreb-Haegele Senior Fellow



Rodrigo Barbosa e Silva Postdoc



Anna Carolina Muller Queiroz Postdoc



Filipe Recch Postdoc



Leonardo Rosa Postdoc



Rebecca Tarlau Postdoc



Stanford Students & Alumni



Ligia Battagello Eloy Master



Bruno Betat Master



Gabriela Bonicio Master



Barbara Born PhD



Felipe Michel Santos Araújo Braga Master



Bruno Bueno Master



Fabio Campos Master



Francisco Mello Castro Master



Hugo Chaves Master



Renata Chilvarquer Citron Master



Raquel Coelho PhD



Joao Paulo Cossi Fernandes Master



Tassia Souza Cruz PhD



Nina Cunha PhD



Pedro Dantas Master



Mariana Anachoreta Duprat Master



Adelmo Eloy Master



Ariane Faria dos Santos Master



Lucas Fernandes Hoogerbrugge Master



Izabel Fonseca PhD



Gabriela Gall Rosa Master



Lucas Giannini Master



Renata Correa Gomes Master



Marcelo Granja Master



Luís Grochocki PhD



Raquel Guimarães Master



Allison Hirata Master



Isadora Kimura Master





Gabriel Marcondes Koraicho PhD



Danilo Leite Master



Lucas Longo Master



Alice Dias Lopes Master



Deborah Lourenço Master



Livia Maria Macedo Master



Ana Machado Master



Luana Marotta PhD



Marcelo Martins Master



Ana Montosa Master



Gabriela Néspoli Master



Lívia Palomo Master



Bruna Pecin Master



Camila Pereira Master



Ana Paula Pereira Master



Isabela Freire de Andrade Pinto Master



Sara Vitral Rezende Master



Iona Szkurnik do Rio Master



Renato Russo Master



Alfredo Sandes Sampaio Master



Heitor Santos PhD



Caetano Siqueira Master



Joice Toyota Master



Ana Trindade Ribeiro PhD



Lara Vilela Master



Thais Junqueira Franco Xavier Master

Stanford Students & Alumni





Jair Ribeiro Visiting Policy Scholar



Alexandre Nascimento Visiting Policy Scholar

Visiting Fellows

Visiting Scholars and Visiting Student Researchers



Mariaugusta Rocha Visiting Fellow



Camila Mendonça de Barros Visiting Student Researcher



André de Holanda Padilha Vieira Visiting Student Researcher



Priscilla Bacalhau Visiting Student Researcher



José Armando Valente Visiting Scholar

ndonça de André de Holanda Priscilla Bacalhau



Paulo Adeodato Visiting Scholar



Fátima Alves Visiting Scholar



Juliana Marangoni Amarante Visiting Student Researcher



Tel Amiel Visiting Scholar



Ulisses Araujo Visiting Scholar



Cláudio Avena Visiting Scholar



Raphael Bruce Visiting Student Researcher



Fernando Carnaúba Visiting Student Researcher



Marco Cauduro Visiting Scholar



Tiago Cortinaz Visiting Student Researcher



Leandro Costa Visiting Scholar



Joana Costa Visiting Scholar





Lucrezia Crescenzi-Lanna Visiting Scholar



Alause Da Silva Pires Visiting Student Researcher



Ariane Faria Visiting Student Researcher



Janaína Mourão Freire Gori Visiting Scholar



Bernardo Fernandes Visiting Scholar



Flavio Campos Visiting Scholar



Luís Armando Gandin Visiting Scholar



July Silveira Gomes Visiting Student Researcher



Marcelo Knobel Visiting Scholar



Sofia Lerche Vieira Visiting Scholar



Guilherme Lichand Visiting Scholar



Solange Macedo Visiting Student Researcher



Paula Louzano Visiting Scholar



Cecilia Machado Visiting Scholar



Ricardo Madeira Visiting Scholar



Scheila Wesley Martins Visiting Scholar



Luciano Meira Visiting Scholar



Eliton Moura Visiting Student Researcher



Paulo Nascimento Visiting Student Researcher



Manoel Andrade Neto Visiting Scholar



Laura Ogando Visiting Student Researcher



Vitor Pereira Visiting Student Researcher



Ana Pires do Prado Visiting Scholar



Juliana Portella de Aguiar Vieira Visiting Student Researcher





Ricardo Primi Visiting Scholar



Andre Luis Alice Raabe Visiting Scholar



Rachel Reis Visiting Student Researcher



Sabine Righetti Visiting Scholar



Enid Rocha Visiting Scholar



Erica Castilho Rodrigues Visiting Scholar



Karine Votikoske Roncete Visiting Student Researcher



Geraldo Andrade da Silva Filho Visiting Scholar



Lara Simielli Visiting Student Researcher



Filomena Siqueira Visiting Student Researcher



Valdinei Souza Visiting Scholar



Eduardo Zancul Visiting Scholar

"Topics in Brazilian Education" Course

An important part of building community among Lemann Center scholars and Stanford students interested in Brazil is the new class created in 2012 at the Graduate School of Education entitled "Topics in Brazilian Education." To our knowledge, this year-long seminar is the first to be exclusively dedicated to the discussion of issues in the Brazilian educational system. The class is intended to help students from different backgrounds become knowledgeable about Brazilian educational theories, policies, and current research. The seminar meets weekly and is a focus of Brazilian academic interaction at Stanford. Between twenty and thirty students, alumni, and friends participate regularly in the seminar. Beginning in 2020, the class went online because of Covid-19, and it remains hybrid, which has allowed participants to join from Brazil. Presenters include educational entrepreneurs, innovators from non-profit organizations, foundation leaders, researchers at Stanford and at other universities in Brazil and the U.S., policymakers, Brazilian state and municipal secretaries of education, and other leaders in practice and policy. Appendix B provides a select list of the presentations in the course from 2015-present.



















Innovation

New Technologies in Science Education

In the first four years of its existence, the Lemann Center, under the direction of Paulo Blikstein, quickly jumped out to lead in two major innovations in educational technologies, especially as applied to science education: the FabLabs/Maker Movement and Massive Online Labs (MOLs—labs that can add "hands-on learning" to online courses). The research funds allotted to the Center supported the development of cutting-edge technologies that have had a significant impact in Brazil. This pioneering work had considerable impact in Brazil and in the world – Blikstein' s 2013 paper on the topic, written with support from the Center, is considered the field's foundational article with over 1200 citations. Blikstein' s work on FabLabs/Makerspaces also helped the Lemann Foundation to strategize its own role in this space. The FabLab at Stanford developed teaching methods in science capable of motivating highly disadvantaged students to embark upon successful STEM careers. In addition to the FabLab in Brazil, Blikstein tested these labs in Russia, Thailand, Australia, Denmark, Mexico, Spain, and Finland.

Below, we highlight four projects that Blikstein conducted as part of Lemann Center initiatives. All of these have direct relevance for the future of education in Brazil.

"Flipped classroom" and hands-on learning

Blikstein and coauthors conducted research about the "flipped classroom" and tested different designs for mixing videos, text, and hands-on learning. In an article published in the IEEE Transactions on Learning Technologies, Blikstein and co-authors proposed a new model, the "Flipped Flipped Classroom," in which students watch videos after doing exploratory activities, and not as a preparation for hands-on activities. This paper has generated academic discussion about the classic flipped classroom model. This study and this line of research could have significant implications for the use of new technologies for education in Brazil and beyond. As Brazil, like many countries, increases its use of nontraditional educational models, the flipped flipped model could increase academic quality.

Big data and Learning Analytics in STEM education

Together with Lemann Fellow Alfredo Sandes, July Gomes, and other doctoral students at Stanford with ties to Brazil, such as Marcelo Worsley, Blikstein conducted research in the uses of big data and learning analytics in education. He focused on the learning of computer sciences, engineering, and science, and his team published several conference and journal articles on the topic. He created novel measures for measuring the learning of computer programming; developed several new machine-learning algorithms to model learning of computer programming; and pioneered research studies using new data sources such as biosensors and eye trackers. He also did one of the largest known surveys of computer science education. Given



the importance of the learning of computer science and programming, this research has the potential to greatly impact the Brazilian pipeline of computer talent.

Low-cost technologies for learning, FabLabs@School

Since 2012, Blikstein has developed several new prototypes for low-cost technologies that have had a significant impact in Brazil. Two of them were developed with Lemann Fellow Alfredo Sandes: Dr. Wagon, a tangible system for elementary school children to learn programming, and Tink, a system for middle- and high-school children to add computer programming to their home and environment. Together with Brazilian fellows and other researchers, he developed several low-cost boards for sensing and robotics, with potential to allow kids from very low-income communities to do environmental and urban sensing projects (water quality, pollution, temperature, etc.). One of these platforms, the Gogo Board, is currently being used in tens of Brazilian schools, and has become the official robotics and sensing platforms in several cities in Rio Grande do Sul. This board has recently been described by famed Brazilian technologist Ronaldo Lemos as one of the "five Brazilian technologies to watch" in a recent article in *Folha de São Paulo*.

Science education in Sobral

Beginning in 2017, Blikstein led a major Center initiative in Sobral aimed at transforming the teaching and learning of science and technology, through a complete rewrite of the science standards, the construction of brand-new maker/science labs in two schools (as a model for subsequent implementation in all schools), and a brand-new professional development program for lab teachers.

In 2018 the project transferred to Columbia University following Blikstein's move, but the collaboration with Stanford continued. In December of 2020, the new science curriculum – *Currículo IDEIA* (www.curriculoideia.org) was published for public consultation. The workshops for teacher professional development continue in 2022, for implementation of the new standards in elementary and middle school levels.

The Sobral project also produced significant research. Upon graduation, two Stanford graduate students were hired by the project to build and execute a comprehensive research plan for this project, including questionnaires, observation protocols, and analysis frameworks. Blikstein and coauthors examined tens of existing questionnaires and the cutting-edge of evaluation of science programs, and also conducted interviews with the world leaders in curriculum development to guide our writing of the Sobral curriculum. Reports from the participating teachers were overwhelmingly positive. The project resulted in several conference publications and now one journal article, and the data analysis is ongoing with many more in the pipeline. This work has inspired similar efforts in Ceará and São Paulo.

Dados para um Debate Democrático em Educação (D3e)

One of our key goals when we first established the Lemann Center in 2011 was to create a policy institution to increase the impact of academic research in education policy debates in Brazil. Our efforts were guided by the conviction that making solid evidence and rigorous analysis available to policymakers can support the development of policies that will more effectively address the policy challenges facing Brazil's education system. After some initial efforts and learning, we finally achieved this goal in 2018, with the creation of *Dados para um Debate Democrático em Educação* (D3e). In the three years since, D3e has established itself as a valued contributor to policy debates in education, and as a valued partner for many of the key institutions participating in those debates.

Mission

D3e seeks to build bridges between the academic community and a variety of policy audiences, in order to expand and strengthen communication between scholars and policymakers. This work benefits both groups. On the policy side, it provides legislators and other policy actors with access to the best available research on critical education issues, which can help them to design more effective policies. On the academic side, it creates opportunities for scholars to communicate their findings to policymakers, thus increasing the relevance and impact of their work.

The credibility and effectiveness of D3e depend entirely on the center's independence from ideological and partisan entanglements, and our absolute commitment to high-quality academic research as an essential contributor to the development of successful educational policies. We work with a wide variety of partners, but our unique role in these partnerships is to bring research findings into the policy conversation, and not to engage in advocacy for or against specific policies.



The ways in which D3e engages in the policy process are summarized in the figure below.



Organizational Structure and Leadership

D3e originated as a project of the Lemann Center and conducted its work under the administrative and financial auspices of the Center in the years following its creation. Beginning in 2019, however, the Center and the D3e leadership team set out to establish D3e as a Brazilian *associação civil sem fins lucrativos*. This process involved multiple challenges, both at Stanford and in Brazil, but in December 2020 D3e's *Estatuto* was registered by the Brazilian government and D3e was assigned a CNPJ, which allows the organization to raise money in Brazil. Among other things, this allows D3e to draw on a wider group of funders, which both increases the resources available for D3e activities and serves to confirm the independence of D3e from any single revenue source or political point of view. D3e retains a deep and permanent connection to the Lemann Center and to Stanford University, but the organization no longer receives operating support from the Center. Full administrative and financial responsibility for D3e's operations and activities now resides with the *Assembleia Geral* of D3e.

Assembleia Geral

Administrative responsibility for D3e is fully vested in the three members of the *Assembleia Geral.* Felipe Michel Santos Araujo Braga received his Master's degree from Stanford in 2015. He is a specialist in public policy and public administration in the *Secretaria da Educação* in Minas Gerais, based in Ouro Preto, and the President of the *Conselho Estadual de Educação*. Robert Verhine is a Senior Fellow in the Lemann Center, and an Emeritus Professor at the Universidade Federal da Bahia. He currently serves on the Fulbright Commission for Brazil, and as the CAPES/MEC Coordinator for the field of education. Sofia Lerche Vieira is an Emeritus Professor at the Universidade Federal do Ceará (UFC) and the Universidade Estadual do Ceará (UECE). She previously served as Secretary of Education in Ceará and continues to work as a researcher and consultant with a wide variety of Brazilian and international organizations concerned with education policy.

Conselho Consultivo

D3e's *Conselho Consultivo* comprises a diverse and distinguished group of leaders and experts including policymakers, funders, journalists, and educators to provide advice and guidance to the *Assembleia Geral* and the executive leadership team on organizational priorities and strategy. David Plank from the Lemann Center serves as the initial chair of the *Conselho Consultivo*. Other members include

- Antônio Gois: Colunista do jornal O Globo, diretor e fundador da Jeduca e colaborador do Instituto Unibanco.
- Daienne Amaral Machado: Servidora pública federal, atualmente é diretora de Estudos e Políticas Sociais da Companhia de Planejamento do Distrito Federal (Codeplan).
- Daniel Bento Teixeira: Diretor Executivo do Centro de Estudos das Relações de Trabalho e Desigualdades (CEERT).
- Eduardo Mufarej: Ex-Presidente da Somos Educação, criou a Escola de Formação Política e Liderança RenovaBR e integra, entre outros, o conselho consultivo do Wilson Institute.
- Inês Mindlin Lafer: Idealizadora do Confluentes e diretora do Instituto Betty e Jacob Lafer. Presidente do conselho do Grupo de Institutos, Fundações e Empresas (GIFE).
- Jair Ribeiro: Fundador e presidente da Associação Parceiros da Educação e da Casa do Saber S.A., integrante do Conselho Consultivo do Todos pela Educação, do Comitê de Gestão da Secretaria da Educação do Estado de São Paulo e do Instituto Paula Souza.
- Kátia Helena Schweickardt: Professora adjunta do Departamento de Ciências Sociais da Ufam, membro dos Conselhos Consultivos da Associação Nova Escola, do Movimento Nacional pela Base e Consultora Especialista do Todos pela Educação.
- Paulo Ferraz: Investidor e membro de conselho de algumas entidades privadas, públicas e do terceiro setor, entre elas a LASA (Lojas Americanas S.A).



