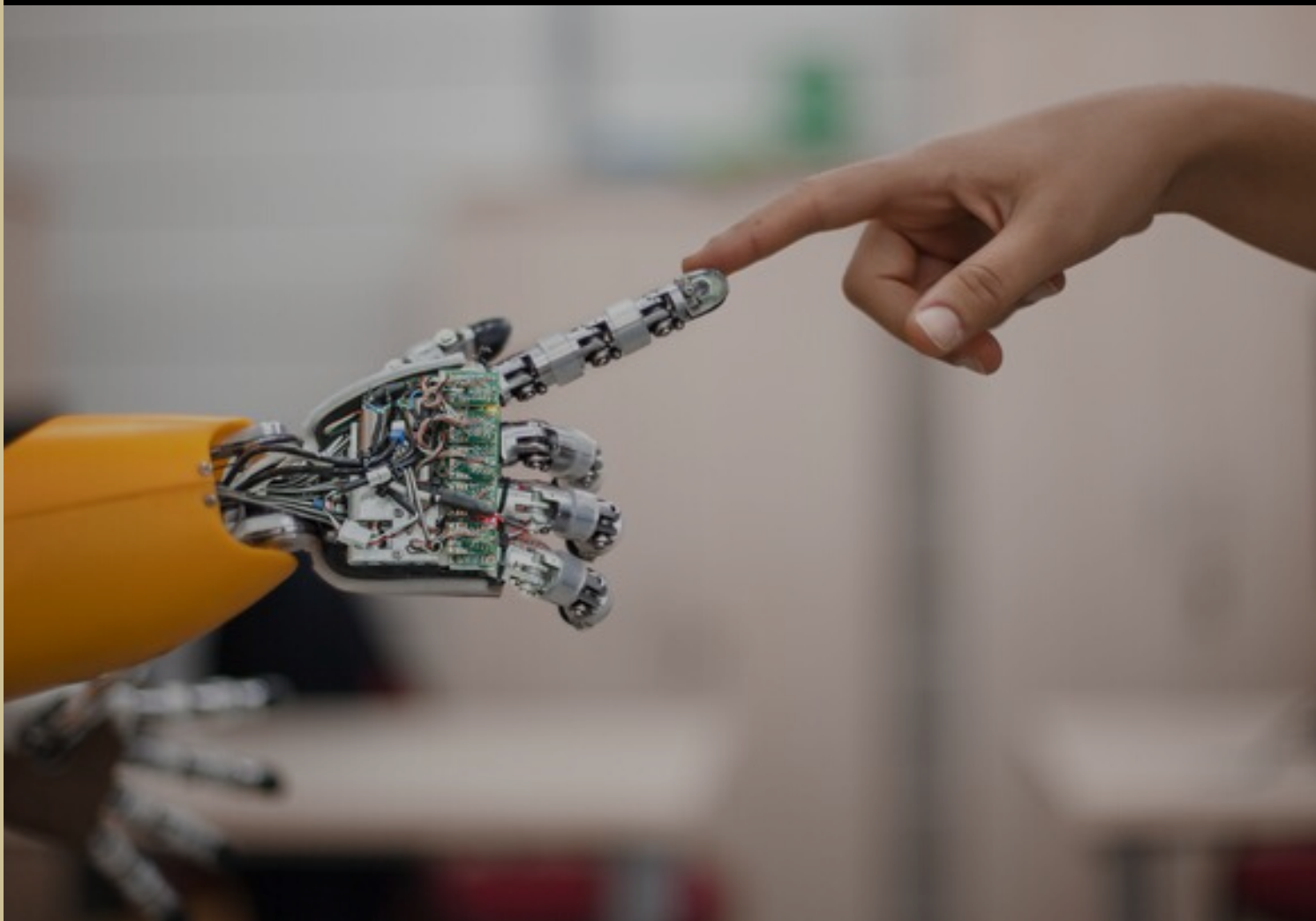


4/8/2020

Reimagining Education

Bringing Artificial Intelligence into Primary
School Education



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**“IF WE TEACH
TODAY’S STUDENTS
AS WE
TAUGHT YESTERDAY’S,
WE ARE ROBBING
THEM OF
TOMORROW.”**

JOHN DEWEY

TABLE OF CONTENTS

01 Executive Summary

02 Artificial Intelligence

03 Why Research
Artificial
Intelligence

04 Research Methods

05 Problem Landscape

08 Solution Landscape

10 Gaps and Levers
for Change

13 Key Insights

14 Lessons Learned

15 Bibliography

Executive Summary

The goal of education should always be to teach for tomorrow. As we live in a progressively complex and increasingly global world, there is a desperate need for educational institutions to transform. A structural shift in both education and curriculum is necessary to keep at pace with the needs of our technological future. Education is changing and it will continue to evolve faster than it ever has throughout history because of technology. School conditions and curriculum today meet only basic requirements by providing a space for students to learn, but not an environment for students to flourish and grow in their education environments. Education is not meeting the needs or preparing for the future of work, as not only the realities of youth have radically changed, but they are not reflected in the classroom, nor current school curriculum. Education can be better and do better for students.

