BY TEACHERS FOR TEACHERS

A TOOLKIT TO REIMAGINE THE FUTURES OF THE TEACHER-TECHNOLOGY SYMBIOSIS

BY ROCÍO CHÁVEZ TELLERÍA

Submitted to OCAD University in partial fulfillment of the requirements for the degree of Master of Design in Strategic Foresight and Innovation

Toronto, Ontario, Canada, 2021

CREATIVE COMMONS COPYRIGHT NOTICE

ABSTRACT

This research project explores how teachers can design new images of the future that explore the possible and necessary transformations of their roles and their relationships with technology. This paper provides first an overview of the nature and factors that shape the role of teachers and the elements that need to be considered when exploring the transformation of the teacher's role. It then presents an analysis of the current understanding of the teacher's role from the perspective of EdTech. Finally, it introduces the prototype of a toolkit based on an adaptation of the Causal Layered Analysis futures research method that guides teachers through a layered deconstruction and reconstruction of their roles to design images of the future.

ACKNOWLEDGEMENTS

This major research project would not have been possible without the unconditional love and support of my Mom, Dad, Toño, and Geoff. You are my rock. Thank you for supporting me through everything, for believing in me and for keeping me going.

This project would also not have been possible without the endearing friendship and brilliance of my mentor, Yanira, who inspires me and challenges me with every conversation. You were the one who set me on this intellectual path, and now you've helped me through the finish line. Thank you.

Thank you to Greg, my primary advisor, for his great insight, support, and understanding throughout this project.

CONTENTS

LIST OF TABLES AND FIGURES

INTRODUCTION

INTRODUCTION

On March 11th, 2020, the World Health Organization declared the expanding COVID-19 crisis as a pandemic (WHO, 2020). The world shut down, and almost all aspects of life moved online. With systems disrupted everywhere, our lives became essentially digital for the first time. The Internet and videoconferencing tools became the backbone of almost every aspect of life. It became evident that what journalist Oliver Burkeman wrote about the Internet in 2009 was true, "Without most of us noticing when it happened, the web went from being a strange new curiosity to a background condition of everyday life." Even the concept of 'technosphere' proposed by Peter Haff, to reconceptualize technology in the Anthropocene Epoch, "not as a derivative consequence of human activity, but as a new 'quasi-autonomous' sphere of the environment that conditions human survival within the Earth System" (Gärdebo, Marzecova, & Knowles, 2017) became true to people everywhere. We could not survive without technology, nor perform any essential function such as work, social life, education, or even religious life. As our daily lives become more deeply intertwined with increasingly complex and powerful technologies, we enter an era in which emerging technologies will bolster the formation of new human-machine partnerships (Institute for the Future, 2017).

The same is valid for education. The COVID-19 pandemic represented the most severe disruption to worldwide education systems in history. At one of the peaks of the crisis, 1.6 billion learners, 94 percent of students, in over 190 countries were out of school and university (UNESCO, 2020; The World Bank, 2021). An estimated 63 million primary and secondary teachers were also affected (UNESCO Institute for Statistics, 2020).

When many governments and institutions turned to distance learning to ensure continuity of teaching and learning, only 56% of teachers from OECD member countries reported that they had previously used ICT in teacher training, and only 43% felt prepared to use ICT in teaching. Even after the transition to Emergency Remote Teaching happened, only half of OECD member countries offered additional training on distance education for teachers (UNESCO, UNICEF & The World Bank, 2020). When digital technologies suddenly became the backbone of education, teachers were overwhelmingly unready for it and left in a state of future shock.

It is essential to increase efforts in co-creating with teachers and educators tools and platforms that aid them in navigating transitions of their roles and technological systems, as they are a strategic profession for a thriving future. Teachers are a strategic profession for a thriving future. The global teacher workforce has expanded rapidly since 2000, yet many more teachers are needed. The total number of teachers worldwide increased by 50% between 2000 and 2019, from 62 million to 94 million teachers. However, to reach universal primary and secondary education in 2030, 69 million more teachers are needed (The International Task Force on Teachers for Education 2030, 2020). According to the study *"The Future of Skills,"* preschool, primary, secondary, and special education school teachers are the first occupation expected to see increased demand through 2030 in the United Stated; post-secondary teachers occupy the fourth spot. Teaching and educational professionals occupy second place in the UK as the occupation most likely to experience increased demand through 2030 (Bakhshi et al., 2017).

Apart from the challenge of attracting new people into the teaching profession, the world faces the challenge of keeping teachers in the profession. In the wake of the COVID-19 crisis, it is concerning to learn of so many teachers wanting to leave the profession because the role changes do not make sense to them. As one California high school teacher expressed (Rothman & Feinberg, 2020):

"Distance learning is leaching a lot of the joy out of being a teacher. I love being around my students: witnessing their learning, seeing their light bulbs go off, hearing their spontaneous conversations. All of that happens less frequently now. I feel like I'm teaching into a vacuum."

Even before the COVID-19 crisis, teacher shortages were a real prospect in many education systems. In a joint communication, UNESCO, the International Labour Organization (ILO), UNICEF Education International and the UNDP declared that about 70 million teachers would be needed worldwide by 2030. Nevertheless, the additional pressure that the current, worldwide upheaval of education is putting on teachers could have a negative effect on their willingness to stay in the profession. Among teachers in OECD countries, experiencing much work-related stress doubles the odds of expressing the intention to leave the profession within the next five years (Marconi, 2020). Additionally, it is the youngest and most novice teachers who most readily express regret about joining the profession and consider leaving (Schleicher, 2020).

All of the phenomena described above reveal that futures thinking has become an essential skill for teachers, as it is vital for them to have the sensemaking skills that allow

them to anticipate and navigate a world in flux, and what that means for the transformation of their role. It is also increasingly important to explore the futures of the teacher-technology relationship as the symbiosis becomes more strategic for the future of education. This task should rise from the teachers' perspectives before those of policymakers or educational technologies (EdTech) developers, as it is teachers who stand on the front lines of implementation of every education innovation.

This major research project focuses on the following questions:

How can teachers design new images of the futures [3] that explore the possible and necessary transformations of their roles [1] and their relationships with technology [2]?

1. What are the nature and factors that shape the role of teachers? What elements need to be considered when exploring the transformation of the teachers' role?

2. What is the current understanding of the teachers' role from the perspective of EdTech, and what shapes the current relationship between teachers and EdTech?

3. What type of tools and pedagogical guidance can help teachers understand the current factors influencing their professional role and explore how it can transform in the future?

To answer these questions, I conducted a thorough literature review and applied the lessons learned in designing a toolkit prototype. Chapter 1 gives an overview of the multidimensional role of the teacher. Chapter 2 presents a history of images of the futures from EdTech's perspective. Chapter 3 explains Causal Layered Analysis (CLA) as a futures research method that allows examining the influence of images and metaphors in the framing of futures. Then, Chapter 4 explains a layered model of the teachers' roles. Chapter 5 proposes an adaptation of the CLA method by overlapping it with the layered model of teachers' roles. Chapter 6 then provides an overview of the mental processes that are involved when imagining possible futures. Finally, Chapter 7 presents the toolkit prototype that synthesizes the research.

CHAPTER 1

THE MULTIDIMENSIONAL NATURE OF THE ROLE OF TEACHERS

1. THE MULTIDIMENSIONAL NATURE OF THE ROLE OF TEACHERS

A teacher's role cannot be conceived universally, as it is deeply influenced by cultural, social, political, historical, and geographical factors. Nevertheless, the essence of a teacher can be abstracted as that of a *learning guide*. However, such abstraction must not be oversimplified, as "the role of teaching has never been limited to just teaching" (Makovec, 2018).

Historically, different authors and institutions have understood and captured this multidimensional nature of the role of teachers. To illustrate, Fishburn (in Adams, 1970, 122) identified six roles for a teacher: director of learning, guide, counsellor, mediator of the culture, school-community liaison, and member of the profession. Trow (in Adams, 1970, 122) proposed three different types of teacher roles related to extra-class, administrative and executive, and instructional roles.

In 2013 the Institute of Play, now the Connected Learning Alliance, defined the role of the teacher through seven dimensions:

- a wellness integrator, who can use their knowledge of these dynamics to address students' emotional, academic, and physical needs,
- a technologist, able to find meaningful ways to use technology to expand student learning about complex problems beyond what analog tools allow,
- an assessor, able to use tools and data to make decisions about how to best support all students in reaching learning goals based on student strengths and areas of need,
- a designer, able to design learning experiences that increase student engagement resulting in more student learning,
- a systems thinker, able to see and manage complexity, and subsequently teach and model the use of tools and ways of thinking to help students understand how systems work and how to change them in positive ways,

- a practitioner, able to create safe and productive learning environments for all students and effectively connect support networks for students in and out of school, and

- a leader who can continue their professional growth as they initiate and lead projects that exemplify their strengths and develop their growth areas as leaders.