Conselho Científico

The members of D3e's *Conselho Cientifico* are distinguished members of the academic community who serve to connect D3e to new scholarship and potential collaborators in their respective fields of expertise. They also organize and support expert review of policy reports and other D3e publications to ensure that all publications meet the highest standards of academic rigor. Lara Simielli, D3e's Director of Research, serves as Chair of the *Conselho Cientifico*. Other members include:

- Ângelo Ricardo De Souza: Professor associado da Universidade Federal do Paraná.
- Elizabeth Macedo: Professora Titular da Universidade do Estado do Rio de Janeiro.
- Martin Carnoy: Professor Vida Jacks na Faculdade de Educação da Universidade de Stanford e co-diretor do Lemann Center de Stanford (EUA).
- Naercio Menezes-Filho: Professor Titular da Cátedra Ruth Cardoso e pesquisador do Centro de Gestão e Políticas Públicas, no Insper. Professor Associado da Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo (FEA-USP).
- Paula Louzano: Diretora da Faculdade de Educação da Universidad Diego Portales (Chile).
- Ricardo Primi: Professor Associado do Programa de Pós Graduação em Psicologia da Universidade São Francisco (Mestrado e Doutorado em Avaliação Psicológica)
- Roseli De Deus Lopes: Professora Associada do Departamento de Engenharia de Sistemas Eletrônicos da Escola Politécnica da USP.

Leadership and Staffing

Since its founding D3e has benefited from the contributions of several very talented leaders, whose work helped to lay the foundation for D3e's long-term sustainability and impact.

The founding Executive Director of D3e was João Paulo Cossi Fernandes. João led the design process that led to the official launch of D3e in August 2018 and set up our basic organizational infrastructure (website, design templates, accounting procedures). João left in 2019 to take a position at the Inter-American Development Bank and was succeeded as Executive Director by Leonardo Barchini. Leo took the lead in establishing D3e as an associação civil sem fins lucrativos, working with lawyers and accountants in Brazil and at Stanford to draft D3e's Estatuto and set up the organization's financial and accounting systems. He also took the lead in building strong partnerships between D3e and a variety of key education policy organizations including Todos pela Educação, Instituto Unibanco, Instituto Natura, and others. Leo returned to his career at CAPES in January 2021, and Antônio (Tom) Bresolin assumed the role of Executive Director shortly thereafter. Tom is an economist specializing in educational evaluation and research. Before joining D3e he worked with a variety of third-sector organizations focused on education policy, including Itaú Social and the Instituto Ayrton Senna. As Executive Director Tom has devoted himself to building D3e's institutional infrastructure, working closely with the Assembleia Geral to constitute and engage a strong Conselho Consultivo, hire staff, and professionalize communications. He has also worked to strengthen D3e's relationships with funders and other partners and has overseen the publication of several policy reports.

The founding Director of Research and Outreach for D3e was Tássia Souza Cruz. At the end of 2020, Tássia left D3e to join the *Centro de Excelência e Inovação em Políticas Educacionais* (CEIPE) at FGV/Rio, and her place as Director of Research was taken by Lara Elena Ramos Simielli, who had been working closely with Tássia since 2019. Lara is a Professor at FGV/SP, and a specialist in educational leadership and administration. Juliana Veiga dos Santos joined D3e in 2020 to staff the Conselho de Administração e Fiscal. Juliana has worked as a fiscal administrator at the federal, state, and local levels. In addition to our core team, Maurício Holanda Maia worked closely with D3e in 2018 and 2019 to ensure that D3e got off to a successful start, and he remains a key partner in our work in Brasília.

Policy Reports

In the past three years D3e has published eight major policy reports on topics including education finance, teacher labor markets, educational leadership, and educational technology. Several of these reports (notably including reports on the new FUNDEB, educational technology, and the nature of teachers' work) have received substantial media and policy attention. For example, *Tecnologias para uma Educação com Equidade* (which D3e produced in partnership with Blikstein' s Lab at Columbia University) was widely cited in the elite media, including an interview with the primary author (Paulo Blikstein) and an editorial strongly endorsing the report in the *Estado de São Paulo*. D3e's report on the *Novo Fundeb* (produced in partnership with the Inter-American Development Bank) also received wide media attention and was cited in the Congressional debate on Fundeb reform. A full list of D3e reports, associated events and media coverage is available on the <u>D3e website</u>.

D3e has a number of policy reports in the pipeline for release in 2022 and after, including reports on the design of "hybrid" educational programs; the labor market for teachers; the evolution of private higher education; and the design of the professional/technical track in secondary schools. In addition, D3e is planning to begin publishing a series of shorter policy briefs on key issues in Brazilian education, based on reviews of the international scholarly literature. The first two of these will focus on private funding for public schools and the utility of monetary and other incentives for improving teacher performance.

D3e Events and Outreach

From the beginning D3e has seen in-person events (seminars, conferences, media outreach, presentations to legislative committees) as an essential complement to the publication of policy reports and policy briefs, and as a critically important opportunity to foster a democratic debate on education policy issues. In 2018-19 we organized several events in Brasília and São Paulo, in partnership with organizations including *Todos pela Educação* and the *Frente Parlamentar da Educação*, but the pandemic put an end to these. In the past two years D3e has participated in a variety of on-line events, including *Todos pela Educação* and *Instituto Unibanco* to present reports



to a larger audience. As the pandemic comes to an end the resumption of in-person opportunities for outreach and dialogue is a top priority for D3e.

Innovation in Teacher Education

As described in our reports over the last two years, in 2016, we initiated a major venture in social entrepreneurship to improve teacher education in Brazil, called *Programa de Especialização Docente* (PED). PED works with Brazilian public and private universities to train and collaborate with teacher educators to deliver an 18-month *especialização* degree for in-service teachers in mathematics and sciences. The 18-month program is based on a comprehensive curriculum of ten modules (courses) that include learning goals, assignments, readings, and classroom activities that emphasize the connection between scholarship and practice. The ten modules support deep reflection on practice and innovation in instruction, culminating in a performance assessment in which participants showcase their approach to creating equitable classrooms. This curriculum, developed at Stanford University and Instituto Canoa in São Paulo—a group of highly skilled young Brazilian teacher educators—is rooted in years of studies on features of high-quality teacher education and effective pedagogical practices and is adapted to the Brazilian context.

PED prepares teachers to organize classrooms where students from diverse demographic backgrounds and with a wide range of previous academic achievement have access to developmentally appropriate, academically rigorous, and intellectually challenging curricula in mathematics and science. They participate actively and interact in balanced, equal-status fashion with their peers. PED teachers and students recognize that different intellectual abilities are needed to complete classroom tasks. Students are enabled to think deeply, solve practical problems, and demonstrate their intellectual competence in different ways, through varied media, and with different tools.

The PED project is ambitious, innovative, and complex. Its main goal is to build successful demonstration sites and proofs of existence for academically rigorous and solidly practiceoriented teacher education programs, which in turn, help teachers deepen their pedagogical content knowledge and develop skills that expand their math and science teaching practices in Brazilian elementary, middle, and high school classrooms. One of PED's major accomplishments is to have been able to attract university-based faculty to engage in long-term professional development in order to join the program and be fully prepared to deliver PED's curriculum at their institutions. Since 2016, the PED team at Stanford and Instituto Canoa have prepared more than 300 university-based teacher educators in 20 universities in 10 states, from Santa Catarina in the Brazilian South to Amazonas, and Maranhão in the North and Northeast. These teacher educators go through four week-long immersion seminars on PED's principles and pedagogy through the period of a year, and subsequently deepen their knowledge about the program in collaborative working groups for two years.

A key strategy to engage teacher educators with the PED curriculum has been to support them in the refinement and adaptation of the curriculum to their own contexts. To do so, the PED team organizes working groups in which teacher educators are responsible for replanning PED lessons



in detail, tailoring them to their local audience of teachers, and then presenting the new lesson plan to peers in different higher education institutions in the PED Network. By participating in working groups, teacher educators learn from and about the curriculum, as well as from their peers. Further, as they replan lessons and share them with the PED Network, they contribute back to the project. These university-based teacher educators, in turn, have or are now training more than 500 teachers in *especialização* courses in eight partner school communities. These 500 teachers are impacting about 30,000-40,000 students per year.



PED specialization cohorts in Math (blue) and science (green).

In addition, the PED team has developed an evaluation instrument to assess how teacher development and learning program results in changes in classroom instruction. It has also created a large network of teacher educators and PED-trained teachers who are organizing activities around PED, including research projects to study and improve the PED program.

PED in a Nutshell

PED is designed as a high-end professional development (PD) program, in which teachers being trained in the universities meet twice per week for 18-months to engage in a research-based, detailed, classroom-modeled training that covers a wide range of skills, from classroom management to effective math and science pedagogical content knowledge. The university educators model the instruction they expect their teacher trainees to implement in their

classrooms with students; the teacher trainees are supported by mentors who meet with groups of them on a regular basis to discuss issues of implementation. The trainees are also assisted in assessing each other's progress with the mentors using videotapes of their classroom teaching.

PED's ten modules focus on classroom management, student-centered learning, and teaching, building equitable classrooms, developing pedagogical content knowledge in the subject to be taught, as well as topics on planning and assessing student work. The participating teachers' work culminates in preparing a portfolio that includes a teaching performance assessment, an important component of teacher professional learning, and a consequential topic currently raised and discussed in Brazil.

Importantly, the PED curriculum includes a significant clinical curriculum. Teachers who are trained in the PED program in partner universities are expected to connect their learned experiences to their classrooms and teach their students in schools in the way that they were taught by PED-trained university educators. To support these changes, PED mentors at the universities are in constant communication with the participating teachers (remotely or in person if possible) to address context-specific issues that might arise in the participating teacher's classrooms and schools. Many of these conversations among the mentors and the teachers are based on video recordings of the teachers' practices in their classrooms. Such conversations and feedback to the teachers are significant indicators of the implementation of PED strategies by the teachers (See Figure 1).



Figure 1. The PED Curriculum

MENTORSHIP


Strong programmatic coherence is one of the hallmarks of PED and one of the most serious challenges in teacher education. (See Figure 2)





PED Training Seminars and working groups

The collaboration and training of faculty in the participating universities is conducted by a team from Stanford University and Instituto Canoa in Brazil, in 3-4 week-long training seminars in Brazil. The week-long seminars are fundamental to the collaboration with the Brazilian university faculty, during which we introduce the modules and model PED's signature pedagogy in a university classroom setting. Discussions of readings, deep conversations among the participating university faculty in large and small groups, as well as modeling instructional approaches are the basis for teaching the teachers who participate in the 18-month long professional development in mathematics and science at the various universities. We have considerable evidence that teachers who are being trained in the PED program in participating universities have been able to teach their students in schools in the way that they were taught by PED-trained university educators.

For the 2021 cohort, exceptionally because of the pandemic, the training seminars were offered as 3 week-long remote sessions followed by a fourth week that will be held in-person in Brazil. Although these were exceptional and challenging conditions, they afforded a more diverse participation of universities from all over the country and provided many learning opportunities. Having learned from this experience the PED 2022 cohort will participate in four training weeks: two in person and two remotely.

Expanding PED

PED has greatly expanded the number of universities participating in the training seminars over the past six years, and with that expansion, the number of teacher educators who have completed the training or will complete it in 2022 and 2023. Table 2 shows this expansion by institution and the number of teacher educators at each institution.

Table 2: Participants in the development program for teacher educators of PED Brasil, b	y
cohort, 2016-2023	

Partner universities or institutions	2016	2018	2019	2021	2022	total of
and respective federal state (in alphabetical order)	(completion in 2017)	(completion in 2019)	(completion in 2020	(projected completion in 2022)	(projected completion in 2023)	teacher educators (estimated)
AGES Centro Universitário (BA) [via Instituto Anima]				3	-	
Centro Universitário UniSociesc (SC) [via Instituto Anima]		9			1	10
CNEC Campanha Nacional de Escolas da Comunidade (MG)	4				-	4
Faculdade Sesi (SP)	11	1	10	2	2	26
Instituto Anima (SP)			19		-	19
Instituto Superior de Ensino Vera Cruz (SP)		4	2	-	-	6
Instituto Federal Catarinense - IFC (SC)		13	2	2	2	19
Unesp - Universidade Estadual Paulista Júlio de Mesquita Filho (SP)			10	7	3	20
UniBH (MG)	10	3			-	13
UniJorge (BA)	5	4			-	9
Universidade de São Paulo - USP (SP)			5	19	6	30
Universidade de Taubaté - Unitau (SP)				10	1	11
Universidade do Sul de Santa Catarina - Unisul (SC) [via Instituto Anima]				1	-	
Universidade Estadual do Ceará - UECE (CE)		10		3	7	20
Universidade Estadual do Rio Grande do Sul - UERGS (RS) <i>in partnership with faculty from Instituto</i> <i>Federal do Rio Grande do Sul - IFRS</i>				14	1	
Universidade Estadual do Vale do Acaraú - UVA (CE) <i>in partnership with the municipality</i> <i>department of education (Sobral)</i>		8		2	1	11
Universidade Federal do Mato Grosso do Sul (MS)	-	-	-	-	10	10
Universidade Federal de Minas Gerais - UFMG (MG)				13	4	17

Lemann Center tor Educational Entropreneurship						
and Innovation in Brazil						
Universidade Federal do Amazonas - UFAM (AM)				13	8	21
Universidade Federal do Maranhão - UFMA (MA)				6	4	10
Universidade Federal do Rio de Janeiro - UFRJ (RJ)				17	_	17
Universidade Federal do Sul da Bahia - UFSB (BA)		5	6	4	_	15
Universidade Positivo - UP (PR)	6	7	14	6	5	38
Universidade São Judas Tadeu (SP)	7	7		1	_	15
Universidade Veiga de Almeida (RJ) in partnership with the school of teacher education of the municipality department of education (Rio de Janeiro)	6	12				18
SESI BA (in partnership with SESI National Directory)	-	-	-	-	11	11
SESI ES (in partnership with SESI National Directory)	-	-	-	-	10	10
SESI GO (in partnership with SESI National Directory)	-	-	-	-	10	10
SESI SE (in partnership with SESI National Directory)	-	-	-	-	10	10
SESI SC (in partnership with SESI National Directory)	-	-	-	-	10	10
SESI RN (in partnership with SESI National Directory)	-	-	-	-	10	10

Reaching the teachers

total

49

Estimated number of certified teacher educators by the end of 2023

Some of the teachers trained in PED university programs teach in private schools, and it is important that those schools (in some cases, systems of multiple private schools under the same ownership) are committed to training many, even most, of their teachers to the PED standards. Many of the teachers are public school teachers and their numbers are growing as well. Creating partnerships between municipalities and/or state agencies and PED teacher educators is an important and very useful strategy to reach a greater number of teachers in the public sector. Whether private or public, teachers participating in the PED *especialização* programs need to be supported by their school administrations. The PED program is most likely to occur when municipal and state administrations buy into the PED project.