Artificial Intelligence

Artificial Intelligence (AI) is an ambiguous word that has a range of definitions and it is not simple to define, as there are many different uses and applications for these technologies. However, to define it broadly, it is, “An area of the science relating to computers that focus on the development and creation of intelligent machines that are expected to work and react like humans.”[1] AI is the ability for computers and technology to think and learn, as well as to see and communicate and work like humans. These include processes such as reasoning, and self- correction through the applications of speech recognition, learning processes and planning.[1] At the heart of AI, is the idea that tedious, repetitive, and rote tasks can be eliminated so that we are given the opportunity to not only be more efficient, but also more productive. This shift in the relationship between humans and machines could take away the tasks that take time and energy that could be focused on being creative, and reaching goals faster. The simulation of human intelligence has the potential to cognitively and physically operate better and more productively than humans and AI can be used to eliminate human discretion and bias, in order to produce greater efficiency, productivity, accuracy, and to reduce error.[1] Bringing AI into classrooms has the potential to generate more data and personalize students' learning in a way that will better assist students and their needs

[1] Aziz, Sirajuddin. "Artificial Intelligence." *Defence Journal* 23, no. 1 (08, 2019): 28, <http://ezproxy.lib.ryerson.ca/login?url=https://search-proquest-com.ezproxy.lib.ryerson.ca/docview/2283933190?accountid=13631> (accessed April 7, 2020).

Why Research the Impact and Potential of Artificial Intelligence in Education

Technology has permeated every aspect of society. As of 2019, there were 2.5 billion smartphones used in the world, 2.3 billion active social media users, 51% of all payments were made online, and 90% of all data on the internet was generated in the last two years, which is expected to grow 5x within the next 5 years.[2] This progress and the expected growth is not only exponential, but it will only continue to change the world. In the past decade, there have been technological transformations that have changed the ways in which we function daily as well. There have been innovations such as electric and self-driving cars, virtual assistants, for instance Amazon Alexa and Google Home, and even advances in surgical procedures and medicine, all which rely on and use AI technology. What is consistent with all of the most evolutionary AI is that they are meant to help and assist, make individuals more productive, and enhance experiences. For example, self-checkouts that have just been introduced into many grocery stores are not replacing cashiers, but they are used to help checkout customers that have fewer items. They are also used to relieve cashiers when lineups get too long, also benefiting customers so that they do not have to wait as long in line. This is the same with self-driving cars, as people are still expected to drive, but AI is used to make decisions made while driving to stop accidents from happening. The goal of AI technology is to assist and provide safer and more productive conditions. In instances where AI would automate and take away jobs, they would be creating new and different roles where people could work instead. There is early proof that AI will be changing the world, especially the job market. The future of AI is already here and the rates of these changes are exponential, as there have been major changes that could not have been imagined within just the past decade.

[2]Bughin, Jacques, Eric Hazan, Tera Allas, Klemens Hjartar, James Manyik, Erik Sjatil, and Irina Shigina. "Tech for Good: Smoothing disruption, improving well-being." (2019).

Research Methods

I obtained my research through:

- This research has been supervised by Jacqui Gingras, Sociology professor at Ryerson University, specializing in transformative education.
- My fieldwork in Technology and Robotics classrooms. I have collaborated with the STEAM and technology teacher's and observed students learning to understand more about technology and the ways that it is taught in an elementary school setting.
- 6 in- depth interviews with professionals in the AI industry, elementary school teachers, university professors.
- Academic journals, documentaries, news articles, Government reports and publications, and summit reports.