More recently, the 'teacherpreneurship' movement in the United States that seeks to involve practicing teachers as part-time policymakers envisions the role of the teachers as designers, knowledge brokers, system thinkers, talent maximizers and bridge builders in the transformation of education (Berry et al., 2013, 20). This expanded role of the teacher aligns with the latest portrayal of educators as futurists (McBain & Solomon, 2020), which has begun to gather more attention and reveals a shift from visualizing teachers as implementers or operators of a system and more as creatives and designers.

Despite the differences in how teachers' roles are defined in a specific culture, geography, or moment in time, one thing is evident: the teacher's role is highly complex and multidimensional. It can not be replaced by technology, as many developers enthusiastically claim. As a matter of fact, when EdTech is used effectively for learning, teachers end up taking a more central role, instead of peripheral, in the learning process (Hawkins et al., 2020, 14). This is supported by the findings of a meta-analysis study by Durham University, which systematically reviewed research publications between 1990 and 2012 in the United Kingdom that evaluated the impact of technology on school attainment. "There is no doubt that technology engages and motivates young people. However, this benefit is only an advantage for learning if the activity is effectively aligned with what is to be learned. It is, therefore, the pedagogy of the application of technology in the classroom which is important: the how rather than the what" (Higgins et al., 2012, 3). In alignment with these findings, a study by the Atlantis Group (2019) also concludes that "today's EdTech cannot replace teachers, but it can augment good teaching. It can provide teachers and students with a wide diversity of resources that open new perspectives, illustrate concepts in new ways, and help to assess learning." Teachers, then, play a pivotal role in change-making in education, more than the technology itself.

Currently, "the demand for learning technologies from teachers, however, is often poorly understood by developers and policymakers alike. Both [...] tend to offer teachers solutions in search of problems" (Atlantis Group, 2019, 13). So, if EdTech is to continue 'augmenting good teaching,' its development needs to be aligned with a deep understanding of the multidimensional nature of teaching and possible future evolutions of the teaching role.

Too many policymakers and developers treat technology mainly as a supplement or retrofit to traditional education (Atlantis Group, 2019, 14) rather than as a tool to augment good teaching and learning because they lack an understanding of the *multidimensionality* of the teaching and learning process. That narrow understanding of teaching from EdTech developers ends up limiting its impact, as teachers have little incentive to use technology that they do not want or do not understand.

Fundamentally, teachers must want to use technology because they believe it will offer a more effective approach than they already do (Atlantis Group, 2019, 13). In fact, Ertmer et al. (2012) remark that “teachers’ own beliefs and attitudes about the relevance of technology to students’ learning were perceived as having the most significant impact on their success.” Therefore, actual change requires belief among teachers that the proposed new tools and methods will bring improvements. A recent Swedish Government investigation, for example, showed that less than one-third of teachers were optimistic about integrating ICT in education, and twenty percent felt ICT interfered with their pedagogical work rather than support it (SOU in Genlott et al., 2019). So, in order for EdTech to realize its potential, it needs to resonate with teachers.

The toolkit that results from this research project aims, precisely, to guide teachers in becoming co-creators of future educational technologies by creating new metaphors and images of the future that reflect the evolution of their multidimensional roles, as a response to the changing needs of learners, and re-envision their relationships with digital technology.

To steer the development of future educational technologies into a direction that resonates with the evolution of learning and the transformation of teaching, we need to deconstruct, reconstruct, and socialize new images of the future inspired by teachers themselves. Images of the future are powerful sources of inspiration since they create and express, at the same time, social and collective realities. “The rise and fall of images of the future precede or accompany the rise and fall of cultures. History has been made what it is largely as a result of the ideas and ideals of man that have been congealed in the form of images of the future” (Polak in Bell and Mau, 1971, 14).

The following section presents selected 'images of the future' that have shaped the most influential educational technologies of our time to help understand the patterns that have constructed this present reality and the dominant images that need to be broken to allow space for transformational futures.

CHAPTER 2

EDTECH PALEOFUTURE: A HISTORY OF IMAGES OF THE FUTURE OF TEACHING FROM EDTECH'S PERSPECTIVE

2. EDTECH PALEOFUTURE: A HISTORY OF IMAGES OF THE FUTURE OF TEACHING FROM EDTECH'S PERSPECTIVE

Analyzing the dominant images of the future that have shaped the current EdTech ecosystem helps us understand the patterns we must break to create space for transformational futures. Audrey Watters, one of the main critiques of educational technologies, identified some of the most famous images, going back almost a century, that have shaped both the discourse and developments of 'the future of education' (2015).

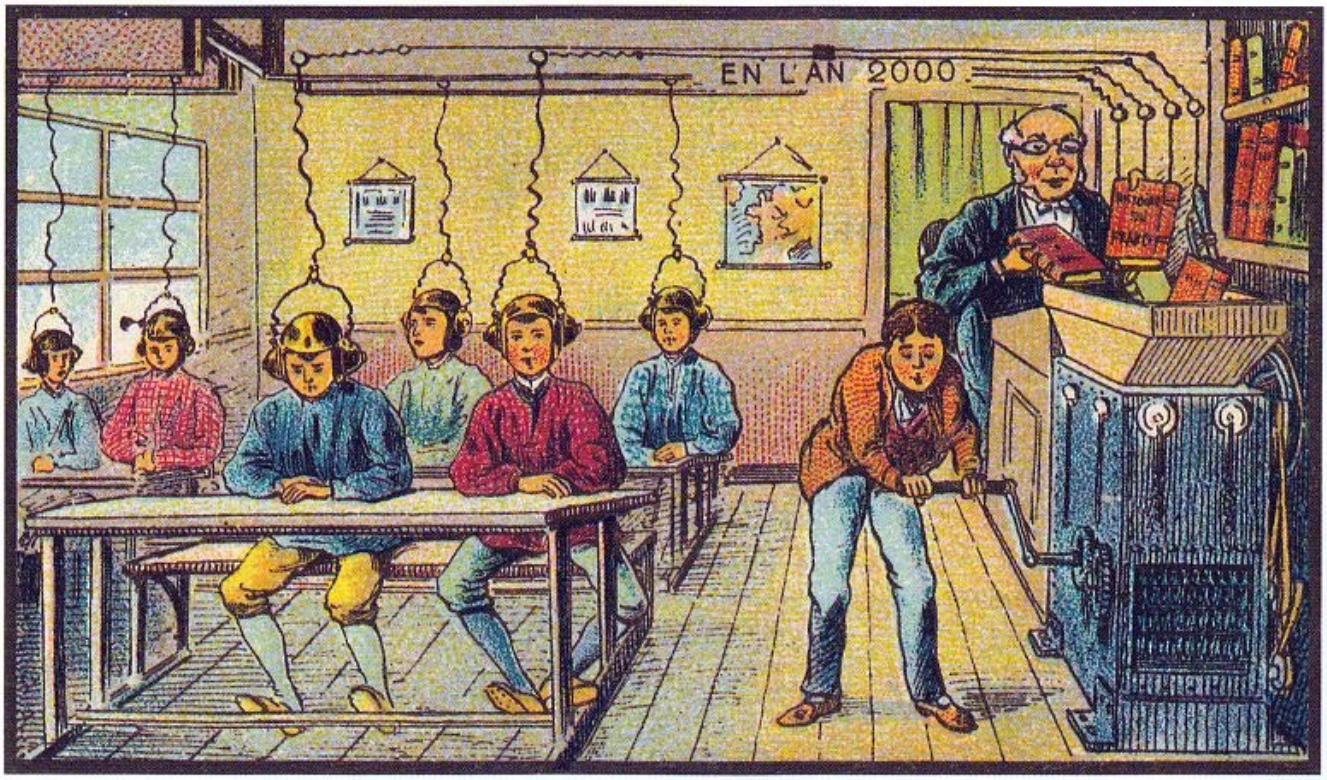


Image 1. At School (Villemard, 1910)

This 1910 print by the French artist Villemard is probably the most famous 'image of the future' of education. It was created as part of the series "En l'an 2000" ("In the Year 2000") for the World's Fair. The 'future' that this postcard presents is mainly a different technology

that maintains the most traditional concepts of teaching and learning: students as 'receivers' of knowledge, and teachers as 'transmitters.' In this particular 'future' the role of the teacher is that of a curator of the content that students must learn and a role of 'transmitter' of such content, the latter substituted by technology. The 'improvement' enabled by technology in this particular image of the future appears to be a more direct transmission of the content into the students' heads.

Also, at the start of the twentieth century, Thomas Edison predicted in 1913 that "Books will soon be obsolete in schools." He believed that the motion picture, an invention that he was investing in at the time, would displace both textbooks and teachers alike. "I believe that the motion picture is destined to revolutionize our educational system and that in a few years, it will supplant largely, if not entirely, the use of textbooks," Edison asserted in 1922. Once again, the innovation criteria seemed to be a matter of 'efficiency of transmission' as he expressed it: "I should say that, on average, we get about two percent efficiency out of school books as they are written today. The education of the future, as I see it, will be conducted through the medium of the motion picture... where it should be possible to obtain one hundred percent efficiency." Once more, this reflects an understanding of the role of the teacher as merely a 'transmitter' of knowledge.