83

68

122

109

322 (2022)

431

It would be misleading to claim that this is an easy program to scale up. As mentioned, however, PED is now training future trainers of university teacher educators who will help expand the number of seminars that can be offered every year. In addition, one large municipality, São Paulo, has committed to send over the next 4 years many math and science teachers to *especialização* courses in universities in São Paulo where PED teacher education teams have already been trained in PED training courses. Two municipalities in Ceará (Sobral and Fortaleza) are training teachers in two PED Programs (at UVA in Sobral and UECE in Fortaleza). Thus, PED is poised to scale up on two fronts—both in training many more teachers in partnership with municipalities' and states' departments of education and in expanding the number of faculty in Brazilian universities who will be prepared as teacher educators to train teachers in the PED model. PED is currently in conversations with the Department of Education of Rio Grande do Sul (with UERGS), Department of Education of Bahia (with UFSB), Department of Education of Amazonas (with UFMA) and Department of Education of Rio de Janeiro (with UFRJ).

PED offers the single best model for setting much higher standards in Latin America for teacher education. Although PED is currently a professional development program for in-service teachers, it contains the principles and practices of powerful pre-service teacher education. With a structural modification in the extent and placement of the courses, especially in those universities and municipalities already well advanced in the PED program, it could serve as a model for powerful initial teacher education. For example, teachers who are graduates of PED can serve as mentors for undergraduate teacher candidates in well-planned residency programs – another topic of discussions about teacher education in Brazil. Strong relationships among the universities and the schools also have the potential to strengthen the induction process for novice teachers and so help to create faculty stability at the schools.

PED Governance: The PED Board

PED is governed by an Advisory Board made up of

- Camila Pereira: Lemann Foundation
- Martin Carnoy: Stanford Lemann Center
- Marcelo Knobel: Full Professor of the Gleb Wataghin Physics Institute (IFGW) of the University of Campinas (Unicamp) and the former Rector of UNICAMP)
- Daniel Castanho: Instituto Ânima
- Paula Louzano: Dean of Education at Universidad Diego Portales, in Chile
- Izolda Cela: Acting Governor of Ceará
- Roseli de Deus Lopes: Professor at POLI USP and Vice-Director of Instituto de Estudos Avançados (IEA USP).

The Board met three times during the academic year 2019-2020—in early December 2019, early March 2020, July 2020, and April 2021. At each meeting, Rachel Lotan and Canoa presented a joint report of the activities and future plans of PED, and the Advisory Board discussed the presentation and made recommendations for PED strategies.



The PED Response to COVID-19

PED moved quickly in March and April 2020 to respond to the cancellation of face-to-face classes in Brazil and the conditions of social distancing. Our partner universities conducting teacher PD— Instituto Federal Catarinense, Universidade São Judas (Instituto Ânima) and Universidade Positivo—began offering a remote version of PED classes developed in close cooperation between Canoa and the university training teams. They developed alternative versions of the classes and group work in Heterogeneous Classrooms; Curriculum, Assessment and Teaching in Mathematics I/Sciences I and Curriculum Planning, considering the impossibility for participating teachers to implement and carry out pedagogical strategies in their classrooms. This entire process was conducted paying close attention to the needs and limitations of the PED Network's universities and closely monitored by the PED team. Throughout this process, it was emphasized that remote classes were and are an emergency response to current circumstances and are no substitute for face-to-face training.

"Teachers are planners per excellence. Planning provides a renewing and challenging intellectual movement. When we redesign something, it is the same as revisiting what we went through, but with new perspectives. To be redesigning together with the Positivo team, with support from the Canoa Institute, provided a lot of reflections and fine adjustments." Testimony by Professor from the Federal Institute of Santa Catarina.

The PED team and our partner universities have learned many lessons from the remote classes, which can be made available on request. They have important implications for future PED training.

PED Outreach and PED Future Training of University Teacher Educators

Outreach to public state and federal universities has been a priority for PED in order to reach more teachers and students in public schools. In 2020, PED has developed a cooperative arrangement with USP through the Polytechnic School of Engineering (via Prof. Roseli de Deus Lopes) and developed relationships with a number of new universities and state governments— notably Rio de Janeiro (UFRJ), Minas Gerais (UFMG), Maranhão (UFMA), Amazonas (UFMA), Rio Grande do Sul (UERGS). In October and November 2020, PED offered two remote informational seminars to universities potentially interested in a planned PED training in 2021. Rachel Lotan, Tatiana Hochgreb and the Canoa team made presentations at the two-hour sessions. One hundred plus individuals attended the sessions representing 27 public institutions from 11 states. These initiatives were paramount to the establishment of a strong cohort of faculty from universities in 2021.

During 2021, we established a two-year partnership with SESI Nacional to offer the training to their states' units. PED also developed relationships with UFMS, who is now joining the cohort of PED 2022.

The PED Network

PED has formed a Network of PED *docentes* and institutions with the purpose of maintaining PED standards and also to conduct research on PED activities. PED Network has established its own organization:

The PED Network is a community of Higher Education Institutions (HEIs) certified as members of PED Brasil. This network has the following goals: i) To communicate, collaborate, update the knowledge base, share resources and document the achievements of PED with members of the PED's professional community and other educators in Brazil; ii) to advocate for the value of the teaching profession in the public sphere; iii) to form a community of mutually responsible members that monitor and maintain the high quality of PED Brazil.

The institutions of the PED Network are organized into four working committees that meet monthly to discuss issues related to the development and quality implementation of the program. Its governance is under the General Assembly and the Deliberative Council, which meets once a year, beginning in 2021.

The PED Network played an important role during the beginning of 2022 activities, when members from Instituto Canoa and from the PED partner universities composed an *ad hoc* committee to deliberate on the conditions in which PED would go back to face-to-face activities. As a result, PED will resume face-to-face immersion seminars to university faculty under very strict sanitary protocols created by this same committee.





















42 A Decade of Accomplishments and A Vision for the Next Ten Years











The Recruitment Project

In response to ongoing initiatives at the Lemann Foundation and at the Stanford Graduate School of Education to recruit historically underserved minorities, the Lemann Center began a major recruitment project to attract more students from Brazilian minority groups. The recruitment project's initiatives and results since its inception in spring 2020 have relied on the efforts of alumni, students, scholars, and partners as the Brazilian Student Association (Brasa) an international group of scholars who support and promote Brazilian studies around the world. The project aimed to increase the diversity of applicants to the GSE programs for which the Lemann Center offers scholarships. The project team was led by Lemann Center professors Martin Carnoy, David Plank, and Eric Bettinger, with project coordinators Cristina Antunes and Anna Carolina Queiroz. Participating Center fellows include Tatiana Hochgreb-Haegele, Rodrigo Barbosa e Silva, Deborah Lourenço, Camila Pereira, Laura Ogando, Ligia Battagello Eloy, Robert Verhine, Mariaugusta Rocha, and Filipe Recch.

Challenges encountered by applicants in the initial undertaking have included lack of information about scholarships, Brazilian government-funded scholarships that don't cover the costs of living in California, costs of exams and applications, and lack of English proficiency. Meeting frequently, the team established a network of collaborators in Brazil to increase the Center's outreach targeting a diverse population and offered webinars and workshops to help share information and assistance in preparing the applications. A series of well-advertised Zoom meetings were held with potential applicants and each of the directors of GSE MA programs eligible for LC fellowships—namely, International and Comparative Education (ICE); Policy, Organization, and Leadership Studies (POLS); Learning Design and Technology (LDT); and a new program in Educational Data Sciences (EDS). They provided detailed information about the GSE programs and offered support in the application process.

Results have been immediate—first, in increasing the number of Brazilians applying to the GSE, and second, in successfully increasing diversity among the MA and PhD students admitted. In years prior to 2020, the GSE averaged about 7-8 applications annually from Brazil for MA programs. In 2020 and 2021, the number of applications increased to 25. In both years, at least one underserved minority has been admitted into the MA programs, and two have been admitted into the PhD. The Recruiting Project will continue outreach to diverse potential applicants by informing and supporting them in the application process.

Research

Attached is a list of publications by researchers at the Lemann Center in the period 2013-2021 (APPENDIX A).

The research is concentrated in two main areas: educational policy and learning sciences. There are many publications by Lemann Scholars in various subfields of these two main areas. We highlight four in Educational Policy and four in Learning Sciences.

Educational Policy

Time in School

Two major reforms in Brazil since 2007 have increased the time Brazilian students stay in school. The first was the reform to admit students to first grade at six years old rather than seven. This began in some municipalities in 2003 and became a federal law in 2007 to be completely implemented by 2010. Researchers at the Lemann Center estimated the impact of this reform using a difference-in-difference-in differences approach based on the staggered timing of implementation across municipalities (Rosa, Bettinger, Carnoy, and Dantas 2022). The estimates show that the extra year of schooling increased 5th grade math and Portuguese scores on the Prova Brasil by about 0.11-0.12 standard deviations. This increase declines to about 0.05 SD by 9th grade, but it is still statistically significant. Although these are not large increases in achievement, the research suggests that the reform required very few additional resources; in other words, the benefit-cost ratio was quite high compared to other reforms. For the most part, the extra space and teachers needed to expand the number of first grade classrooms was accomplished by converting preschool classrooms and teachers into first grades. Teachers were provided with limited additional training; in essence, they were told to teach the new six-year-old first graders to read and do simple arithmetic.

The additional year reform should have had a positive impact on PISA scores, since by 2015 some fraction of Brazilian students taking the PISA had attended an extra year of schooling. Brazilian PISA scores decreased in 2015 but increased about 0.05-0.06 SD in reading and math in 2018. How much of this was due to increases in the average years of schooling attended is an open question subject to further research.

A second important reform that also began about 2007 is an increase of daily school hours (single shift schools) in some municipalities, such as Rio de Janeiro and São Paulo, and more typically in full-day secondary schools. Cruz et al (2017) analyzed the impact of full day programs in basic education and Rosa et al (2021), in secondary education, focusing on the state with the most expanded number of full-day secondary schools—Pernambuco. The results of these studies show that single-shift alone in elementary and middle schools does not show significant impact on



student achievement, but when teachers teach only in the single shift school and activities in the extra hours are structured around academic activities and teachers are trained to use the additional time effectively (certified schools), the increase in achievement is large and significant, especially in middle schools. The full-time secondary school study of Pernambuco shows less ambiguous robust results: Controlling for initial quality of students, increasing time of instruction to a full-day increases student achievement on the Pernambuco state test by 0.22 SD over the three high school years. The estimated impacts are consistent regardless of the year of implementation of the full-day program, and the effects are the same for initially low- and high-achieving students.

These results for expanding time in school to a full day suggest that more time on tested subjects does increase student achievement significantly in those subjects. That said, unlike the early entrance into primary school reform, the full-day (single-shift) reform is expensive. It requires additional classroom space and requires paying teachers more for the additional hours they are teaching. Despite these high costs, it is likely that the full-day reform will spread. It is consistent with schooling in developed countries and provides benefits for parents in that their children are in school longer rather than home alone or in the streets.

University Value-Added

Brazil is one of the few countries of the world that has data on the achievement of higher education students at the end of their higher education studies. In recent years, this test, called the ENADE, has been linked with the higher education entrance test, the ENEM. Researchers at the Lemann Center have been active in studying Brazilian universities and Brazilian HE outcomes with the objective of developing evidence that can shape HE policies. In 2015, CAPES published a Portuguese translation of the book, University Expansion in a Changing Global Economy (Carnoy et al, 2013) and distributed it, gratuitamente, throughout Brazil. That book compared the expansion of the Brazilian higher education system after 1995 with similar expansions in other BRIC countries. More recently, Dalmon et al (2019) estimated the impact of institutional selectivity on student achievement gains (ENADE controlling for ENEM) in seven university programs of study in 2014. The single most important finding is that the *lowest* quintile selective (as measured by ENEM scores of students attending) HE institutions in Brazil generally have a significantly lower value added than the next highest quintile selectivity institutions for students who could, by dint of their similar SES and ENEM test scores, attend the next highest selectivity institutions. This suggests that public funding in the form of tax credits for low-income students admitted to these lowest quintile selective HE institutions should be withheld to incentivize students to go to somewhat more selective institutions.

Fonseca (2019) finds similar results for value added measured by earnings gains for Brazilian students attending HE institutions of different levels of selectivity. She was able to merge data from ENADE and ENEM with RAIS data to estimate the impact of HE selectivity on earnings gains and employment in the formal labor market.

Impact of Mid-level Management on Student Outcomes

A third important set of research findings by Lemann Center researchers shows that middle-level educational management–namely at the state's sub regional level–can have a significant impact on test score gains in Brazil's middle schools. Felipe Recch's (2020) study of subregions in Sao Paulo's state educational system used the SP state test results to estimate student learning gains (value added) in middle school (6th to 9th grades) for three cohorts of students in all the state's subregions in the second decade of the 2000s. He interviewed administrators in the five highest-gain subregions and the five lowest-gain subregions using a management protocol developed by Nicholas Bloom, a Stanford economics professor. The protocol allowed Recch to classify various management characteristics of subregion administrators in the ten regions. Recch found that there were significant differences in educational management in these higher and lower gain regions–namely, that subregion managers in the higher gain regions were much more likely to keep close tabs on school principals and were more likely to get involved in assisting principals with managing their schools.

Lemann Center studies in other states (Ceará and Pernambuco) have shown less of a relationship between subregion management and 5th to 9th grade test-score gains. One hypothesis is that in these Northeastern states, a much smaller proportion than in Sao Paulo of middle schools are under state management. Therefore, we would expect to find a much weaker relationship between subregion management characteristics and middle school outcomes. Further research in these two states (focusing on 9th to 12th grade gains) and in Minas Gerais is currently continuing to explore the subregion management-learning outcome.