Problem Landscape

1. *The Changing Realities of Students*

When discussing the potential for AI in education, the changing realities of our primary students must be taken into consideration and educational structures must change first to better prepare students for the future. It is not technology alone that will transform education.[3] But a humanistic approach to education is essential to foster creativity, mental flexibility and critical thinking, which will allow students to understand and navigate the technological world that surrounds them. Planning and implementing policy that will allow for a shift in the social structure in education and enhance institutional methods in primary education, current barriers in student engagement and the learning outcomes of students can be improved, thus allowing us to reimagine the ways that schools function.”[3] The current primary school educational climate is uncertain however, as there is resistance to changing not only the structure of education, but also the traditional roles of teachers.

Change will not only be resisted systematically, but the negotiation between the costs and benefits for these changes within our educational systems will limit and inhibit the measures that will be taken to keep students at pace with the future, but changes that are needed to make teachers jobs more satisfying and rewarding. At the end of the day, schools must not be seen only as a system, but as a community where students can feel safe and confident with themselves and their learning and where students can develop their interests, creativity, curiosity and critical thinking skills.

[3] West, D. "Digital schools: How technology can transform education [Kindle reader]." (2012).

2. *Outdated Learning Methods*

Schools should no longer focus on rote memorization and studying to forget. Learning fast and expecting students to memorize concepts just enough so that they can pass their tests is not the right reputation for education. Education must support lifelong learning and give students the skills that they will carry and develop throughout their lives. Students need to be prepared for technological changes and have the skills that will be transferable to the future of jobs and work. The future of work is not only digitized, but it will focus on critical thinking skills, creativity, and be a collaboration of students from different educational backgrounds. The current primary school climate does not give students the skills and tools that they will need to navigate and keep pace with the technological world, or the engagement and creativity that will direct them to their interests and passions.

“The vast majority of high schools and colleges aren’t adapting quickly enough to the change, leaving their students increasingly unprepared for the job market which are being driven by advanced technology, such as AI, robotics, and data analytics.”[4]

[4] Strada Institute for the Future of Work & EMSI (2018). Robot-Ready: Human + Skills for the Future of Work. <https://www.economicmodeling.com/robot-ready-reports/>

3. Stigmatization of Artificial Intelligence

Popular ideas around AI revolve around the belief that Terminator style malicious robots will be taking over the world and that AI will do more harm than good. Fears surrounding not only the ethics, but also the legal issues of AI, economic issues, as well how AI should be treated. The resistance to AI is because of the diverse ethical issues and stigmatization that comes with duplicating human intelligence, as the biggest barrier is the presumption that robots will be taking jobs away and creating more harm than good. The stigmatization of AI makes its applications in education disconcerting because it is assumed that teachers' jobs will be automated and replaced by robots and online schooling.

Solution Landscape

1. Curriculum Reform

“If the work of tomorrow demands more from us, we must demand more from our education.” -Aoun

Curriculum must adapt and focus on implementing AI in education in a mutually beneficial way for both teachers and students, the current curriculum in Ontario is falling behind on updating and the skills that students now need. Ontario’s Science and Technology curriculum was last revised in 2007, which is extremely problematic because the development of technology has been exponential within the past ten years, making this curriculum immensely outdated.

Teachers are not to blame for the deficiencies in the current curriculum.

On a given day, teachers are flooded with administration duties and are expected to prepare all of their class material, organize their students and classrooms, engage all students in learning, creating and marking assignments and activities. Teachers are also expected to collect data about students learning for report cards.

“Time management and mental health are the two biggest challenges of being a teacher. There is never a moment where you feel as though you have “caught-up” on all of your work and can take a breather. Between planning lessons, creating and marking assessment pieces, parent communication, prepping daily materials, and the actual act of teaching, there’s no such thing as free-time, or even enough time in the day, so maintaining a healthy home-work balance is difficult. I find I’m thinking about my students, a lesson, or a problem with a colleague when I should be in the moment with my own children”[6]

There is currently a lot of pressure on teachers and a lot of tasks that they do that go unnoticed, therefore developing a curriculum with more guidance for teachers and alleviating the mundane tasks can help teachers everyday and lead to more satisfaction with their jobs.

[6] Interviewee 1, York Region District School Board: Ontarian Primary School Educator, Interviewed by Alyssa Mosgopoulos, November 23, 2019.

2. Making Education More Meaningful

AI can be used to make education more engaging and meaningful. AI can get information on how students are feeling about what they are learning and will be better able to make personalized learning to help students to better understand and to develop and practice what it is they are having trouble with. This will also be able to collect data on students progress throughout the year and have a digital record of can help teachers take into consideration whether students are comfortable with their learning, if they need more assistance, or need to take things slower. This will also create more understanding on how students are progressing overall and will give the teacher feedback on where the class or individual students need more instruction or support on certain concepts. This could also change the classroom environment because it can also allocate more time to in-class collaboration and students can work more together to solve problems and focus on creative and critical ways to solve problems and answer questions, which will be an extremely important skill that can be developed earlier on. This can be done instead of listening to a lecture and spending time doing textbook work.