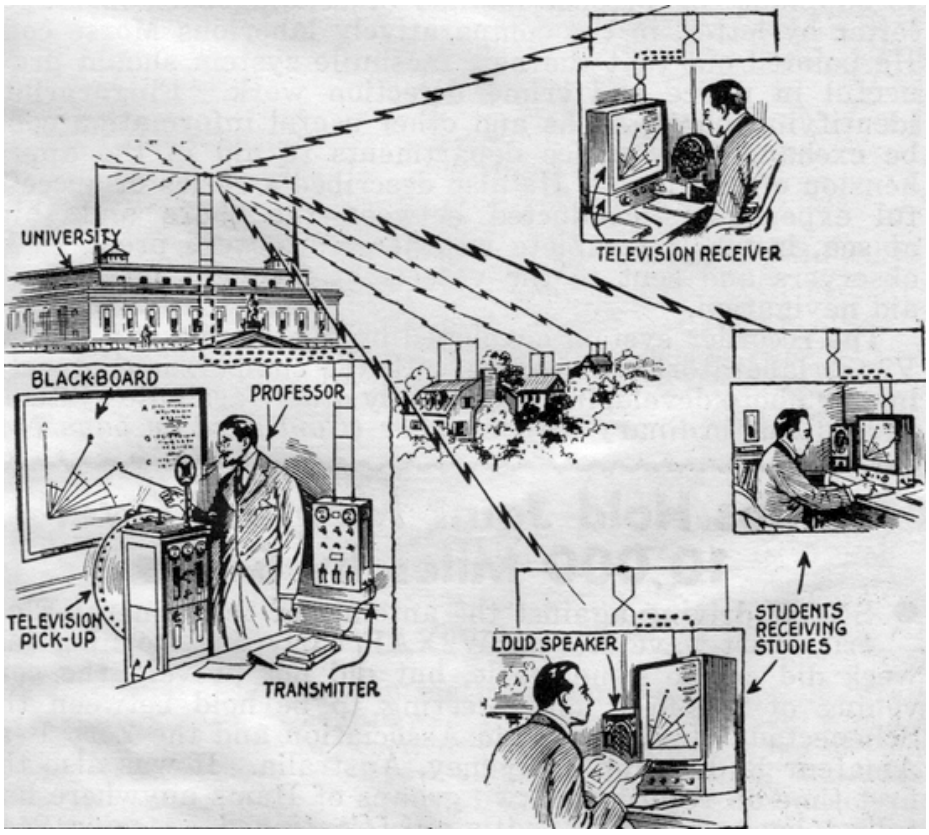


Image 2. A professor of the future gives a lecture via television (Carlin, 1935)

Later on, in 1935, Cheryl Carlin created this image of the 'professor of the future' (Novak, 2012). The innovation this time was scale and ubiquity, with the possibility of reaching a wider, more ubiquitous audience of students with radio and television. Still, the role of the teacher and students remains unchanged.

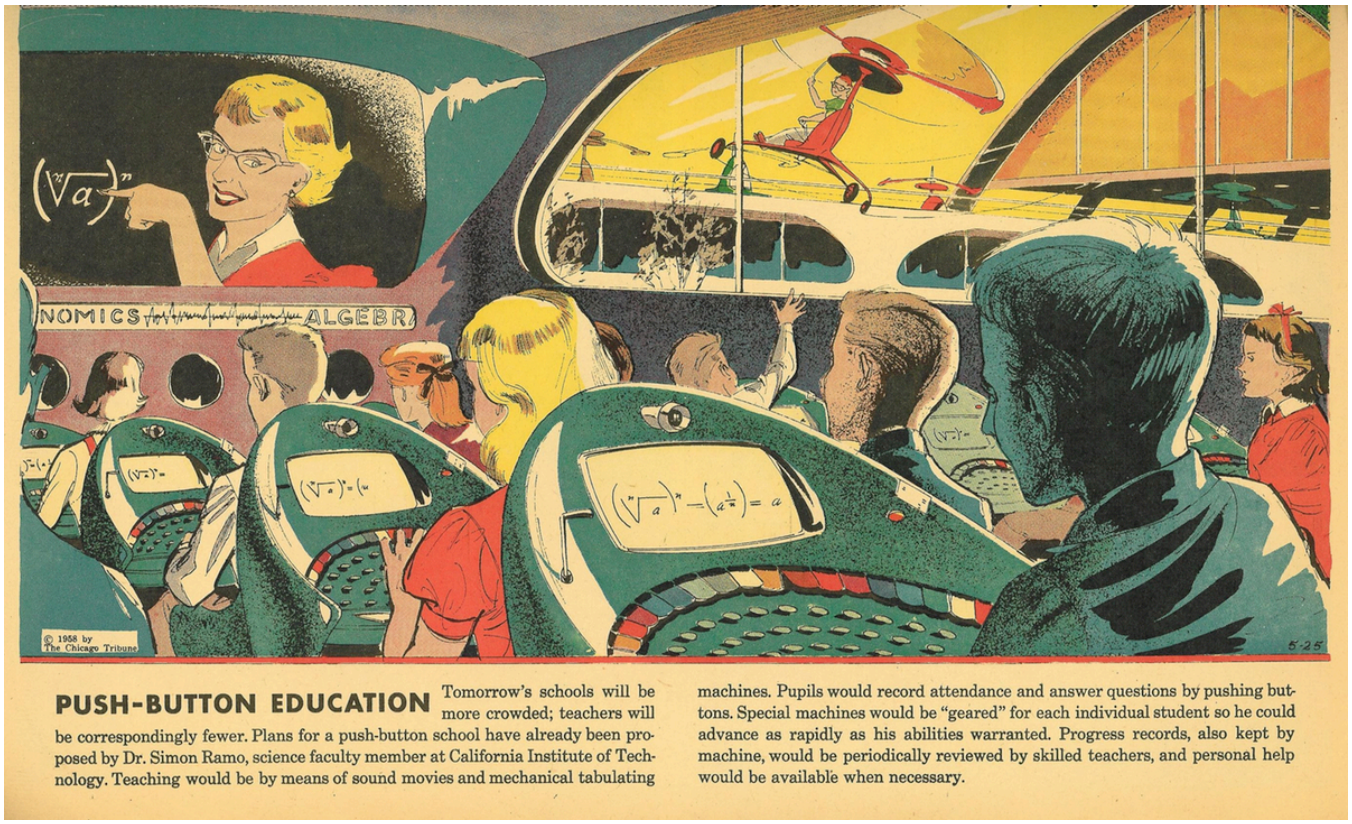
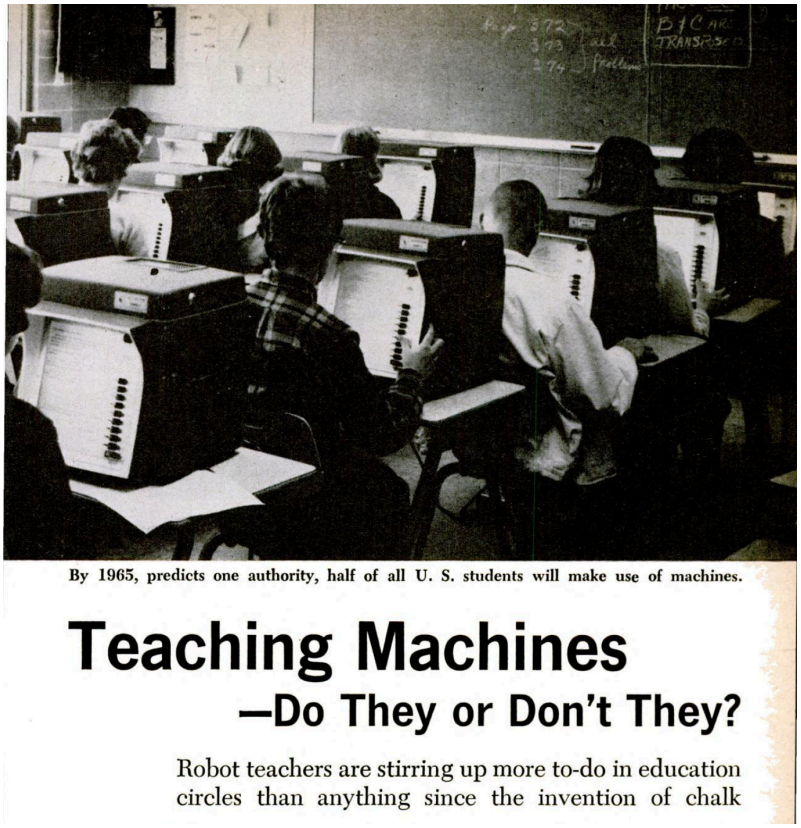


Image 3. Push-Button Education. (1958)

"Tomorrow's schools will be more crowded; teachers will be correspondingly fewer. Plans for a push-button school have already been proposed by Dr. Simon Ramo, a science faculty member at the California Institute of Technology. Teaching would be by means of sound movies and mechanical tabulating machines. Pupils would record attendance and answer questions by pushing buttons. Special machines would be "geared" for each individual student so he could advance as rapidly as his abilities warranted. Progress records, also kept by machine, would be periodically reviewed by skilled teachers, and personal help would be available when necessary."