The Lemann Center also partnered with Instituto Unibanco to interpret and further rework Instituto Unibanco' s impact evaluation of an ambitious intervention (*Jovem de Futuro*) aimed at improving school administration in four states (Espírito Santo, Rio Grande do Norte, Pará, and Piauí). The results of that analysis were presented as a Report to Instituto Unibanco in September 2021. There are ongoing discussions of continuing the collaboration with Instituto Unibanco in further joint research projects. These are discussed below.

Family Behavior and Mindset Interventions

A major research initiative of the Lemann Center focuses on providing parents with information and opportunities to improve their children's education. Many of these interventions emphasize the use of text message interventions and have been implemented as randomized controlled trials.

One of the forms of outreach took place in São Paulo in 2017. Our team designed and implemented a texting intervention to inform parents about their children's performance. Parents in the texting intervention received messages about students' attendance, students' assignments, and students' tardiness. The Lemann Center team developed a classroom monitoring system which would gather real-time data on these topics and then randomly



assigned parents into one of three conditions: a control which received general announcements about school events, a treatment group who received general information about the topics, and a treatment group who received personalized information. The treatments were separated by the level of detail. Some parents received messages personalized with data about their child specifically (e.g. the number of absences in the last three weeks) while others received more general information (e.g. class attendance is important).

Results showed that any information motivates parents to engage in their children's education. This increased participation led to an increase in students' academic performance by almost a full grade level. The results were stunning. Importantly, the messages that were general had the same impact as those that were highly personalized. This is important in that the latter requires the development of additional information systems. Not only does student performance need to be monitored, but the student information has to be integrated into a complex texting campaign. This can be costly. By contrast, the more general messages made attendance and performance more salient without any degree of personalization. Parents responded to this general information with a greater degree of oversight. Attendance and student performance improved.

Lemann Center researchers presented the study at numerous universities and academic conferences including dedicated seminars at FGV, Duke, Stanford, USP, University of Munich, University of Stavanger and USC. It has attracted attention both in Brazil as well as in other countries.

As an extension of the SMS campaign, the research team conducted additional work that provided opportunities for parents to "invest" in the SMS campaign. In conducting the follow-up survey, the research team offered a small phone credit for completing the survey. The research design allowed parents to decide whether to receive this credit directly or to invest their credit in their child by using it to enroll their child in the SMS program.

The results shed light on inequality in parents' investments. Wealthy parents were more likely to invest in their children, and among low-income families, those that stand to benefit the most (i.e. those with poor attendance and poor performance) invest the least. Even if parents just "feel poor" they invest less in their children. The study is important in that it shows that many families struggle to pay attention to potential investments in their children not because of affordability but because they are preoccupied by the impacts of poverty in their lives. Informational campaigns can neutralize the impacts of poverty, but they have to provide essential information in a timely manner, so it stays "top of mind" when parents have to make decisions. Early information be "top of mind."

The second set of projects focuses on *growth mindset*. During the 2019 school year, the Lemann Center fully piloted a growth intervention project in Rio de Janeiro high schools. The intervention was designed to test whether an internet-based training on growth mindset outperformed a lighter touch intervention which used text messages to convey information about growth

mindset. The predominant way in which growth mindset is trained involves an intensive internetbased training which the Lemann Center translated into Portuguese. In Brazil, internet access in schools can be inconsistent while text messages are available more broadly. Lemann Center researchers developed an alternative training method of improving mindset that could be implemented over text message.

In the pilot project, the computer-based model was stronger, but it was considerably more expensive. Moreover, most of the high school campuses which were included in the research sample that used the internet-based version of the training on growth mindset lacked the capacity to use the intervention (e.g. hardware was malfunctioning, internet access was not working).

The project was intended to roll out to scale during 2020. It included collaboration from international scholars (Mari Rege from University of Stavanger in Norway, David Yeager from University of Texas, Guilherme Lichand from University of Zurich). However, the project, based in Rio de Janeiro high schools, was severely impacted by the COVID-19 shutdown and the project had to be put on hold.

Despite the restrictions imposed by the COVID-19 pandemic, researchers were able to circumvent some of the challenges on reaching students after school closures through a new partnership, with São Paulo State's Secretary of Education, and a redesigned project. The revised project uses a randomized controlled trial to test whether the texting version of this intervention could influence student outcomes in a similar way to the original computer-based format.

In this project, Lemann Center researchers introduced two main separate conditions. Some students would receive the computer-based intervention at the school – replaced by a text message containing a link to an online version of it on their phones in the 2020 redesign; and others receive the content through text messages, broken down into small pieces of information to fit this format without having to rely on additional infrastructure, often unavailable. In all these treatments, our Lemann research team has enlisted help from Mari Rege and David Yeager, two of the foremost researchers on growth mindset.

Video conferences during the pandemic lockdown and their impacts on higher education students in Brazil

Catalyzed by the COVID-19 pandemic and the lockdown measures needed to contain it, videoconference use abruptly increased as schools, companies, and communities transitioned towards remote and hybrid meetings. Zoom, for instance, grew from 10 million daily users in 2019 to 350 million daily users by December 2020.

Relative to other forms of digital communication like texting and emailing, videoconferencing is better in communication cues: allowing people to see and hear others near-synchronously despite being physically distant. These features, however, may also make them exhausting. When



experienced for hours without breaks (e.g., while attending full-time education remotely), the cognitive effort required to attend to others' nonverbal cues while monitoring one's own may feel particularly draining.

Lemann Center postdoc Anna Carolina Queiroz, in collaboration with Stanford's Virtual Human Interaction Lab and Social Media Lab, developed the first scale to measure the phenomenon of Zoom Fatigue (ZEF)–the fatigue resulting from the frequent use of videoconferencing (Fauville et al., 2021a). She conducted 11 studies with more than 15,000 participants, investigating the mechanisms in Zoom Fatigue, and found that women feel more Zoom Fatigue than men. This gender difference mirrors greater anxiety, feeling physically trapped, hyper gaze, and producing nonverbal cues among women than men (Fauville et al., 2021b).

She then conducted a set of studies to translate, validate, and apply the ZEF Scale in Brazil and investigate how this phenomenon impacts Brazilian students and workers (Queiroz et al., 2021). She surveyed more than 500 higher-education students in Brazil, and the results replicated the gender effect found in the US, with women reporting 20.6% more fatigue than men. It was the first study targeting higher education, and her findings showed that students reported 16.7% higher levels of Zoom Fatigue than workers. These studies were broadly publicized in Brazil and internationally. Their findings contribute to the discussions of large-scale remote learning programs adoption and public policies in Brazil. These programs usually rely heavily on video conferences without considering their impact on fatigue, and public policies that include this practice should consider these findings.

Learning Sciences

Learning Analytics

The field of Learning Analytics—the study of student learning processes—has expanded greatly, and research at the Lemann Center has contributed significantly to the creation of the field itself, and its growth, especially in the study of multimodal data (gesture, eye-tracking, biosensors, etc.), the diversification of learning environments (MOOCs, classrooms, and hands-on learning environments.), and new types of research questions as researchers begin to consider a broader set of learning-related constructs (moving away, for example, from the focus on student retention.) (Blikstein, Merceron, & Siemens, 2015).

New techniques and frameworks introduced by Learning Analytics and educational data mining have made possible the analysis of open-ended, hands-on, engineering design tasks that are becoming increasingly prevalent as educators are adopting this approach in order to teach students real-world science and engineering skills (e.g., the "Maker Movement") (Blikstein, 2013; Worsley & Blikstein, 2014). Importantly, the use of multimodal learning analytics (MMLA) can offer new insights into student learning trajectories in more complex and open-ended learning environments, with several educational applications (Blikstein, P. & Worsley, M., 2016).

This research argues persuasively that the debate between the direct instruction approach to teaching-learning and the constructivist approach has been difficult to settle because the former is easier to test and quantify using currently available tools rooted in psychometrics and standardized testing strategies and the constructivist approach has no comparable quantitative method to measure learning outcomes. Blikstein proposed that Learning Analytics could equalize the playing field by developing methods that examine and quantify non-standardized forms of learning.

This research suggests that these techniques provide unprecedented insight into the minute-byminute development of several activities, especially when they involve multiple dimensions of interaction and social interaction. For example, *multimodal learning analytics* could coalesce these multiple techniques in order to evaluate complex cognitive abilities, especially in environments where the process or the outcome are unscripted. The research provides a number of examples of text analysis, speech analysis, handwriting analysis, eye-gaze analysis, sketch analysis, and even action and gesture analysis, as well as affective state analysis as ways to delve into learning processes that are not amenable to evaluation of student learning through written tests.

Technology in Education and Maker Education

A second important area of research in the Learning Sciences undertaken at the Lemann Center is the description and assessment of Makerspaces and FabLabs. Research at the Lemann Center by Blikstein and his students about digital fabrication as a learning tool and how it can contribute to teaching science and engineering has played a leadership role in this field in Brazil. As such, Blikstein' s team developed the first validated assessment instrument for exploratory and fabrication technologies, as well as the first series of studies on the "cognition of construction."

Co-edited by Blikstein, a series of books on *"Tecnologia e inovação na educação brasileira"* was organized in collaboration with various Stanford Lemann Fellows (Scholars, Postdocs and Graduate Students). These volumes feature selected work by more than 100 Brazilian practitioners, researchers, and entrepreneurs, and give an overview of the current state of technology in education through compilations of innovative experiences in Brazilian education, such as educational robotics, digital games, physical computing and computer science education.

Technology Uses in Education

Research at the Lemann Center has also led in the field of tools and frameworks to support productive uses of technology in education. An example is Bifocal Modeling – a technological and pedagogical framework to enable students to connect computer models and sensors in real time, as to validate, compare, and refine their models using real-world data, through the combination of physical experimentation and virtual modeling to support students' learning in science links student-designed experiments and computer models in real time. By comparing virtual models with physical experiments, students encountered "discrepant events" that contradicted their existing conceptions and elicited a state of cognitive disequilibrium. This experience of conflict



encouraged students to further examine their ideas and to seek more accurate explanations of the observed natural phenomena, improving the design of their computer models (Blikstein, P., 2014; Blikstein, P., Furhmann, T., & Salehi, S., 2016). This work was also recognized with a CAREER award—one of the most prestigious grants by the National Science Foundation—and several others. It has also been implemented in several Brazilian schools.

Learning in the Metaverse (Virtual Reality)

There has been interest in using VR in education since the 1960s. Still, because of technological and cost barriers, both research and applications of VR were restricted to a few university labs or companies in developed countries (Queiroz et al., 2018a, b, c). VR research and implementation have been almost nonexistent in developing countries until recently. However, this has been changing as high-tech industry increased investment in VR devices and content development (Queiroz et al., 2018a, b, c).

Reviews of VR research groups in Brazil showed that few scholars were investigating educational applications, and none of them studied the mechanisms underlying learning or learning assessments using VR (Queiroz et al., 2018d). Hence, before implementing VR at scale in Brazil, we conducted several theoretical and experimental studies to develop the knowledge base and theoretical depth and gather scientific evidence to provide a roadmap for future VR implementation and research targeting Brazilian education. Given the social impact component of the projects targeting education in Brazil, this step was critical to assure that we would bring Brazil effective VR experiences and high standard VR research practices.

From a theoretical standpoint, a systematic literature review found that despite VR's possibility to track body and eyes' movements, enabling the development of objective measures of learning, most studies used subjective quantitative data to assess learning (Queiroz et al., 2019). Hence, to advance studies in objective measures of learning assessment in VR with large samples, we developed partnerships with and implemented VR stations in dozens of educational institutions worldwide (museums, aquariums, universities, and schools). Preliminary results of a study testing the pedagogical aspects of the experience on learning indicate that the movement VR allows during the experience positively influences self-efficacy, which is known to impact learning positively (Queiroz et al., 2020).

To translate these studies to the cultural, social and economic conditions in Brazil, we developed partnerships with several non-profits organizations to a) develop educational VR content depicting the Brazilian environment and culture; b) implement VR at scale in public schools in low-income communities in Brazil; c) offer innovative educational experiences to K-12 students from marginalized areas and d) evaluate how the results she has been finding worldwide translate to the Brazilian population and reality.

In collaboration with the University of São Paulo, Queiroz and Eloy investigated the drivers and career effects of AR and VR development by Brazilian K-12 students who submitted projects to FEBRACE, a national science fair (Eloy et al., 2022). The results showed a significant role of

vocational schools in developing the skills needed to create AR and VR. Also, it showed a lack of teachers' preparation in dealing with immersive technologies and the importance of informal learning and low-cost learning materials in developing programming skills.

Partnering with non-profit organizations and municipal governments of the five geographic areas of Brazil, we are bringing educational VR experiences to Brazilian K-12 public schools in low-income and indigenous communities. It is one of the largest field studies using VR in K-12 education in the world, involving approximately 11 thousand students from a diverse population. Preliminary results are similar to what we found in other countries: participants report higher self-efficacy after the VR experience compared to lectures. These results may have important implications for equalizing gender differences in science interest and increasing women's participation in STEM professions.



Outreach

From the beginning, the Lemann Center has been deeply committed to working closely with Brazilian partners, both as a guiding principle and as a strategic necessity. We have invested a substantial share of our resources—monetary and otherwise—to building and supporting networks and partnerships that extend and amplify the Center's capacity and impact, and these investments have yielded spectacular returns. We have strong and active relationships with a wide variety of individuals and organizations that share our mission of working to support improvement in Brazil's education system. Key partners include our students, alumni, and fellows; an extensive network of friends and colleagues in diverse roles and institutions; multiple state and municipal governments; federal agencies including MEC, INEP, CAPES, IPEA, and ENAP; dozens of federal, state, and private universities; and many of the most powerful and influential institutions working on educational issues in the third sector. The pandemic put many of our outreach activities on hold, but as we move into our second decade, the Center will continue to expand and strengthen our networks and partnerships, which we recognize as a critical asset in our efforts to foster innovation and improvement in Brazilian education.

Lemann Center Networks

The foundation for the Lemann Center's outreach efforts in Brazil is our network of students, alumni, and former fellows, nearly all of whom remain in regular contact with the Center and many of whom participate actively in Center projects and events. Our alumni now occupy a wide variety of key roles in Brazil's education system, where they provide support for the Center's initiatives, identify new opportunities for the Center to advance our mission, and encourage their colleagues and friends to pursue degrees or fellowships at Stanford. In the past two years several of our alumni have worked directly with Center faculty and staff on our recruitment project (described elsewhere in this report), which has led to significant diversification in the pool of students that we recruit and enroll.

The Center's Visiting Fellows program has attracted educational leaders and innovators from multiple sectors, including academics, entrepreneurs, policymakers, and public servants at all levels of the political system. As with our alumni, many of our former fellows have continued to serve as "ambassadors" for the Center, introducing us to new networks and opportunities, and several of them remain deeply engaged in the Center's activities.