It is extremely important to create understanding that AI will only be used to complement and work alongside both teaching and learning roles, not to overtake. The goal if there are ever any robots in classrooms is that they will assist with caring for students, but tasks and care will always be left to humans. If this goal of AI is not addressed first, then it has the potential to invade and disrupt education and concerns surrounding not only the ethical implications, but also the social conditions, policy that needs to be updated, privacy issues, as well as the economic obligations are all constraints that must be well thought about.

Gaps Levers for Change

1

Ensuring that AI will benefit all students and not just the elite

What is most crucial is how we will use AI to leverage education and how it will be used for the interests of the students and to benefit humanity. The most important measure will be ensuring that AI benefits humanity, and it is not used as an advantage for capitalism and the neoliberal state, nor will it be used as a political tool to generate data on students. AI will not be exclusive for privileged, the elites and the big technology corporations, but it will be used to make a meaningful difference in the lives of students and teachers, as well as revolutionize education. AI is the answer for genuine and equitable change that will benefit and catch up countries that lack technological means.

Gaps



Levers for Change

2

Funding, Cost, and Up-skilling Current Teachers

At the moment, AI technology is expensive as it is so new and limited, therefore the latest AI is only seen and being used in privatized and higher education, as these schools are more likely to have the funding and the ability to update curricula. As prices start to decrease and AI becomes normalized in public and primary school settings, it will be more accessible and economical but until then, AI will be primarily used in privatized education, granting students of higher socio-economic status access to AI, while leaving public schools behind. Therefore, Government funding will have to be put towards up-skilling teachers, changing teachers college curriculum, as well as adapting current curriculum to allow for technology and AI to be introduced into education.

Gaps



Levers for Change

3

Changing the Ideology and Stigmatization of AI

Although there are already ways to implement AI in schools, we need to break through the resistance and misinterpretations of the goals and place of AI in education. There is a clear window of opportunity that AI can bring to the education system. However, there are also many challenges at the macro level that will need to be addressed by changes in policy, informed planning, and introducing AI into educational settings. The question that will have to be addressed is how AI can be brought into education in a way that will benefit both students and teachers, as well as enhance learning outcomes and quality of education.

Key Insights

What Can Be Gained from AI in Education

Using AI to leverage education, there are many benefits that can accelerate and enhance learning for all students. Gains such as increased social mobility and life chances are one of the biggest and large-scale changes that AI can contribute to, as it can bring us closer to more equitable education for all. Education is critical because it creates social capital that can lead to positive welfare outcomes, better access to jobs and steady income.[7] Adapting education to the future of jobs and society and creating more equitable education through online education and platforms must be a priority globally. Adopting AI in classrooms and education will ensure that students will have the skills that they will need for their futures and it will allow children that do not have adequate education to receive the life chances that will generate positive growth and opportunity. This in turn can form better living standards, can lead to social mobility and reduce inequality within society and countries.[7] Education must be meaningful in a way that it is not just a process that students must go through, but as an experience that is done for them and a way to develop potential. Instead of focusing on rote memorization, studying to forget, and giving the right answers, students should be getting the education that will not only generate curiosity and the ability to be passionate about their education and interests, but they also deserve a quality education.

[7] Bughin, Jacques, Eric Hazan, Tera Allas, Klemens Hjartar, James Manyik, Erik Sjatil, and Irina Shigina. "Tech for Good: Smoothing disruption, improving well-being." (2019).

Lessons Learned

I have learned that the topic of AI and education is not overlooked and it has already been foreseen as one of the fastest approaching implications to overcome in education, as a technological revolution is fast approaching. Implementing AI and technology that will serve the interests of all students, teachers and schools is an issue that has been discussed, negotiated and has been faced with much discretion. It is argued that education has been completely neglected when finding solutions to implementing AI however, this is an extremely complex position. Changes, innovation and disruption to education will have large- scale effects on both political, economic and social structures. Whatever is done on the micro level at schools will have macro effects and vice versa. This is surely the most complicated issue that education has faced, as there is no certainty on the outcome of these effects and there is no way to know for sure what the future of education will look like. However, this is also an advantage because we are now able to make informed decisions of AI that is brought into education and this can be done in the interests of all students by giving the quality education that will prepare them for their future of work.

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