Then, this image of the "Push-Button School of Tomorrow" that was published in the May 5, 1958 edition of Arthur Radebaugh's Sunday Coming, *Closer Than We Think* (Novak, 2011), was one of the first to envision some form of self-directed learning, where students could advance at their own pace. The description of this proposal reflects the role of 'teacher as record keeper' and support for learning.



By 1965, predicts one authority, half of all U. S. students will make use of machines.

Teaching Machines
—Do They or Don't They?

Robot teachers are stirring up more to-do in education circles than anything since the invention of chalk

Image 4. Teaching Machines. (Popular Science, 1961)

Then, in 1961, came this prediction from Popular Science, that by 1965 half of all students would be using teaching machines or robot teachers (Watters, 2015). The image closely resembles that of the "Push-button school," and the prediction is amazingly similar to the prediction made in 2008 by Harvard Business School professors Clayton Christensen, Michael Horn and Curtis Johnson in their book *Disrupting Class* about online learning and the future of K-12 schools. They predicted that by 2019, half of all middle and high-school courses would be replaced by online options, thanks to the developments driven by innovators in education technology.

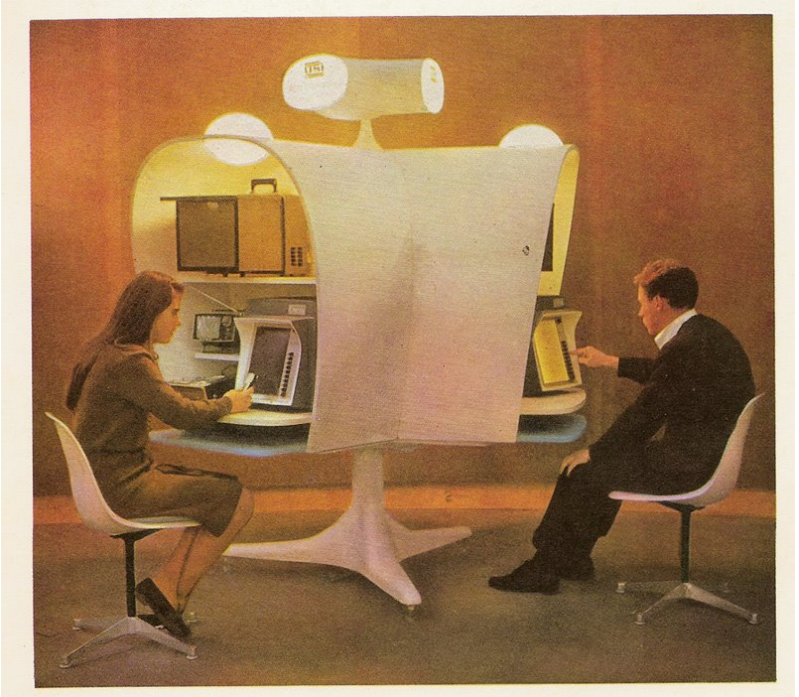


Image 5. Automated Schoolmarm. (1964)

Another image produced in the context of the World's Fair, this time in 1964, comes to light (Novak, 2008; Watters, 2015). This Auto-tutor or "Automated Schoolmarm" is another one that eliminates the teacher and presents an image of automated learning (or teaching in this case). Even if it eliminates the teacher, it still reflects an understanding of learning due to the transmission of knowledge, which can be automated.

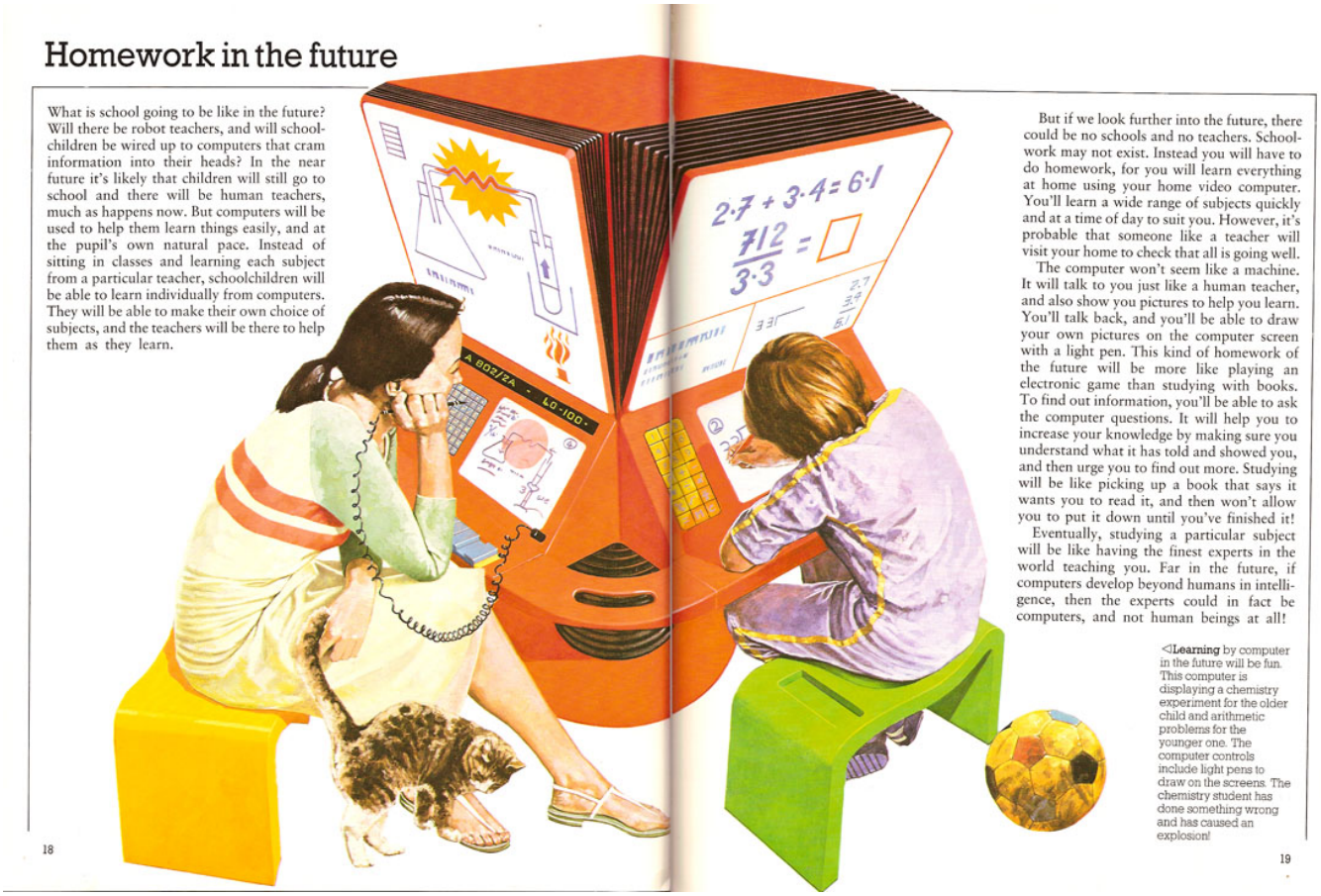


Image 6. Homework in the future. (1981)

"If we look further into the future, there could be no schools and no teachers. Schoolwork may not exist. Instead, you will have to do homework, for you will learn everything at home using your home video computer. You'll learn a wide range of subjects quickly and at a time of day to suit you. ... The computer won't seem like a machine. It will talk to you just like a human teacher, and also show you pictures to help you learn. You'll talk back, and you'll be able to draw your own pictures on the computer screen with a light pen. This kind of homework of the future will be more like playing an electronic game than studying with books. ...Eventually, studying a particular subject will be like having the finest experts in the world teaching you. Far in the future, if computers develop beyond humans in intelligence, then the experts could in fact be computers, and not human beings at all!"

Finally, this illustration from a 1981 book *School, Work and Play (World of Tomorrow)* also replaces teachers with technology and reflects the teaching role as that of content experts, so we only need the best ones in the world, the most knowledgeable ones, if the transmission can be scaled. This image also introduces gamification as an innovative learning method.

If we jump to the twenty-first century and reflect on some of the most so-called 'disruptive' innovations that have 'transformed' teaching and learning on a large scale, we can find, for example, Khan Academy.

Salman Khan started the American non-profit Khan Academy in 2008 with a compilation of short videos explaining math concepts, which he later complemented with an extensive collection of online practice problems and explanatory videos in many other subjects. In 2011, he gave the TED Talk "Let's Use Video to Reinvent Education," which has been seen by nearly six million people. He portrayed a future in which learners could advance at their own pace through foundational content online, thus allowing teachers' time in the classroom to be focused on providing intensive remediation or facilitating group projects (Khan, 2011). Bill Gates, who participated in the TED Talk, closed the session, saying, "Well, it's amazing. I think you just got a glimpse of the future of education." Shortly after, Wired, Time, and Forbes all featured Khan on their covers. "One Man, One Computer, 10 Million Students: How Khan Academy Is Reinventing Education" read one of the headlines (Noer, 2012; Thompson, 2011; Webley, 2012).