State and Municipal Partnerships

A central element in the Lemann Center's strategy to support improvement in Brazil's education system is support for policy research, evidence-based policy innovation, and rigorous policy evaluation. To advance this part of our mission we have established partnerships with

Secretarias de Educação in multiple states and with several municipal Secretariats as well. The current state of these partnerships ranges from preliminary conversations to full-scale data-sharing agreements to active cooperation in reform initiatives. At the state level our most fruitful and sustained partnerships have been in Paraná, Pernambuco, and São Paulo; at the municipal level we have made significant progress in the city of São Paulo, and we have worked directly with municipal authorities in Sobral to support reforms in science education.

As with many things in Brazil, the depth and durability of partnerships with state and local governments depends to a very large extent on continuity in political leadership and policy priorities. CONSED and UNDIME were established at least in part to foster stability and consistency in education policy, and the Center remains committed to working with both organizations to build their capacity to support effective reforms and lasting improvements in the performance of state and municipal schools.

Partnerships with Federal Agencies

While much of the energy supporting educational innovation and improvement resides in state and local education systems, administrative and financial control nevertheless remains highly centralized at the federal level. Since its founding the Lemann Center has worked diligently to establish partnerships with many of the federal agencies that manage key elements of Brazil's education system. We have organized frequent meetings and seminars with Ministers of Education, with Ministry staff, and with members of the CNE. We have worked with successive directors of INEP on issues related to data management and data access, and with leaders and staff at IPEA to develop projects of mutual interest. We have worked with CAPES to increase support for Brazilian students seeking degrees at Stanford, and we have engaged in long-term and ongoing discussions with ENAP about building training programs for leaders and administrators in the education sector. Public servants employed by MEC, CAPES, IPEA, ENAP and INEP have spent time at Stanford either as students or as Visiting Fellows.

The depth of our conversations with these and other federal agencies and the strength of our relationships with them waxes and wanes with changes in political leadership, but the Center recognizes these partnerships as an essential element in our work to support long-term improvement in Brazil's education system.

University Partnerships

In higher education most of the Lemann Center's partnerships are with individual faculty members and specific research teams, but we have established some institutional partnerships as well. The largest number of these are with the more than 20 federal, state, and private universities that participate in the PED program. In addition to these, the Center has a formal partnership with the Instituto de Estudos Avançados at USP to exchange visits and to develop joint projects. The Center Directors have met with education faculty in federal and state



universities in Ceará, Goiás, Pernambuco, São Paulo and other states to discuss the Lemann Center and its work, and we have worked closely with other Lemann-funded universities to increase the utility and impact of the annual Lemann Dialogues.

Third-Sector Partnerships

The Lemann Foundation is self-evidently the Center's most important partner, and we are grateful for the Foundation's ongoing support and the opportunities that it presents for regular consultation and cooperation on topics of shared interest. Over the course of the past decade, we have developed relationships with other third-sector institutions, and we expect to build on these in our second decade.

Apart from the Lemann Foundation the Center has established our most significant relationships with *Instituto Unibanco* and *Instituto República*. IU has partnered with the Center and with D3e on joint research projects, and we expect that these initial efforts will lead to further cooperation on topics including the impact of improved management on educational performance in years to come. *Instituto República* provided funds to support students in the Center early in our history, and we are currently engaged in discussions with them about how to expand their current focus on leadership training in the public security and public health systems to include training for leaders in the education system.

We will continue to explore partnerships with other organizations in the third sector including *Itaú BBA, Instituto Natura, Instituto Sonho Grande* and others as opportunities arise.

Other Outreach Activities

Between 2011 and 2018 the Lemann Center organized an annual seminar in São Paulo to address current topics in Brazilian education and to introduce prospective students, fellows, and partners to the work of the Center. In several years these seminars were followed up with visits to Brasília, where Center faculty met with Ministers, senior officials in federal agencies, and legislative leaders to discuss policy issues and explore potential areas of cooperation. The topics discussed in São Paulo and Brasília included multiple issues related to educational technologies, educational finance, the development, and implementation of the BNCC and the Reforma do Ensino Médio, early childhood education, and the initial and continuing training of teachers. These seminars also provided the occasion for "reunions" with Center alumni, helping us to maintain and strengthen ties with our former students and fellows in Brazil.

The Center has organized other meetings in addition to these annual seminars. In 2014 Stanford hosted the Lemann Dialogue, which that year brought together an eminent group of Brazilian educators, academics, and policymakers to discuss the challenges facing Brazil's education system. In 2016 the Fablearn conference (ordinarily convened at Stanford, with some Brazilian

participation) was held in Brazil, attracting over 300 participants. The Center hosted the Lemann Dialogue for a second time in 2018.

The Directors of the Center travel frequently to Brazil to give speeches, participate in conferences and other events, and meet with current and prospective partners. The Center also hosts frequent visits from Brazilian politicians, policymakers, entrepreneurs, and others who are interested in learning more about the work that we do at Stanford. In several instances these visits have led to the establishment of long-term partnerships.

Summary

Despite the disruptions and obstacles to travel brought about by COVID-19 the Lemann Center has continued our work to engage new partners and new audiences in our work. Over the past two years the Directors have participated in a variety of on-line events addressing the educational consequences of the pandemic and other critical issues in Brazil's education system. As the pandemic draws to a close, we expect to resume regular travel to Brazil, and to expand and strengthen our partnerships with individuals and organizations who share our commitment to support improvement in Brazil's education system.























































Impact of the Lemann Center on the Stanford Graduate School of Education and the University at Large

The greatest impact that the Lemann Center has on the Graduate School of Education is through the Brazilian students who come and study in the various programs of the GSE. They bring a different perspective to educational problems, enriching the classes they attend. Feedback from GSE professors not connected with the Lemann Center consistently gives very positive feedback about the quality of Lemann fellows in classes. In addition, the Lemann Center has involved a number of GSE professors in Lemann Center activities, whether presenting in the "Topics in Brazilian Education" course, contributing to D3e policy papers, presenting in the two Lemann Dialogues that have been held at Stanford, or coming to the Lemann Center/Lemann Foundation meetings in Brazil. Stanford GSE Professors Bryan Brown, Sean Reardon, Rachel Lotan, Linda Darling Hammond, Prudence Carter, Michael Kirst, Deborah Stipek, and Thomas Dee have all participated in Lemann Center events in Brazil. Jennifer Langer, a specialist in math education, participated in developing a protocol for the evaluation of PED math videotapes.

Several Stanford professors from outside the GSE have also been involved in Lemann Center activities. These include Ram Rajagopal in the engineering department, Nicholas Bloom, from the economics department, and Jeremy Bailenson, Woods Institute for the Environment.

Furthermore, a committee of the university, in a report prepared for the Board of Trustees on the role that Stanford should play globally, featured the Lemann Center as one of several outstanding examples of how Stanford should interact with other countries in research and development projects. The report's summary of Lemann Center activities and the lessons the University can learn from them, are shown in Appendix C.

Lessons Learned from the First Ten Years

Lessons about Human Resources

- The Lemann Center began training students on a small scale in 2010-11, but gradually increased the numbers, so that MA graduates eventually averaged almost 5 per year. In addition, the Center will have produced 10 PhD graduates in the first ten years plus a number of MBA/MA graduates. Beyond this, a very large number of visiting scholars and student scholars experienced Stanford's academic and innovation environment. The lessons learned from investing in so many kinds of training programs begin with *a strong reaffirmation of the importance of exposing the next generation of Brazilian education leaders to a high-quality academic experience and a flood of innovative ideas at a place such as Stanford.* The vast majority of our degree graduates and visiting scholars/student scholars learned skills at Stanford that helped make them better innovators, educational policymakers, scholars, and leaders, and they have been able to put these skills successfully into practice in a political environment that was not always conducive to constructive change.
- A lesson learned from training individuals in a wide variety of programs was that success in meeting the major objective of enhancing the quality of educational leadership in Brazil varied across investment programs. Most MA graduates from the Graduate School of Education returned to Brazil and made almost immediate contributions to some aspect of improving education through NGOs, state governments, and EdTech start-ups. As many as ten entered PhD programs (four at Stanford)—one of them, Raquel Guimarães, took her PhD in Brazil and became a professor at the Federal University of Paraná. Although the record of Stanford MBA/MA graduates and Stanford PhDs returning to Brazil is spottier, some of them, such as Joice Toyota (MBA), Erica Butow (UC Berkeley MBA), Ana Paula Pereira (MA/beginning MBA), Tássia Cruz (PhD), and Luis Grochocki (PhD) are playing very important roles in the education sector. This will likely also be the case for more recent arrivals, such as Lucas Giannini (MBA/MA), Izabel Fonseca (PhD), Leonardo Rosa (PhD), and Bárbara Born (PhD). Another Recent PhD, Filipe Recch, is helping run the Lemann Center at Oxford.
- Our mixed success in returning our graduates to Brazil suggests that we need to be more thoughtful and deliberate in how we recruit students and how we structure incentives for them. This raises a third lesson we have learned. If we are to be helpful to our PhD graduates in gaining academic positions in Brazil to play leadership roles in policy research, we have to be more systematic in bringing them into Brazilian academic networks. One way is to engage them in more academic conferences in Brazil, help them



get their research published in US academic journals while still at Stanford, and develop more extensive academic networks in Brazil (see below).

- Another lesson learned is that a relatively inexpensive program of bringing visiting scholars and student scholars as Lemann Fellows to Stanford seems to have had a very high return in developing a network of individuals "enhanced" by the Stanford experience and becoming more productive in their policy and academic positions in Brazil. Many of them have continued to participate in Lemann Center forums and seminars and have engaged in a wide array of activities around improving education in Brazil. One visiting program (iSTEP) brought about 50 educators interested in teacher education to Stanford for an annual intensive, one-week international seminar on the teacher education program at Stanford over eight years, but seemingly failed completely to achieve its purpose of generating similar programs in Brazil. Yet once the Lemann Center-with the help of the Foundation—took direct action to establish partnerships with Brazilian universities to train teacher educators in Brazil itself (the PED program) and to develop Instituto Canoa to manage that training, even iSTEP ultimately had some positive impact on this process. Because so many educators had come to iSTEP over the years, there was more familiarity with the PED concept and greater receptivity to PED once it got going. There were even the remnants of one iSTEP-type program at Positivo University that had been started by an iSTEP participant. So, the iSTEP investment did not achieve what we had hoped, but it may have "paved the way" for the successful innovation of PED and potentially other initiatives.
- It was a relatively low cost project to greatly increase the number of applications to MA and PhD programs at Stanford. As explained, we were able to triple the number of applications by organizing large, informational Zoom meetings in which MA program directors at the GSE explained their programs and what they were looking for in applications. We also organized Zoom meetings with experts on the TOEFL. Nevertheless, we also learned that increasing the number of applications from underrepresented groups is more difficult, requires a longer timeline, and requires more emphasis on English requirements. At the same time, we have learned the hard way that we need to be in constant touch with the MA directors and GSE admissions staff early in the process to assure that all diversity applicants have correctly completed application requirements.
- We also learned that investing in post-doctoral students was very productive in increasing research at the Center and providing help to our MA and PhD students. In the case of Filipe Recch, we were even able to pay part of his salary through an interesting and successful joint research project with *Instituto Unibanco*, which had the important side effect of creating an excellent relationship with IU and continued cooperation on a new project beginning in 2022.

Lessons about How a U.S. University Can Help Develop Innovative Programs in Brazil

 During the past ten years, the Lemann Center established a number of innovations in science and engineering education within the context of constructivist education methodologies, as well as developing a state-of-the-art teacher education program focused on changing teacher professional development in Brazilian universities (PED) and an educational policy center focused on bridging the worlds of evidenced-based academic policy research on education and public policy making (D3e).

How were we able to do this? As the iSTEP annual seminar experience proved, just *showing* motivated Brazilians how a program works was not enough. All three innovations required four elements: (a) a well-researched idea with a solid theoretical basis; (b) a sizable start-up investment; (c) the right team in Brazil dedicated to implementing the idea and carrying out the complex process required for it to be successful; and (d) continued commitment by the Lemann Center to provide technical assistance even as innovations moved into maturity and new sources of external financing. Each innovation was adapted specifically to the Brazilian context, and the reason that could happen is that it was implemented by a team of Brazilians. Furthermore, in the case of PED and D3e, Brazilian governing boards were established to advise and monitor the programs.

• The Lemann Center also established and attempted to establish several partnerships with state governments, mainly to undertake education policy studies using state education and other data. These have worked quite well but don't have the structure and thus sustainability of D3e, PED, or the Sobral science education projects, mainly because they only have one or perhaps two of the four elements listed above. They allow us to perform the data analysis and draw policy inferences, but not to work closely with the State Secretary to help in evidence-based policy, which should be the ultimate goal in improving educational decision-making at the state level. We need to take the lessons learned from our successful projects and apply them in the future to our partnerships with states.

Lessons about Successfully Engaging Brazilian Academics

One important objective of the Lemann Center is to develop close relationships with various groups of Brazilian academics. Through PED and D3e, we have achieved some success in developing such relationships under the auspices of those programs. Paulo Blikstein has also developed close contacts in the Maker and FabLab community. The lesson we have learned is that successfully engaging academics in Brazil, just as in the U.S. or anywhere else, requires working projects. In the D3e and PED cases, such engagement is built into the structure of the programs. Indeed, PED has built a network of the teacher educators trained in PED seminars, and the plan is to develop research projects to study the teaching process with that network. D3e relies on academics to write D3e policy briefs, thus necessarily engages academics in the D3e



project. Through its visiting scholar program, the Center has also developed ties to many Brazilian academics, but we have been less effective in following up with most of these scholars in developing continued collaborative arrangements. This probably requires a more systematic effort to sustain this network.

Envisaging the Next Ten Years (2022-2031)

Over the past ten years the Lemann Center has played an increasingly central role in the Graduate School of Education and in the University more broadly. The Center has been recognized by Stanford as an exemplary international center, and a model for others building international partnerships. We have graduated students from all four of the GSE's MA programs operating during this period (the Educational Data Sciences program only started up in 2021). Most students graduated in Learning Design and Technology and International Comparative Education, along with several students in the MBA/MA in Education program and two in POLS. The vast majority of our students and fellows have returned to Brazil to continue their work to improve Brazil's education system.

As we begin our second decade, we reaffirm the Center's mission to support improvement in Brazil's education system in collaboration with our students, alumni, and other Brazilian partners. We have already accomplished a lot, and we are only getting started.