Khan Academy, even if Bill Gates, Wired, Time, and Forbes portrayed it as a newly discovered revolutionary innovation in education, seemed to crystalize Thomas Edison's vision from 100 years early. However, the story does not finish there. In 2013, Salman Khan published a book, *The One World Schoolhouse: Education Reimagined,* and in 2014 he founded a school, the *Khan Lab School* in Mountain View, California, to test and demonstrate his transformational ideas. In 2019, he gave an interview to District Administration, a trade magazine for school superintendents and central office staff, which has, of course, had less exposure than his 2011 TED Talk. Khan said, "Now that I run a school, I see that some stuff is not easy to accomplish compared to how it sounds theoretically. [...] More recently, we're seeing that if students put 30 minutes to an hour per week, or one class period per week, toward software-based, self-paced learning, schools will see a 20 to 30 percent greater-than-expected gain on state assessments" (Brown, 2019).

Khan's direct experience with the complex realities of learning and education seemed to convert Khan Academy into a modest supplement to traditional classroom instruction, as less of a disruptive transformation or "magic formula" that would radically transform education. Even his new, more tempered recommendations, which fall into the method known as *flipped classroom,* can be traced back to the blended model proposed in 1997 by Ken Koedinger and his colleagues, through a report, "Intelligent Tutoring Goes to the Big

City," that described the use of adaptive, self-paced algebra tutoring software in the Pittsburgh public schools (Reich, 2020).

The example of Khan Academy reveals three critical lessons. One, images of the future are truly powerful, as they, in fact, have the traction to steer the creation of certain futures, as Polak stated. From the images of the future presented above, we can see that they created a mindset foundation for education innovations with the likes of Khan Academy.

The second lesson is that the rhetoric of EdTech developers easily revolves around finding 'the magic formula' (which usually consists of a singular technology product) that will disrupt education. "The rich and fascinating past of education is forgotten and erased in an attempt to tell a story about the future of education that emphasizes products, not processes, the private, not the public, "skills" not inquiry" (Watters, 2015). The problem is that such bold statements come from a narrow understanding of the complexities of education as to what guiding and enabling learning, which is the essence of the teaching role, truly entails.

The third lesson is that there is a clear pattern of dominant metaphors underlying what EdTech developers understand of improving teaching and learning. From the examples presented above, we can extrapolate that 'improving learning' from the EdTech perspective means increasing the outreach scale of learning experiences (disregarding the importance of context), enabling direct transmission of the knowledge for self-directed learning (ignoring the social element of learning), and relying on efficiency as the main criteria (focusing on what can be quantitatively evaluated about learning outcomes). These are some of the patterns and dominant assumptions that must be overcome to allow a more human, meaningful space for transformation in images of the future.

The following section provides an overview of a futures research method that can allow teachers to analyze and deconstruct the underlying metaphors that shape dominant understandings of teaching and learning while also providing a structure to reconstruct alternative images.

CHAPTER 3

CAUSAL LAYERED ANALYSIS: EXPLORING METAPHORS AS THE FOUNDATION OF FUTURES

3. CAUSAL LAYERED ANALYSIS: EXPLORING METAPHORS AS THE FOUNDATION OF FUTURES

To analyze and deconstruct images of the future and design transformational alternatives, the most suitable futures research method is Causal Layered Analysis (CLA), developed by futurist Sohail Inayatullah. Its utility, as Inayatullah (1998, 815) explains, lies "not in predicting the future, but in creating transformative spaces for the creation of alternative futures."

The fundamental premise of CLA is that realities can be understood from different layers and ways of knowing (Riedy, 2008). The approach supports the deep understanding that problem framing and solutions are constructed through a multilayered context. The layers are named and sequenced as follows (Inayatullah, 1998):

1. **The litany:** the shallow understanding of an issue, usually backed by some data. It mainly consists of events and trends, what is happening backed by some evidence and symptoms, what we see and hear in the news.

2. **The systemic causes:** economic, cultural, political, legal, social, or historical factors that are causing the issues and the relationships between them. This layer is often the concern of academic research.

3. **The worldview/discourse:** the assumptions, beliefs, and values that support and legitimate the systemic causes. The deeper social, economic, cultural, political, religious or civilizational structures that this layer is concerned with are "actor-invariant," which means not dependent on the particular actors of the system.

4. **The myth/metaphor:** the, often unconscious, beliefs that keep the worldviews alive. This layer refers to the deep stories and collective archetypes that express social narratives and images of the collective consciousness and are usually depicted in art.

The method consists of moving up and down the multiple layers, rethinking the implied futures at each level to deconstruct and reconstruct a particular reality (Inayatullah, 2009). Deepening the analysis of current issues all the way to guttural and emotional metaphors creates space for "deconstructing conventional metaphors and then articulating alternative

metaphors, [which] becomes a powerful way to critique the present and create the possibility of alternative futures" (Inayatullah, 1998, 819).

CLA is considered a *critical futures* research method, as it creates a separation from current categories that 'define' or 'control' the implicit 'official, assumed or expected futures' (Van Der Heijden, 2005) and thus allows us to 'undefine' them. Drawing on its poststructuralist roots, CLA frames futures research around five principles: deconstruction, genealogy, distance, alternative pasts and futures, and reordering knowledge. CLA motivates deconstruction by identifying the privileged groups, perspectives, and assumptions of the future portrayed as preferable or possible. It relies on genealogy by looking for the history and paradigms and discourses that have been victorious or dominant in constituting the present. It fosters distance from the present by identifying the particular scenarios that make the present either remarkable, unfamiliar, strange or denaturalized. CLA looks for alternative pasts and futures by revealing which particular interpretations of the past are valorized, which ones make the present problematic, and which visions of the future are used to maintain the present. Finally, the approach allows reordering knowledge by understanding and drawing on ways of knowing different civilizations, genders, and epistemes to reconstruct alternative futures (Inayatullah, 1998).

Nevertheless, these poststructuralist roots of CLA also present a problem when using it as a futures research method. Poststructuralists viewed the person as socially and culturally shaped and thus focused on this social and cultural context giving little attention to the individual. "The problem with this approach is that most people *do* understand themselves as subjects, with perceptions, values and other types of self-knowledge. This self-knowledge cannot be ignored in a comprehensive approach to reality" (Riedy, 2008, 9).

In the applications of CLA that are mainly interested in collective futures, the absence of the individual perspective is not concerning, since collective futures are, precisely, more highly influenced and shaped by the collective discourses, worldviews, metaphors and myths that result from the assemblage of individual values and perceptions (Riedy, 2008, 9). However, when change-making relies ultimately on transformed individual action, as the research on impactful uses of EdTech has shown (Atlantis Group, 2019; Ertmer et al., 2012; Genlott et al., 2019), the exclusion of the individual dimension becomes problematic.

Inayatullah himself (2009) identifies the works of Gestalt-Jungian psychotherapists Hal and Sidra Stone as useful in creating an inner dimension to CLA, as they seek to create inner maps of the self. "Linking the work of the Stone's with CLA allows for inquiry into the layers of identity and the different futures that selves perceive and wish for" (Inayatullah, 2009, 4). This enables a deep understanding of the reasons underlying individual choices, whether decision-making hinges on rational considerations of evidence or depends on unexamined worldviews or influenced by interiorized metaphors or stories. In this way, CLA can allow teachers to understand better and deconstruct the social and cultural structures that shape their role and better understand themselves as practitioners and their professional identity.

To aid the aforementioned process, the following section provides an overview of the structural layers that shape a teacher's role, to then attempt to modify Inayatullah's CLA method by combining it with Duffy's model of Nested Theories of Action that influence the teachers' role. It is an effort to provide educators with a futures exploration tool that is more closely conceptualized around the particularities of their profession.

CHAPTER 4

THE LAYERS OF A TEACHER'S ROLE

4. THE LAYERS OF A TEACHER'S ROLE

A teacher's role is defined by cultural and social events and the particular geographic environment that they belong to. The factors that influence such a role are both internal and external. Internal factors refer to the teacher's perceptions of his/her/their role, shaped by his or her beliefs about its importance and his/her/their expectations of it. The external factors are the beliefs and expectations of the role held by related stakeholders, such as learners, parents, colleagues, school leaders, and the public. Of course, both internal and external factors are influenced by the teacher's cultural, social, and geographical environment (Makovec, 2018).

According to Makovec's analysis of what shapes a teacher's role, we can conclude that envisioning future transformations of such a role means understanding the beliefs that shape it and exploring how those can change. This is what Eickelmann & Vennemann (2017) call *second-order change*, which requires teachers to challenge their practices and beliefs, including how they define teaching and, thereby, learning. It represents a deeper level of transformation than first-order change, which means adjusting current practice by doing the same things as before, but in new ways (Genlott et al., 2019).

So far, most of the changes that EdTech has brought to the teaching practice represent first-order change. To illustrate, the Varkey Foundation Atlantis Group research concluded that, on a large scale, teachers and students are not doing anything fundamentally different from before. As one expert told them: "In EdTech 1.0, we were digitizing traditional models [...]. Nothing has really changed, we've just added tech, overlaid over the existing framework" (Atlantis Group, 2019, 14).

Therefore, to drive and sustain meaningful transformation, which is second-order change, we must enable transforming the beliefs and expectations that shape and transform teaching roles and notions of how to support those transformed roles through EdTech.

A *belief* 'can be understood as a subjective element of knowledge that an individual considers true and important in relation to a specific subject' and 'bound up with a person's history, emotions, and personal values' (Petko, 2012, 1353). According to Francis M. Duffy (2009), beliefs, alongside values, fuel attitudes that reveal mindsets. A *mindset* can be defined as a self-perception or "self-theory" that people hold about themselves (Dweck, 2017) and about what works and what does not work, about what has merit and value, and what does not (Duffy, 2009, 11).

Duffy (2009) suggests that mindsets, with their underlying mental models and paradigms, represent the theories of action that shape the teaching role, expressed through observable behaviours. He proposes that paradigms, mental models, mindsets, behavioural strategies, and observable behaviours can be organized as a hierarchy of nested theories of action, as displayed in Figure 1.

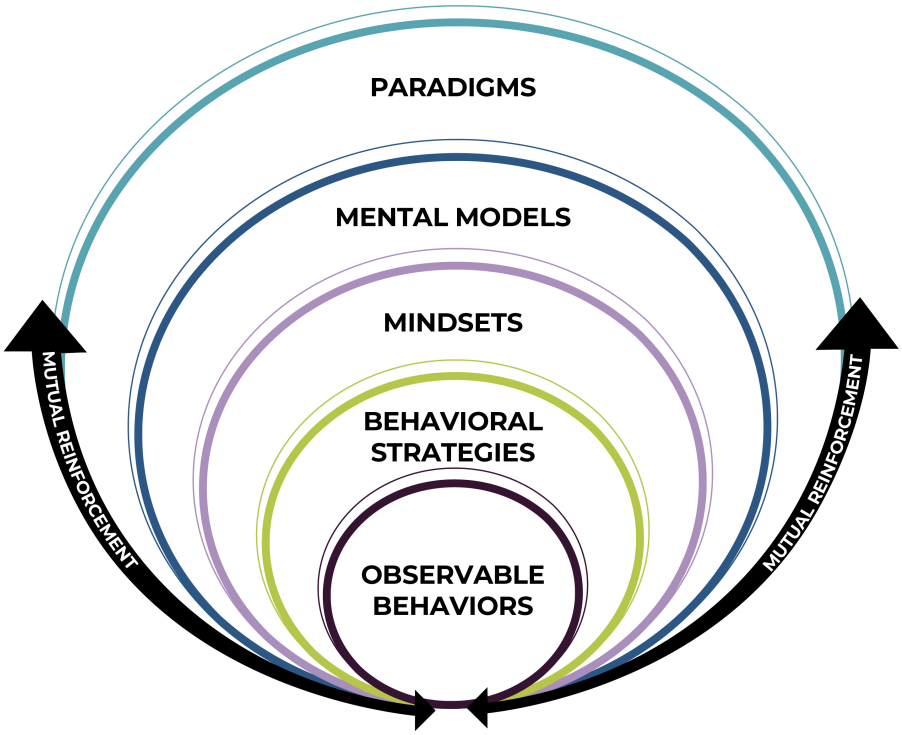


Figure 1. Nested Theories of Action

With this nested framework, Duffy (2009) explains how the teaching roles are systemically shaped. Teachers develop mental models that are aligned with the dominant paradigms of their particular context and educational system. This alignment reinforces and sustains the paradigm. As teachers attune to the stipulations of the paradigm and mental models, they form mindsets about the worthiness and effectiveness of the paradigm and its related mental models. The mindsets, then, help teachers to forge strategies for how to do their work (behavioural strategies), which are manifested through observable behaviour. In every system, successful behaviours, which are judged according to the stakeholders' beliefs and expectations, are rewarded, reinforcing the mindsets, mental models, and dominant paradigms. This intricate interconnectedness and mutual reinforcement are unavoidable and powerful.

To envision how the teaching role may transform in the future, it is necessary to consider the interplay of all these constructs and how they influence each other. For that, let us clarify the meaning of the constructs proposed in this model.

PARADIGMS

Thomas S. Khun first described a *paradigm* as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" (Khun in Shapere, 1971). Later on, Capra (1996) defined *paradigm* as "... a constellation of concepts, values, perceptions and practices shared by a community, which forms a particular vision that is the basis of the way a community organizes itself" (Capra in Duffy, 2009). In other words, we can understand paradigm as a framework to make sense of reality and guide thought and behaviour within certain boundaries or rules, written or unwritten.

MENTAL MODELS

The concept of *mental models* first arose in the field of philosophy. American philosopher, Charles Sanders Pierce, theorized that, through deductive reasoning, the human mind examines "the state of things asserted in the premisses, forms a diagram of that state of things, perceives in the parts of the diagram relations not explicitly mentioned in the premisses, satisfies itself by mental experiments upon the diagram that these relations would always subsist, or at least would do so in a certain proportion of cases, and concludes their necessary, or probable, truth" (Pierce in Johnson-Laird, 2004, 179). What Pierce describes as a 'diagram' can be understood now as a mental model. In the field of psychology, Kenneth Craik was the first to coin the concept. He explained that "if the organism carries a 'small-scale model' of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilize the knowledge of past events in dealing with the present and the future, and in every way to react in a much fuller, safer, and more competent manner to the emergencies which face it" (Craik, 1943 in Johnson-Laird, 2004, 179). From a broad review of the history of the concept, Johnson-Laird (2004) concluded that a mental model is a construct of the mind that results from perception, imagination, knowledge, memory, and discourse comprehension.

In summary, mental models are "deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take

action" (Senge, 1990, 8) and are shaped by a person's life experiences, perceptions, and understandings for the world (Jones et al., 2011).

MINDSETS

Mindsets are the core meaning systems that influence our behaviour by bringing together our goals and beliefs. Mindsets are particularly moulded by beliefs that come from people's lived experiences and do not work as isolated ideas but rather serve an organizing function to inspire certain attitudes and behavioural responses to different situations (Dweck & Yeager, 2019). Certain aspects of motivation, personality, and development are organized around the development of these beliefs and belief systems (Dweck, 2017).

As a mindset consolidates, it forges a proclivity to think, believe, and act in a specific way. Duffy (2009) states that within a profession, in this case, teaching, mindsets are deeply reinforced by the profession's controlling paradigm, the mental models related to it, and the reward systems that emphasize them. Shared mindsets also create powerful motivations for people and groups to behave in alignment with these factors.

BEHAVIOURAL STRATEGIES

People formulate strategies for conducting themselves within a particular dominant paradigm, its related mental models, and the mindsets supporting them. In the case of the teaching profession, these strategies are formulated by all individuals, groups, and entire school systems. These behavioural strategies shape how people should work, when, with whom, and so on (Duffy, 2009). We can understand these behavioural strategies as the implicit and explicit 'game plan' of the teaching profession.

OBSERVABLE BEHAVIOURS

When behavioural strategies are in full operation, they create observable behaviours. Through one's observable behaviours, one manifests the underlying behavioural strategies, mindsets, mental models, and paradigms guiding one's daily activities. People and professions can be either rewarded or punished, or ignored, depending on the alignment of their observable behaviours with their paradigm-driven visions (Duffy, 2009).

CHAPTER 5

CLA FOR THE TEACHING PROFESSION

5. CLA FOR THE TEACHING PROFESSION

As described in the previous sections, Sohail Inaytullah's Causal Layered Analysis model provides a layered representation of the social and contextual constructs that shape the particular framing and solutioning of issues, systems, policies, and others. On the other hand, Francis M. Duffy articulated a layered model of what shapes the teaching profession, drawing both on contextual and individual constructs. By analyzing the overlap of the constructs and layers that both authors proposed, I reached the following adaptation of CLA, with specific elements of inquiry that may better guide teachers in the deconstruction and reconstruction of their roles.

An important consideration when proposing a causal layered analysis of the teachers' role is that, as explained in section 1.1, the role of the teacher is multidimensional; attempting an exploration of the role considering everything at once could be daunting and unclear. Therefore, I suggest that teachers could break down and focus their exploration by choosing one dimension of their role and one related stakeholder at a time. Then, they could run several iterations of the CLA by choosing different elements to reach an overview of their role's full-spectrum, interconnectedness and complexity. This approach could even help surface contradictions or tensions that coexist within the multidimensional role of the teacher. Figure 2 provides an overview of the role dimensions (the inner circle) and the different stakeholders (outer circle) related to and influencing the teaching profession. The elements included in both circles are neither exhaustive nor definitive, leaving room for teachers to add different elements.