In our first decade the Lemann Center for Entrepreneurship and Innovation in Brazilian Education launched multiple projects and lines of research in response to perceived needs and opportunities for improvement in Brazil's education system. Even as we anticipate significant changes in leadership in the next few years, we fully expect that the Center's commitment to develop and promote innovative approaches that address the many educational challenges that Brazil faces will persist and flourish. Several new initiatives are already underway, and we will continue to build on the work that we have already begun, but the support that the Center receives from the Lemann Foundation makes it possible for us to remain agile and adaptable as new challenges and opportunities arise.

One issue on which we have already begun to focus our resources and attention is the worldwide challenge of reducing social, racial, and gender inequality in education and work. The Lemann Center is working closely with the Lemann Foundation and other partners to expand and diversify the pool of candidates that we attract to our programs, with some success, and we plan to strengthen our efforts to recruit and enroll a more diverse group of students and fellows in our second decade. To take a single example, lack of fluency in English is a critical obstacle for many poor and Black Brazilians who are otherwise prepared to succeed at Stanford, and we are exploring strategies that would allow us to support these students before they apply to the GSE.

An important change from the past ten years that already began in 2021 is to offer fellowships to Brazilian students applying to a greater diversity of MA programs. All but two Lemann fellowships in the past went to MA students in International Comparative Education (ICE), Learning Design and Technology (LDT), and the MBA/MA in Education (for students accepted into the MBA program). In 2022, students admitted into ICE, LDT, the MBA/MA program, plus the



Policy, Organization, and Leadership (POLS) program, and the new Education Data Sciences (EDS) programs will be eligible for Lemann funding. Since we are now receiving many more applications to the GSE from Brazil thanks to our recruitment efforts, we will need to be much more strategic in our funding, especially since our policy has been to provide admitted students a high fraction of the total cost of attending Stanford.

In addition to the Center's recruitment project, we expect to greatly expand our commitment to research on issues related to social, racial, and gender inequality, both by encouraging our MA and PhD students to pursue research in this area and by supporting work on educational inequality in Brazil by our colleagues at Stanford and beyond. We have already reached out to several colleagues in the Race, Inequality, and Language in Education (RILE) program in the Graduate School of Education to encourage them to expand the scope of their research to include Brazil, and our new grant from the Foundation includes funds that will allow us to expand our outreach to faculty across the Stanford campus.

The outreach program should be designed to create longer term partnerships with faculty within the GSE and in other departments that would contribute to more diverse research on Brazil at Stanford. There are several possibilities for such new partnerships, such as with the King Center in the economics department/business school, whose faculty focuses on economic development, poverty, health, and human resources issues. and with faculty in the Stanford Woods Institute for the Environment, which is an interdisciplinary research center drawing mostly on faculty from the School of Engineering.

The future direction of the Center's research will also be influenced by the two new faculty hired under the new Lemann Foundation gift. One of these faculty will almost certainly be involved in research on early childhood education, an extremely important area of research into the reduction of inequality in K-12 education, as well as continued Center research into the impact of interventions in affective skills at all levels of education, including student mindset and student-parent-teacher interactions. The other faculty hire is intended to focus on research into the direction being taken by the PED program in Brazil, which has established a commitment to evaluate and study the teaching process in Brazilian schools and the relationship of teacher preparation and the taught curriculum to student engagement and student learning. This is an understudied area internationally, and the research infrastructure built by the Lemann Center over the past ten years could result in some important breakthroughs in our understanding of teacher education, changes implemented at the classroom level, and the impact of those changes on student outcomes.

In the past few years, the Lemann Center has established partnerships with several state and local governments including Ceará, Paraná, Pernambuco and São Paulo that provide access to data for research by Center faculty and students. Analyses of these data have provided the basis for research projects that have produced new evidence with powerful implications for educational policy and practice. Brazil is rich in data from standardized assessments, school census and other sources, but making these data useful for research requires a lot of work;

integrating and standardizing data from multiple sources requires even more. In the coming decade the Center will work with partners including INEP and CAED to expand the network of federal agencies, state and municipal governments, and universities that are prepared to make data available for research and analysis, with the goal of building a comprehensive educational data system. We have also begun to explore the possibility of arranging internships that would allow our students to work with our Brazilian partners (state and local governments, third-sector organizations) on projects of mutual interest including analyses of state and local data to inform policy choices.

Another productive direction that the Lemann Center has begun to take in its research program is to investigate the role of leadership, management, and policy continuity in supporting educational improvement. Quantitative and qualitative research by Center faculty, students, and partners has identified differences in leadership and management as important determinants of differences in educational performance, while work conducted under the auspices of D3e points to policies related to the training, recruitment, and placement of school-level leaders as key obstacles to sustained improvement in Brazilian schools. As we move forward the Lemann Center will build on our initial research to sharpen our understanding of why and how management and leadership affect school performance, while working simultaneously with partners including PED, the Lemann Foundation and Instituto Unibanco to develop strategies and programs aimed at strengthening training and support programs for administrators at all levels of Brazil's education system.

Finally, we believe that in the next ten years, Brazil will witness significant changes at the secondary education level—*Ensino Médio*. With the new law establishing the possibility for students to elect a vocational track and the responsibility for states to establish the parameters of that track and how to implement it, it appears that there will be considerable variation in how students are prepared vocationally and more generally in changes to secondary education across states. The implications for such variation for the school to higher education transition and the school to work transition are—for the moment—a black box, but it is likely that since about forty percent of students are already indicating a preference for the vocational option, the outcomes for students could vary greatly from state to state. When combined with the trend toward full-day secondary schools in Brazil, which has already been an object of study at the Lemann Center, this unique "Brazilian experiment" in reforming secondary education could be very informative for understanding how educational variation affects educational and social mobility. We will likely make these changes in secondary education an important focus of our future research.






APPENDIX A: List of Research Publications

Research Publications and Working Papers from The Stanford University Lemann Center for Educational, Entrepreneurship, and Innovation in Brazil, 2013-2021

EDUCATIONAL POLICY

Books

Carnoy, M. et al. (2013). *University Expansion in a Changing Global Economy: Triumph of the BRICs?* Stanford, CA: Stanford University Press. In Portuguese, CAPES, 2015.

Gadotti, M. and Carnoy, M. (eds.). (2018). Reinventando Freire. São Paulo: Instituto Paulo Freire.

Tarlau, R. (2018) Occupying Schools, Occupying Land: How the Landless Workers Movement Transformed Brazilian Education. Oxford University Press).

Carnoy, M. (2018). *Transforming Comparative Education: Fifty Years of Theory Building at Stanford*. Stanford University Press.

Dalmon, D., Siqueira, C., and Braga, F.M. (2019). *Políticas Educacionais no Brasil: o que podemos aprender com casos reais de implementação?*

Woessman, Ludger, and Eric Bettinger (2020) New Directions in the Economics of Higher Education. Edward Elgar Publishing.

Carnoy, M. (2021). The Political Economy of Education. Submitted for publication.

Dissertations

Cruz, Tássia (2015). The Teacher Labor Market in Brazil. Unpublished PhD dissertation, Graduate School of Education, Stanford University.

Marotta, Luana (2017). The influence of school-related factors on educational outcomes in Brazil. Unpublished PhD dissertation, Graduate School of Education, Stanford University.

Nina Menezes Cunha (2018). Educational Policy and Causal Inference: Empirical Evidence from Brazil. Unpublished PhD dissertation, Graduate School of Education, Stanford University.



Costa de Fonseca, Izabel (2019). Structural Inequalities in Education and their Impact on Student Achievement and Earnings in Brazil. Unpublished PhD dissertation, Graduate School of Education, Stanford University.

Rosa, Leonardo (2019). The organization of educational markets and effects on individual decisions: An empirical analysis using Brazilian educational policies. Unpublished PhD dissertation, Graduate School of Education, Stanford University.

Recch, F. (2020). Going beyond classrooms and schools–institutional influences on student achievement: How do institutional aspects of complex educational systems affect student learning. Unpublished PhD dissertation, Graduate School of Education, Stanford University.

Grochocki, L. F. de Miranda (2020). Academic endogamy, faculty mobility and scientific networks: Impacts on knowledge production. Unpublished PhD dissertation, Graduate School of Education, Stanford University.

Articles

Carnoy, M., Khavenson, T., Fonseca, I., Costa, L., Marotta, L. (2013). Is Brazilian Education Improving: A Comparative Foray Using PISA and SAEB Results. *Cadernos de Pesquisa*, 45(157).

Carnoy, M., and Loyalka, P. (2014). Quem São e Como São Treinados os Alunos dos Programas de Engenharia e Ciência da Computação nos Países BRIC. In Pereira Pires de Oliveira, M. et al (eds.), *Rede de Pesquisa, Formaçao et Mercado de Trabalho, Volume V, Educacao Superior*. Brasilia: IPEA: pp. 41-74.

Costa, L. and Carnoy, M. (2015). The effectiveness of an early grades literacy intervention on the cognitive achievement of Brazilian students. *Educational Evaluation and Policy Analysis*, 37(4): 567-590.

Cruz, T. & Santana, R. N. (2015). Educação no Brasil Central: Por que cooperar? *Conjuntura Econômica Goiana*., v.35, p.29 / artigo 03 - 42, 2015.

Tarlau, R. (2015). How Do New Critical Pedagogies Develop? Public Education, Social Change, and Landless Workers in Brazil. *Teachers College Record*, 21.

Bettinger, Eric, Jing Liu, and Susanna Loeb (2016), "Connections Matter: How Interactive Peers Affect Students in Online College Courses" Journal of Policy Analysis and Management 35(4): 932-954.

Carnoy, M. (2016). O Brasil separa o que acontece na universidade da prática que acontece nas escolas. *Um Brasil.*

Plank, D., Daro, P., & Carmichael, S. (2016). Base Nacional Comum Curricular, "Common Core" Curriculum. Stanford University Lemann Center Working Paper.

Blikstein, P. & Hochgreb-Haegele, T. (2016). Base Nacional Comum Curricular, "Common Core" Curriculum II. Stanford University Lemann Center Working Paper.

Recch, F. (2017). Federalism and the Provision of Public Education in Brazil. Lemann Center Working Paper.

Marotta, L. (2017). Peer Effects in Early Schooling: Evidence from Brazilian Primary Schools. *International Journal of Educational Research*, 82.

Cunha, N. M. (2017 revise and resubmit). Parents: substitutes or complements to the school environment? *Journal of Human Capital.*

Cruz, T. (2018). Teacher Hiring Decisions: How do Governments React to an Exogenous Redistribution of Education Funds? *Economics Of Education Review*, pp. 1 – 50.

Cruz, T., Loureiro, A., & Sá, E. (2017). Full-time teachers, students, and curriculum: the single-shift model in Rio de Janeiro. *World Bank Policy Research Working Paper.*, v.1, p.1 - 39, 2017.

Carnoy, M., Marotta. L. Louzano, P., Khavenson, T., Recch, F., and Carnauba, F. (2017). Intranational Comparative Education: What State Differences in Student Achievement Can Teach Us about Improving Education—the Case of Brazil. *Comparative Education Review*, 61(4).

Tarlau, R. (f2018). State Theory, Grassroots Agency, and Global Policy Transfer: The Life and Death of Colombia's *Escuela Nueva* in Brazil. *Comparative Education Review*.

Bruns, B.; Costa, L.; Cunha, N. M. (2018). Through the looking glass: can classroom observation and coaching improve teacher performance in Brazil? *Economics of Education Review*.

Marotta, L. (2018). Teachers' Contractual Ties and Student Achievement: The Effect of Temporary and Multiple-School Teachers in Brazil. (Revise and resubmit in *Comparative Education Review*)

Recch, F. (2018). Avaliando a competitividade das candidaturas não-brancas a partir da regressão quantílica na disputa para a Câmara dos Deputados de 2014. Date of submission: *Brazilian Political Science Review*. Revise and Resubmit.

Cruz, T. & Moraes, T. (2018). Minimum Spending in Education and the Flypaper Effect. Stanford University: CEPA Working Paper Series, 2018.

Recch, F. (2018). Meso-Level Management and School Value Added: Evidence from The State of São Paulo, Brazil. Stanford Lemann Center Working Paper.



Rosa, L. (2018). Teacher Preferences in Developing Countries. Work in progress.

Bruce, R. and Rosa, L. (2018). Full-day high schools and their effects on homicides and teen pregnancy. *Work in progress*

Rosa, L. (2018). Government subsidies for education and their effects on high school demand and supply *Work in progress*.

Berthelon, M., Bettinger, E., Kruger, D.I. et al. "The Structure of Peers: The Impact of Peer Networks on Academic Achievement" Research in Higher Education (2019). https://doi.org/10.1007/s11162-018-09543-7. [equal authorship].

Dalmon, D.L., Fonseca, I., Pondé Avena, C., Carnoy, M., & Khavenson, T. (2019). Do students make greater achievement gains in some higher education institutions' programs than others? Insights from Brazil. *Higher Education*.

Rosa, L., Martins, M., & Carnoy, M. (2019) Achievement Gains from Reconfiguring Early Schooling: The Case of Brazil's Primary Education Reform. *Economics of Education Review*.

Machado, Carlos Augusto; Campos, Luiz Augusto; Recch, Filipe. (2019) Evaluating the Chances of Black and Brown Candidates through Quantile Regression Analysis of Brazil's 2014 Congressional Elections. *Brazilian Political Science Review*, v. 13, p. 1-31.

Vieira, S.; Plank, D.; Vidal, Eloisa. (2019) Política educacional no Ceará: Processos estratégicos. *Educação e Realidade*, 44 (4), 1-24.

Recch, F. (2020). Mid-level educational management practices and student performance gains: Evidence from the state of São Paulo, Brazil. Lemann Center Working Paper.

Castilho Rodrigues, E. (2020) Educational Inequalities in Metropolises: Territory, Socioeconomic Status, Race, and Gender.

Coelho, R. (2020) Teaching writing in Brazilian public high schools. *Reading and Writing*, 33, 1477-1529.

Grochocki, L.F.M. (2020) More of the Same? The Structure of Research Collaboration Networks in Homogeneous Academic Environments. (Under submission to *Social Networks*)

Grochocki, L.F.M. (2020) Academic Endogamy or Immobility? The Impact on Scholarly *Productivity* (Under submission to International Journal of Educational Development)

Grochocki, L.F.M. (2020) Endogamy in the Brazilian Higher Education System: An In-Depth Analysis (Under review in *Review of Higher Education*)

Pires, Alause Da Silva, Eliseo Berni Reategui, Ana Cristina Xavier de França, Eric Bettinger, Sérgio Roberto Kieling Franco (2020) "Implicações do sistema de classificação de periódicos Qualis em práticas de publicação no Brasil entre 2007 e 2016." Arquivos Analíticos de Políticas Educativas. Arizona. Vol. 28, n. 25 (fev. 2020), p. 1-25.