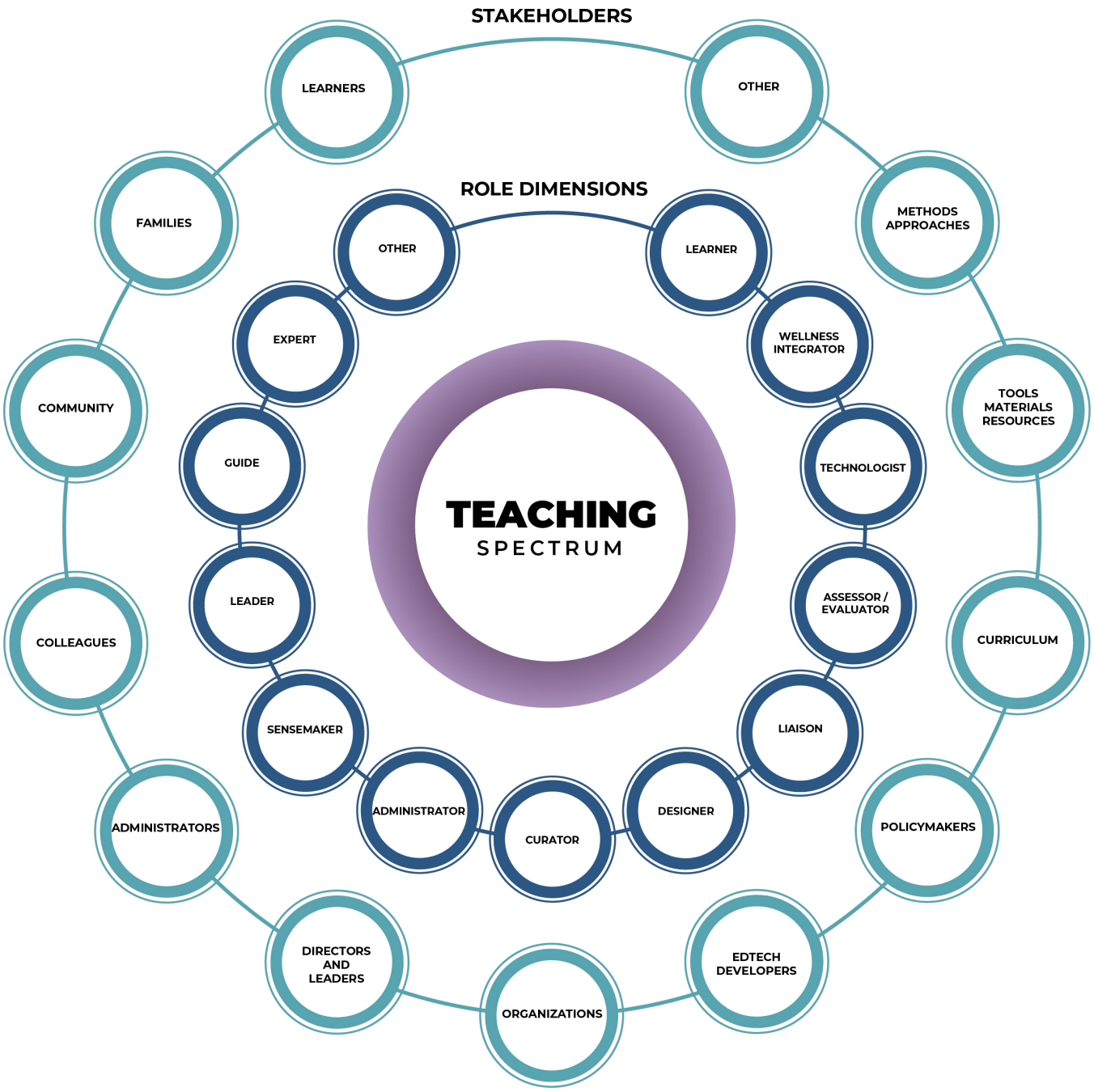


Figure 2. Teaching spectrum

Table 1 outlines the overlap between Inayatullah's CLA and Duffy's Nested Theories of Action models and provides an overview of key baseline questions that could help a teacher explore the layered influences of their role. Then, Figure 3 provides a visual synthesis of the adapted CLA.

CLA	NESTED THEORIES OF ACTION	CLA FOR TEACHERS
Litany • Events and trends • What is happening • Evidence and symptoms • Found in news	**Observable behaviours** • Manifested actions • Operative relationships	The litany layer of a teaching role refers to what is made visible through a teacher's actions and expressions; how they present themselves to different stakeholders. It includes both their performed, observable behaviours, as well as their planned actions. • How do you describe what you do as a teacher? • What would an action log of your routine day/week/month/term show? • What list of actions describes your practice as a [role dimension] with [stakeholder]? • How would [stakeholder] describe you? • What do you express as success? What are you achieving? • What do you express as failure or challenge? What are you struggling with? • What are your primary methods?
	Behavioural strategies • Action plans • Principles and criteria for action	• How do you organize your time? What do you allocate time for and prioritize? What do you not allocate time for or prioritize? • What do you prepare/train/learn/ research for? • What are the pedagogical/learning theories underlying your teaching interventions? How does it shape your practice?

CLA	NESTED THEORIES OF ACTION	CLA FOR TEACHERS
Systemic Causes • Economic, cultural, political, legal, social, or historical factors • Found in academic research	**Mindsets** • Meaning systems • Organizing beliefs	The systemic mindsets layer teaching roles includes economic, cultural, political, legal, social, and historical factors shaping the role. This layer also refers to a teacher's meaning systems and organizing beliefs about teaching and learning, their institution's culture, their community's visions on teaching and learning, and the educational policy of their context. • What is your concept of 'good teaching'? • How does one become a good teacher? • Who are your role models of 'good teaching'? Who/what has inspired your teaching ideals? • What is 'bad teaching'? • What is your concept of 'learning'? • What is your concept of a 'successful' or 'good learner'? • What is your institution's concept of 'good teaching'? (Expressed, for example, in evaluated aspects and areas of feedback) • What types of behaviours does your institution's culture encourage/ support/celebrate? • What aspects of teaching does your community punish/undermine/ neglect/reject? • What is the educational policy framing your practice?

CLA	NESTED THEORIES OF ACTION	CLA FOR TEACHERS
Worldviews/ Discourses • Assumptions, beliefs, and values • Social, economic, cultural, political, religious, or civilizational structures	**Mental models** • Deep assumptions, generalizations, and images that influence our understanding	The worldviews and discourses layer of teaching roles refer to the deeply held assumptions, generalizations, and images that influence the understanding of teaching. It includes social, economic, cultural, political, religious, or civilizational structures and sensemaking frameworks and the constellation of shared values and practices. • Why are teachers needed? • How do teachers 'make a difference'? • What is absolutely essential about teaching? • What are the aspects of your teaching that you would never want to change? Why? • What is 'irreplaceable' about teaching? • What makes a teacher a teacher? • How and where does learning happen? • What is needed for learning to happen?
	Paradigms • Sensemaking framework • Constellation of concepts, values, perceptions, and practices shared by a community	• What are your philosophical views about education? • "Education is a means to..." • What is the dominant paradigm guiding your teaching practice? (Industrial Age, Knowledge Age, Imagination Age)

CLA	NESTED THEORIES OF ACTION	CLA FOR TEACHERS
Metaphor/Myth • Stories • Collective archetypes • Social narratives • Found in art		The metaphors and myths layer influencing teaching roles refers to the stories, collective archetypes, and social narratives about education and teaching. • Metaphors/myth that reveal what education is • Metaphors/myth that reveal what teaching is • Media representations of teachers that you resonate with

Table 1. Adapted CLA for teachers

Deconstructing and reconstructing each layer of one's professional role through images of the future that explore alternative and previously unseen possibilities is a task that requires deep introspection, insight, and creativity. There are so many aspects of one's teaching role that are tacit and unconscious that surfacing them and challenging them needs guidance. Therefore, a toolkit to guide teachers through that journey would require prompts to activate and practice the different cognitive skills that a future-thinking process requires. The following section explores a framework of the neurological processes that enable the thinking process that brings about images of the future.

CHAPTER 6

DECONSTRUCTING AND RECONSTRUCTING IMAGES OF THE FUTURE: THE JOURNEY OF THE MIND

6. DECONSTRUCTING AND RECONSTRUCTING IMAGES OF THE FUTURE: THE JOURNEY OF THE MIND

The process of facilitating the imagination of futures that are distinct to the present and that challenge deeply held assumptions requires a high level of futures thinking practitioners skill and a recognition of how people use foresight methods to avoid 'misfuturing' (Voros, 2005, 38). However, while people have always engaged in imagining the future, most research pays attention to the process outcomes more than the *thinking* process that brings about images of the future (Conway, 2021).