Carnoy, M.; Rosa, L.; Simões, A. (2021) Trends in the Academic Achievement Gap Between High and Low Social Class Children: The Case of Brazil. Submitted to *International Journal of Educational Development*.

Rosa, L., Bettinger, E. Carnoy, M., and Dantas, P. (2021). The effects of public high school subsidies on student test scores. *Economics of Education Review*.

Lichand, G., Bettinger, E., Cunha, N., and Madeira, R. (2021) The Psychological Effects of Poverty on Investments in Children's Human Capital. Stanford University Working Paper. Under Submission.

Bettinger, E., Cunha, N., Lichand, G., and Madeira, R. (2021) What is it about communicating with Parents? Stanford University Working Paper. Under Submission.

LEARNING SCIENCES

Books

Valente, J. & Blikstein, P. (in preparation). *História da informática educacional brasileira* [The *history of educational technologies in Brazil*]. Penso, Porto Alegre, Brazil.

Blikstein, P., Martinez, S., & Pang, H. (Eds.). (2015). *Meaningful Making: Projects and inspirations for fablabs and makerspaces*. CMK Press, Los Angeles.

Blikstein, P., Martins, S. (2016). *Information and Communication Technologies for Education: perspectives from Portuguese-speaking countries. Lecture Notes in Technology, Education and Society*, vol. 1. Lemann Center.

Meira, L. & Blikstein, P. (2020). Ludicidade, jogos digitais e gamificação na aprendizagem [Playfulness, digital games and gamification for learning]. Penso, Porto Alegre, Brazil.

Blikstein, P.; Campos, F. R. (2019) *Radical Innovations in Brazilian Education*. Lemann Center at Stanford and Penso.

Barbosa Silva, R. & Blikstein, P. (2020). *Robótica educacional [Educational robotics]*. Penso, Porto Alegre, Brazil.



Campos, F. & Blikstein, P. (2019). *Inovações radicais na educação brasileira [Radical innovations in Brazilian education]*. Penso, Porto Alegre, Brazil.

Blikstein, Paulo; Barbosa e Silva, R (org) (2019). *Robótica Educacional e Computação Física no Brasil*. Penso Editora.

Raabe, A., Zorzo, A.F. & Blikstein, P. (2020). *Computação na educação básica: Fundamentos e experiências [Computing in K-12 education: Foundations and experiences]*. Penso, Porto Alegre, Brazil.

Nascimento, A. M., Queiroz, A. C. M., Nascimento, A. M., Silva, A, Gonzales, D F, Garcia, E., Bandeira, F V, Satin, L. & Soares, R G (2020). *Como se dar muito bem no Enem.* 9. ed. Indaiatuba: Editora Foco, v. 1. 496p.

Nascimento, A. M., Queiroz, A. C. M., Nascimento, A. M., Silva, A, Gonzales, D F, Garcia, E., Bandeira, F V, Satin, L. & Soares, R G (2018). *Como se dar muito bem no Enem.* 8. ed. Indaiatuba: Editora Foco, v. 1. 520p.

Articles

Learning analytics

Berland, M., Baker, R., & Blikstein, P. (2014). Learning Analytics in constructivist, inquiry-based learning environments. *Technology, Knowledge, and Learning*, 19 (1-2), pp. 205-220.

Worsley, M. and Blikstein, P. (2014). Analyzing Engineering Design through the Lens of Learning Analytics. *Journal of Learning Analytics*. 1 (2), pp. 151-186.

Blikstein, P., Worsley, M., Piech, C., Sahami, M., Cooper, S. & Koller, D. (2014). Programming Pluralism: Using Learning Analytics to Detect Patterns in Novices' Learning of Computer Programming. *Journal of the Learning Sciences*, 23 (4), pp. 561-599.

Schneider, B., & Blikstein, P. (2015). Using Exploratory Tangible User Interfaces for Supporting Collaborative Learning of Probability. *IEEE Transactions on Learning Technologies*.

Schneider, B., & Blikstein, P. (2013). Tangible User Interface and Contrasting Cases as a Preparation for Future Learning. *International Journal of Computer-Supported Collaborative learning*.

Blikstein, P., Merceron, A., & Siemens, G. (2015). Learning Analytics: From Big Data to Meaningful Data. *Journal of Learning Analytics.*

Blikstein, P. & Worsley, M. (2016). Multimodal Learning Analytics: a methodological framework for research in constructivist learning. *Journal of Learning Analytics*.

Maker education

Blikstein, P. & Worsley, M. (2015). The Maker Movement: the last chance of progressive education?. In K. Peppler, E. Halverson, and Y. Kafai (Eds.), *Makeology: Makerspaces as Learning Environments (Volume 1)*.

Blikstein, P., Smith, R. C., & Iversen, O. (2016). Digital fabrication in education: Expanding the research towards design and reflective practices. *International Journal of Child-Computer Interaction.*

Barbosa E Silva, R; Merkle, L E. (2016) Perspectivas educacionais FabLearn: conceitos e práticas maker no Brasil. In: 1a. Conferência FabLearn Brasil, São Paulo.

Barbosa E Silva, R.; Merkle, L. E. (2017). FabLearn, FabLab, MakerEd, Experimental Laboratories: Towards a Discussion of a Theory of Maker Education from a Brazilian Perspective. In Lim, K. Y. T. (org.) *Landscapes of Participatory Making, Modding and Hacking: Maker Culture and Makerspaces*. Newcastle upon Tyne: Cambridge Scholar., p. 107-130.

Development of tools and frameworks for education/ Technology uses in education

Blikstein, P. (2014). Bifocal Modeling: Comparing Physical and Computational Models Linked in Real Time. In Nijholt, A. (Ed.), *Playful Learning Interfaces*. Netherlands: Springer.

Blikstein, P. (2015) Computationally Enhanced Toolkits for Children: Historical Review and a Framework for Future Design. *Foundations and Trends in Human-Computer Interaction*.

Blikstein, P., Furhmann, T., & Salehi, S. (2016). Using the Bifocal Modeling Framework to Resolve "Discrepant Events" between Physical Experiments and Virtual Models in Biology. *Journal of Science Education and Technology*.

Blikstein, P., Gomes, J., Schneider, B. (2017) The Effect of Highly Scaffolded Versus General Instruction on Students' Exploratory Behavior and Arousal. *Technology, Knowledge, and Learning.*

Barbosa E Silva, R; Kira, G; Merkle, L E. (2016). Da construção para o proceder digital: uma problematização de conceitos de projeto por meio de Vieira Pinto. In: *XI Jornadas Latinoamericanas de Estudos Sociais da Ciencia e da Tecnologia, Esocite 2016*: Esocite 21 Anos: Trajetórias plurais entre passados e futuros, Curitiba.

Castelini, P. ; Amaral, M A; Barbosa E Silva, R. (2016). Women and the imaginary in Computer courses at UTFPR. In: *XI Jornadas Latinoamericanas de Estudos Sociais da Ciência e da Tecnologia, Esocite 2016*: Esocite 21 Anos: Trajetórias plurais entre passados e futuros, 2016, Curitiba.

Barbosa E Silva, R.; Merkle, L. E. (2018) Tecnologias Educacionais: rumo a uma discussão em Ciência, Tecnologia e Sociedade no Brasil In: Frasson, A C; Oliveira, A C de; Glap, L. Formação docente: princípios e fundamentos – Ponta Grossa (PR): Atena Editora.



Eloy, A., Cruz, D., Thennakoon, K., & Grant, W. (2020, June). Buildagram: a constructionist environment for spatial reasoning. In *Proceedings of the 2020 ACM Interaction Design and Children Conference: Extended Abstracts* (pp. 280-283).

Learning in the Metaverse (Virtual Reality)

Queiroz, A. C. M., Nascimento, A. M., Tori, R., & da Silva Leme, M. I. (2018a). Using HMD-Based Immersive Virtual Environments in Primary/K-12 Education. In *Communications in Computers and Information Science* (pp. 160-173). Springer, Cham.

Queiroz, A. C. M., Kamarainen, A. M., Preston, N. D., & da Silva Leme, M. I. (2018b). Immersive Virtual Environments and Climate Change Engagement. *iLRN 2018 Conference*, Montana, p. 153-159.

Queiroz, A. C. M., Nascimento, A. M., Tori, R., Brashear, T. A., Melo, V. V., Meirelles, F. S., & Leme, M.I.S. (2018c) Immersive Virtual Environments in Corporate Education and Training. In: *AMCIS 2018 Proceedings*.

Queiroz, A. C. M., Tori, R., Nascimento, A. M., & Leme, M. I. D. S. (2018d). Augmented and Virtual Reality in Education: The Role of Brazilian Research Groups. In 2018 *20th Symposium on Virtual and Augmented Reality (SVR)* (pp. 170-175). IEEE.

Queiroz, A.C.M., Tori, R., Netto, A.V. & Corrêa, A. G. (2018e). Realidade Virtual e Aumentada aplicadas à Educação. In: *Introdução à Realidade Virtual e Aumentada*. Editora SBC: Sao Paulo.

Queiroz A.C.M., Nascimento A.M., Tori R., da Silva Leme M.I. (2019) Immersive Virtual Environments and Learning Assessments. In: Beck D. et al. (eds) Immersive Learning Research Network. iLRN 2019. *Communications in Computer and Information Science*, vol 1044. Springer, Cham

Queiroz, A. C. M. (2020). Ambientes virtuais imersivos e aprendizagem (Doctoral dissertation, Universidade de São Paulo). https://doi.org/10.11606/T.47.2020.tde-05112020-200228

Queiroz, A. C. M., Fauville, G., Herrera, F., Leme, M.I.S & Bailenson, J. N. (2020a). Cognitive and non-cognitive outcomes of immersive virtual reality. *70th Annual ICA Conference* (online).

Queiroz, A.C.M., Fauville, G., Abelles, A., Levett, A., Bailenson, J. (2020b) Stanford Ocean Experience Self-contained Study. Pre-registration: https://osf.io/5rkmb

Eloy, A., Cruz, D., Thennakoon, K., & Grant, W. (2020, June). Buildagram: a constructionist environment for spatial reasoning. In *Proceedings of the 2020 ACM Interaction Design and Children Conference:* Extended Abstracts (pp. 280-283).

Fauville, G., Luo, M., Queiroz, A. C.M., Bailenson, J. N., & Hancock, J. (2021a). Zoom Exhaustion & Fatigue Scale. *Computers in Human Behavior Reports, 4* (100119), https://doi.org/10.1016/j.chbr.2021.100119.

Queiroz, A.C., Nascimento, A.M., Fauville, G. Luo, M., Meireles, F., Plank, D., Bailenson, J., Hancock, J. (2021). Translation, validation, and application of the ZEF Scale to assess Zoom Fatigue in the Brazilian population. *SSRN*. http://dx.doi.org/10.2139/ssrn.3844219

Fauville, G., Luo, M., Queiroz, A. C. M., Bailenson, J. N., & Hancock, J. (2021b). Nonverbal Mechanisms Predict Zoom Fatigue and Explain Why Women Experience Higher Levels than Men. *SSRN*. http://dx.doi.org/10.2139/ssrn.3820035

Eloy, A., Queiroz, A. C. M., Zuffo, M., Lopes, R. (2022). From Users to Creators: Motivations, Implementation and Impacts of Augmented and Virtual Reality in Science and Engineering Projects in K-12 Education in Brazil. *Immersive Learning Research Network Conference 2022*.

Queiroz, A. C. M., Fauville, G., Herrera, F., Leme, M.I.S & Bailenson, J. N. (accepted paper). Do Students Learn Better with Immersive Virtual Reality Videos than Conventional Videos? A comparison of media effects on conceptual learning and self-efficacy with middle school girls. *Technology, Mind, and Behavior*. APA.



Appendix B: "Topics on Brazilian Education" Course

Topics on Brazilian Education–Selected Presentations–2015-2022

2015-16

Martin Carnoy, Stanford University, "Brazilian State Differences in Student Achievement on PISA and SAEB, 1999/2000-2012/2013"

Leonardo Rosa, PhD candidate, Stanford University, "Five Randomized Impact Assessments of a Management and Resources Program for High Schools in Brazil"

Henry Levin, Teachers College Columbia, "Cost-Benefit Analysis Applied to Problems in Brazilian Education."

Rebecca Tarlau, Postdoctoral Fellow, "Social Movement Participation in Rural Education Reform."

Luana Marotta, PhD candidate, Stanford University, "Analyzing High School Dropouts in Brazilian Schools."

2016-17

Paulo Meyer M. Nascimento, Visiting Scholar, IPEA. "Higher Education Student Financing in Developing Countries: The Brazilian Case."

Tiago Cortinaz, Visiting Scholar, "The *Base Nacional Comum* and the Common Core: A Comparative Study about National Curriculum in Brazil and the United States."

Luciano Meira, Visiting Scholar, "Learning, Games and Creativity."

Sabine Righetti, Visiting Scholar, *Folha de São Paulo*, "Higher Education in Brazil: Challenges and Assessment."

Paulo Blikstein, Stanford University, "Mini-Seminar: A Primer on technologies for education ---Can technology really transform education?"

Carl Wieman, Nobel Prize winner in Physics, Stanford University, "New Pedagogies for Higher Education in Science and Engineering."

Claudia Costin, Senior Director for Education at the World Bank Group, "Enhancing Education - Challenges and Opportunities in Brazil (Rio de Janeiro's case)."

Bertrand Schneider, Harvard University Graduate School of Education, "How small but transformative interventions can prepare students for the challenges of the 21st century."

David Plank, Stanford University, "How to bring large scale innovation and research to the real world: examples from the US and California."

Rebecca Tarlau, Postdoctoral Scholar Lemann Center, and Paula Louzano, Visiting Scholar Lemann Center, "Paulo Freire - A Product of a Moment."

Ulisses Araújo, Visiting Scholar, Lemann Center (University of Sao Paulo), "Challenge of Quality Education in Brazil: Technologies and Active Learning Methods as an Answer."

Deborah Rufino, M.A. candidate, Stanford University, and Rebecca Tarlau, Postdoctoral Scholar Lemann Center, "Affirmative Action in Brazilian Higher Education in the 21st Century."

2017-18

José Valente, State University of Campinas, "Integration Curriculum and IC" (Part I) and "Knowledge construction with computing in the digital age" (Part II).

Priscilla Bacalhau, Ph.D. candidate, São Paulo School of Economics Fundação Getulio Vargas, "College quality signaling and individual performance: effects on labor outcomes after graduation."

Alause da Silvia Pires, Ph.D. student, Universidade Federal de Rio Grande do Sul, "The Brazilian system for the evaluation of scientific journals and its influence in scientific production in the country."

Letícia Marteleto, University of Texas-Austin, "Inequalities in Reproductive Processes amidst the Zika Epidemic in Brazil."

Martin Carnoy, Stanford University and Izabel Fosenca, Ph.D. candidate, Stanford University, "Do "Better" Brazilian Universities Have Higher Academic Value Added?"

Camila Barros, Ph.D. student, Universidade de São Paulo. "The effect of managers in the Educational Systems Management: A study of supervisory action in public high schools in São Paulo."

Luis Gandin, Universidade Federal de Rio Grande del Sul, "An analysis of the Sistema Estadual de Avaliação Participativa (SEAP or State System of Participatory Evaluation) in the state of Rio Grande do Sul, Brazil (2012-2014)"

João Paulo Fernandes Cossi, MA candidate, Stanford University, "The Impact of Public Infant Daycare in Students' Future Test Scores in São Paulo City."



2018-19

Tássia Cruz, Escola de Políticas Públicas e Governo, Fundação Getúlio Vargas, "Minimum Spending in Education and the Flypaper Effect."

Janaína Freire: Geography Department, UniBH - Belo Horizonte, "Context Matters: human formation, culture and a teacher training project."

Fernanda Estevan, School of Economics, Fundação Getulio Vargas, "Can affirmative action affect major choice?" joint with Thomas Gall (University of Southampton) and Louis-Philippe Morin (University of Ottawa)."

Ana Pires do Prado, Universidade Federal do Rio de Janeiro, "School enrollment in Rio de Janeiro public schools: Families and school bureaucracy viewpoints."

André Vieira, Ph.D. candidate, Federal University of Rio de Janeiro, "Funding and equity in higher education: How does Brazil stand compared to other countries?"

Eliseo Reategui, Federal University of Rio Grande do Sul, "ICT and the Literacy challenge in Brazil."

Rodrigo Barbosa e Silva, Postdoctoral Fellow Stanford University, "Ethical Implications of Emerging Technologies: Education, Public Policy, Computers, and Society."

Joana Simoes de Melo Costa, Visiting Scholar (IPEA, Instituto de Pesquisa Econômica Aplicada), "Inequality at secondary education: How are different socioeconomic backgrounds related to gaps in access, dropout, and achievement?"

Anna Carolina Muller Queiroz, Visiting Student Researcher (Universidade de São Paulo), "Virtual Human Interaction Lab."

Ana Trindade Ribeiro, Ph.D. student Stanford University, "Affirmative Action Outcomes: Evidence from a Law School in Brazil."

Filipe Recch, Ph.D. candidate Stanford University, "Management practices and sub-state administration value-added: Evidence from the state of São Paulo."

Tatiana Hochgreb-Haegele, Lemann Center, "FabLearn Sobral: An integrative approach to design the science curriculum of Sobral."

Luís Grochocki, PhD candidate, Stanford University, "Academic Inbreeding and International Mobility in the Brazilian Higher Education System."

Lucas Hoogerbrugge, MA, Stanford University, "Does Mid-level Management Matter for Student Achievement? A Case Study of Regional Departments in the State of Ceará, Brazil."

Sidhya Balakrishnan, Jain Family Foundation, "The Impact of Basic Minimum Income Programs in Brazil"

2020-2022

Jair Ribeiro, Visiting Policy Scholar (president and founder of Parceiros da Educação), "Expanding Partnerships with Public Schools in São Paulo."

Caetano Pansai Siqueira, Pedagogical Coordinator, São Paulo State Department of Education; Felipe Michel Braga, Lemann Foundation; Danilo Leite Dalmon, Instituto Natura, "Educational Policies in Brazil: What can we learn from real cases of implementation?"

José Francisco Soares, Federal University of Minas Gerais, "Monitoring the Right to Education in Brazil."

Francisco Gaetani, Brazilian School of Public and Business Administration (EBAPE), and Getulio Vargas Foundation, "A conversation with Francisco Gaetani."

Cecilia Machado, Getulio Vargas Foundation, "How and When: Disentangling Cash and Care effect of CCT's on Birth Outcomes."

Jennifer Langer-Osuna, Stanford Graduate School of Education, "What's so powerful about classroom video as a source of data in education research?"

Grant Miller, Stanford University; Luis Fabiano de Assis, Brazilian Federal Prosecutor; Vicky Ward, Stanford University; Jessie Bruner, Stanford University; Kimberly Bablarz, Center for Health Policy, The Center for Primary Care and Outcomes Research, "The New Stanford Human Trafficking Data Lab Work in Brazil."

Enid Rocha, Visiting Scholar (Instituto de Pesquisa Econômica Aplicada –IPEA), "Socioemotional skills and young people who are not in education, employment or training (NEET) in Brazil."

Barbara Born, PhD Candidate, Stanford, "Becoming a Professional Development Facilitator: Understanding the knowledge and practices of district-based PD facilitators."

Marcelo Gleiser, Appleton Professor of Natural Philosophy, Dartmouth College, "From the Nature of Knowledge to the Knowledge of Nature: Reflections on the Practice and Teaching of Science in the Classroom and the Public Sphere."

Adelmo Eloy, MA Candidate, Stanford; Renato Russo, MA Candidate, Stanford, "Applying the Design Process to Tackle Learning Problems."



Lara Simielli, Fundação Getulio Vargas -EAESP/FGV), "Becoming a School Principal: The Main Challenges Faced by Beginning Principals."

Roseli de Deus Lopes, Professor (University of Sao Paulo), "STEM/STEAM at Basic Education in Brazil: Challenges and Opportunities."

Ricardo Primi, Visiting Scholar Lemann Center, Universidade São Francisco, "Assessing Socialemotional Skills using SENNA: Development, Psychometrics and Validity."

Bob Verhine, Coordinator for the Field of Education, CAPES, "Public Policy Regarding Graduate Education in Brazil: The Implications And Challenges Of Recent Innovations."

Karla Patricia Oliveira Esquerre, Federal University of Bahia, "Data Science on Public Education."

Emmerich Davies, Harvard University, "The Emergence of Political Attitudes Among Bureaucrats: Evidence from Teachers in Brazil."

Alfredo Artiles, Stanford University, "Toward a cultural understanding of inclusive education."

Sal Khan, Founder and CEO Khan Academy, "A conversation with Sal Khan."

Marcelo Knobel, Universidade Estadual de Campinas – Unicamp, "Universities vs. pandemic: is there light at the end of the tunnel?"

Eric Bettinger, Professor, Stanford University, "Salience versus Personalized Information: The Impact of Educational Messages on Parents' Educational Contributions."

Isak Froumin, Higher School of Economics, Moscow, "Inequality in Russian Education and Policy Responses"

Cristian Cox, Universidad Diego Portales, Santiago, "Inequality in Chilean Education and Policy Responses"

Silvio de Almeida, Universidade Presbiteriana MacKenzie, São Paulo, "Structural Racism in Brazil"

Francisco Ferreira, London School of Economics, "Factors in Income Inequality"

Ricardo Madeira, University of São Paulo, "Race and Inequality in Brazilian Education and Labor Markets "

Julia Sant'Anna, State Secretary of Education, Minas Gerais, Brazil, "Contemporary Educational Issues in Minas Gerais"

Gabriela Moriconi, Carlos Chagas Foundation, "Teacher Workload Volume in Lower Secondary Education: A Comparative Analysis Between Brazil, the U.S., France, and Japan"

Guilherme Lichand, University of Zurich, "The Impact of School Closures and Reopening in the Pandemic: Evidence from Brazil"

Alexandre Nacimento, Fundacao Escola de Comercio Alvares Penteado, "Artificial Intelligence in Education."

Renan Ferreirinha, Secretary of Education, Rio de Janeiro, "Issues Facing Urban Education in Rio de Janeiro."

Filipe Recch, Postdoctoral Fellow, Lemann Center, "Mid-level managerial practices and student performance gains – learning from Brazil's decentralized education state systems."

Claudio Ferraz, University of British Columbia, "Agrarian Elites, Education, and Long-Term Development."

Amanda Guimbo and Nidhiya Menon, Brandeis University, "Short and Medium-Run Health and Literacy Impacts of the 1918 Spanish Flu Pandemic in Brazil."

Katia Helena Cruz Schweickardt, Adjunct Professor of Social Sciences, Federal University of Amazonas, and former Municipal Secretary of Education of Manaus, "Experiences of Management of Educational Policies in the State of Amazon: Lessons learned and challenges."

Karine Roncete, Visiting Student Scholar, Lemann Center, and Heitor Santos, PhD student, Stanford, "Civil Society Organizations and Education Reform in Brazil."

Erica Castilho Rodrigues, Visiting Scholar, Data Science Tech Lead at A3Data, "Measure of the gap and inequalities in basic education students' proficiencies in Brazil."



Appendix C: The Lemann Center as an Exemplar of Stanford's Interaction with the World



Lemann Center for Educational Entrepreneurship and Innovation in Brazil

AT A GLANCE

Established: 2011 Located: On campus; Operates in: Brazil.

Mission: Support the success of Brazilian efforts to make a giant leap forward in the quality of their educational system.

Motivation: Research; education; social impact and policy change in Brazil.

Participants: academic staff, students, and visiting scholars; network of alumni, researchers, and other partners in Brazil.

Key Partners: The Lemann Foundation; federal, state, and municipal government officials in Brazil.

Mode of Activity: Inbound fellows & visiting scholars; outbound network of collaborators.

ABOUT

The Lemann Center for Educational Entrepreneurship and Innovation in Brazil is part of the Graduate School of Education.

Through a 10-year agreement between the GSE and the Lemann Foundation, the Lemann Center promotes various initiatives towards the improvement of Brazilian public education, including the training of researchers and professors, professional development of Brazilian educators, and research on novel educational policies and innovative learning technologies.

Model: The Lemann Center is an example of a hub in a single school with a dedicated donor that integrates research, graduate student training, and work with policymakers and entrepreneurs to generate sustainable and effective educational interventions in a foreign country.

PROGRAM DESCRIPTION

What the Center does:

- Training: the Center hosts programs for MA, PhD, MBA students, visiting scholars, and visiting student scholars. Recruitment focuses on scholars committed to the Center's mission: those who are passionate about returning to Brazil and working there towards education reform. Participants are trained not just at the GSE but also at the GSB.
- Research: the Center produces research studies related to the mission of evidence-based education reform, using large data sets from secretariats of education in Brazil; conducts experiments to test the effects of educational interventions on Brazilian student performance and behavior; tests models of students' science learning processes using innovative technological applications (Maker Movement); researches possibilities for science education reform in Brazil.
- Policy-relevant work: the research activities are conducted in collaboration with government officials at all levels and inform policy debate in Brazil.

The Center works in close partnership with the Lemann Foundation and with public officials in Brazil at the federal, state, and municipal levels (e.g., states secretariats of education, INEP, IPEA, the Ministry of Labor).

The Center also brings to Stanford dozens of visiting fellows, many of whom are faculty in Brazilian universities and policymakers who go on to constitute a major part of the Center's network in Brazil; they feel a sense of identity with Stanford and continue to contribute to the Center's work. Exemplar: Lemann Center

March 2019

PURPOSE/ GOALS

Improve education in Brazil:

Attract the best and brightest minds from all fields to support educational improvement in Brazil.
 Build a network of researchers and other partners whose training, sense of community, and shared vision of the future will make them trailblazers of change in Brazilian education.

Generate big changes in policy and practice meaningful to improvement in Brazil's education system.

 Work closely with public officials at federal, state, and municipal levels, with students and academic colleagues, and with the Lemann Foundation and other partners in Brazil to develop and test new approaches to the educational challenges that Brazil faces.

BENEFICIARY/ IMPACT STORY

Tassia Souza Cruz, PhD Economics of Education 2015

Tassia is an exemplar of fulfilling the Lemman Center's mission. She returned to Brazil upon graduation and now works for a top university in the social sciences; advances public policy focused on education; received 25% release to continue working with the Center and is now director of research for its newly established policy center in Brasilia (D3E).

RESOURCES

Team and community:

- Professors Eric Bettinger, Martin Carnoy, and David Plank (directors);
- Staff associate director (1)

Lemann Fellows community to date:

- Postdoctorals, students, and alumni (41);
 Visiting scholars and visiting student
- researchers (42)

By 2021 (the end of the first phase of collaboration between the Stanford GSE and the Lemann Foundation) the Center will have trained more than 150 Lemann fellows in research and innovative practice.

Funding comes from the Lemann Foundation, through a gift by Jorge Lemann. The Center thus funds students and fellows. Brazilian partner organizations cover their related activities and provide in-kind donations (data, time, travel costs).



Exemplar: Lemann Center

March 2019

SUCCESSES & CHALLENGES

Successes and impact:

- The visiting fellowship program is an asset in expanding the Center's capacity to support improvement in Brazilian education. Fellows continue to serve on dissertation committees, contribute data, engage in every aspect the Center's activity, and to do policy work in Brazil, for example, using the alumni network to bring in reliable partners for teacher training programs who now implement best practices from Stanford.
- The establishment of a Brazilian policy center (D3E) in Brasilia in Aug. 2018: its mission is to bring research
 done at Stanford (mostly by Brazilian academics) to bear on the policy challenges facing Brazil's education
 system. The director for research was the Lemann Center's first PhD student.

Measures of success include: numerous federal/state/local governments that have expressed interest in sharing their data and seek partnerships with the Center's teacher training programs; strong record of students career placement; numerous publications.

Challenges:

 The insularity of the Center, with its focus on one sector in one country, leaves it somewhat exposed both at the GSE and at Stanford at large—it's been a challenge to prove that the Center's work is integral to and beneficial for both, and that the work is valuable to the field in general, not just to Brazil.

CONCLUSION & KEY OBSERVATIONS

What the Center is learning from its global partners that can inform work at Stanford:

- Learning about different contexts for education reform—Brazil is one of the emerging economies, but in
 education it is still very much developing country.
- Understanding the application of technology in schools: from research perspectives Brazil has helped provide a context to cement counterfactuals.
- Learning about coalition building for educational reform.
- Perhaps most important to the team is what they learn from the funder, the Lemann Foundation: the
 Foundation wants to move the needle on education in Brazil and the Center is part of that; there is deep
 synergy in how the Foundation integrates the Center's work with work done by other universities, and in
 how they use the students who are trained at Stanford to help build a bigger coalition in Brazil.

Other points of interest that the Center demonstrates:

- That improvement strategies cannot target only direct beneficiaries (schools and their students in this case), but must address the entire ecosystem of institutions that promote their well-being.
- That through partnership and affinity with a focused funder an entire international Center can emerge at Stanford with very little or no involvement/guidance/support by the University.

03