Rhemann (2019, p.51) proposes that combining Future Studies and Foresight (FSF) with neuroscience would enable the emergence of a "cross-disciplinary approach to understanding how we think about the future" to design new techniques that engage the brain's anticipatory and sensory systems to expand and deepen visioning and similar processes (Rhemann in Conway, 2021). Rhemann's research (2019) presents a comprehensive examination of the neural mechanisms involved in thinking about the future. Building on Rhemann's work, Figure 3 illustrates an adaptation of Maree Conway's conceptual framework of the neural and cognitive factors involved when we imagine possible futures.

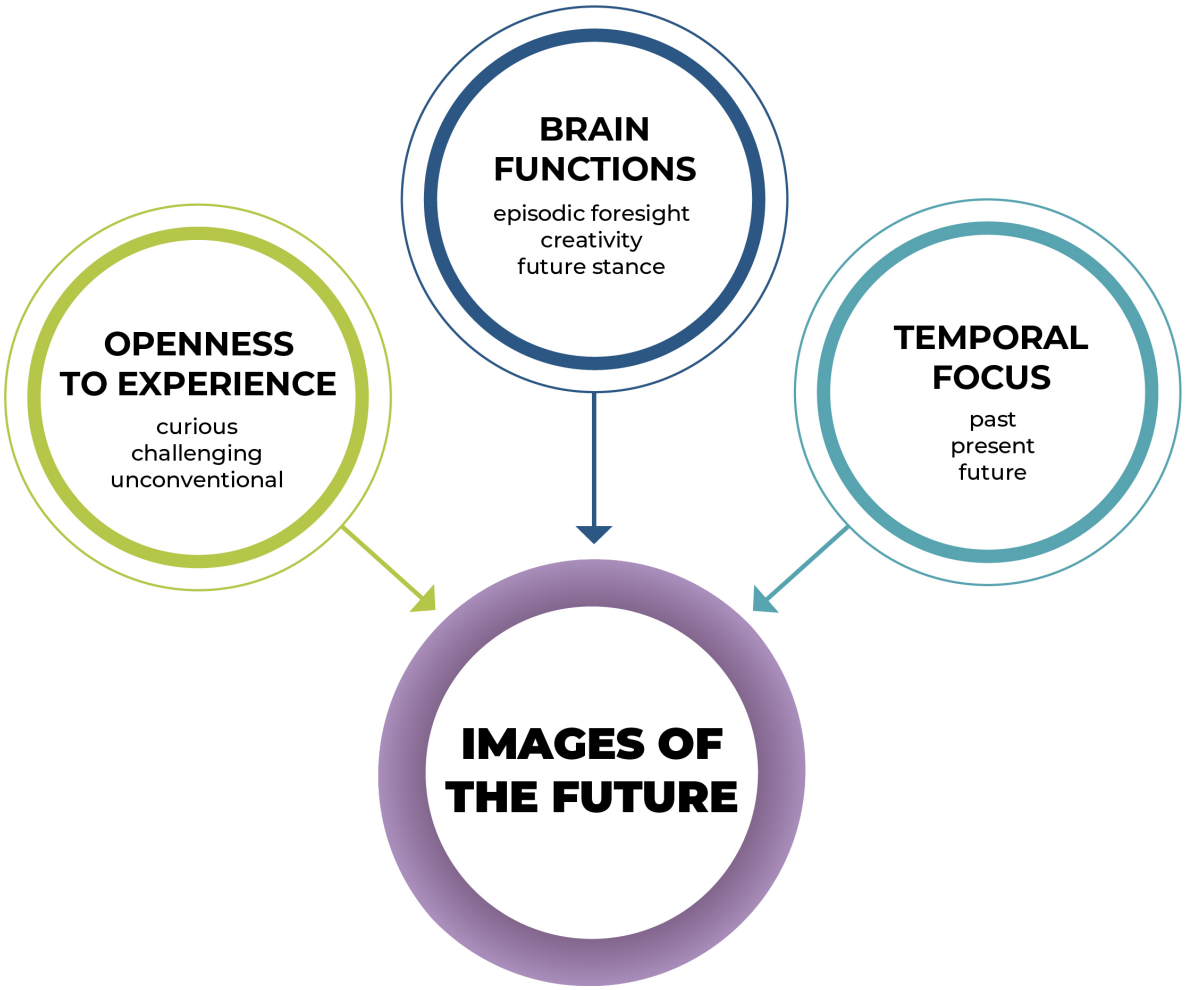


Figure 3. Mental processes involved in constructing Images of the Future

The three top circles in Figure 3 represent the tacit mental processes involved when a person is involved in creating an image of the future (central circle). "A well-designed FSF process then must include specific processes that activate both tacit and overt factors to ensure meaningful and useful images of possible futures can be imagined in that process" (Conway, 2021).

OPENNESS TO EXPERIENCE

Creativity and imagination are directly related to 'openness to experience,' as recent brain and psychological research have found (Sun et al., 2018). The Five-Factor Model of Personality (McCrae & Costa Jr, 1987; Digman, 1990; McCrae & John, 1992) is a model developed to represent as much of the variability in people's personalities as possible (Soto & Jackson, 2013). It defends that personality varies around five main traits:

conscientiousness, extraversion, agreeableness, neuroticism, and indeed, openness to experience. This last trait signals the "most important ways in which individuals differ in their enduring emotional, interpersonal, experiential, attitudinal, and motivational styles" (McCrae & John, 1992, 175). Whether individuals have an open mind towards the future or a closed mind depends on this trait, as suggested by the Five-Factor Model of Personality.

Curious, imaginative, insightful, original are terms also used to describe the openness trait. In the surveys and inventories it can be identified as people who have a 'wide range of interests,' 'value intellectual matters,' 'judges in unconventional terms,' 'aesthetically reactive' (McCrae & John, 1992, 179) or 'unusual unconventional thought' (McCrae & John, 1992, 198). It has been more recently defined that people who are 'open to experience' tend to be intellectually curious, creative and imaginative (Smillie, 2017); they see the world differently and are more open to diverse ideas and beliefs, including those which challenge existing assumptions.

Openness to experience appears to be equivalent to the 'Openness to Alternatives' dimension of the Future Consciousness scale (Ahvenharju et al., 2018; Lalot et al., 2019). It includes capacities such as "creativity, imagination, critical thinking and openness, and it is strongly linked to the capability of embracing and appreciating change, seeing the value of alternative ways, and questioning established truth" (Ahvenharju et al., 2018, 10).

Generating unique and distinct images of the futures of teaching and its relationship with technology might be easier for those teachers who already possess this personality trait. However, if we are to encourage truly diverse and democratic images of the future, foresight methods and tools created and implemented by practitioners need to provide deeper guidance and prompts for openness to experience or openness to alternatives. That way, a more comprehensive number of teachers, mainly EdTech developers and policymakers, can challenge their assumptions.

TEMPORAL FOCUS

'Time perspective' is "a fundamental dimension in the construction of psychological time [that] emerges from cognitive processes partitioning human experience into past, present, and future temporal frames" (Zimbardo & Boyd, 1999, 1271). This is a critical capacity when engaged in foresight activities, as our brain reconstructs the future by reconstructing the past in new ways (Conway, 2021). According to their temporal focus, some people might

base their decision-making and future-imagination processes on reconstructing the past. In contrast, others might base them on anticipated or expected desired futures.

Even though the time frame that foresight is mainly interested in exploring is the future, a good foresight process requires engagement with the three temporal frames to be unbiased or consistent. Inayatullah (2008) frames this as mapping a 'futures triangle' consisting of understanding the 'pull' of the future, the 'push' of the present, and the 'weight' of history (or the past). To ensure the balance of that 'futures triangle,' it is also essential to introspect how each person engages with the future according to influential cultural, social, and individual factors. According to Shipp et al. (2009, 1), people and organizations have a natural tendency to develop a preferred temporal focus. "More past-focused individuals tended to be more negative, while current and future-focused individuals tend to be more positive" (Shipp et al., 2009, 16).

About the impact of temporal focus in individual present-day action, Karniol and Roos (1996, 594) identified that people tend to imagine a reduced number of possible futures or avoid imagining futures that do not align with personal values and beliefs. Also, they stated that present-day action could be related to the degree to which people can connect representations of themselves in the present with images of the future, that is, by creating "images of possible selves, representations of how they might act, look, or feel in the future." It is then possible to see how tacit understandings of the self and how we 'sense-make' can enable and constrain the emergence of possible futures. Ensuring people engaged in a foresight activity are aware of their time preference is therefore essential.

BRAIN FUNCTIONS

EPISODIC FORESIGHT

The primary neurological process that allows us to imagine the future is episodic memory, which Irish & Piguet (2013, 1) describe as:

> "One of the fascinating aspects of human cognition is our ability to withdraw from the current moment and mentally transport ourselves to another time, place, or perspective. Collectively, the powers to remember the past via episodic autobiographical memory or to imagine possible future events represent important expressions of the human memory system that enable not only the capacity for retrieval from our personal past but also encompass the ability to imagine and

> envisage possible future scenarios, leading to a constructivist view on how humans might achieve such sophisticated acts of cognition."

It is interesting to learn that recollection of the past and the imagination of the future happen in the same brain regions. Ingvar (1985, 127) coined the term 'memory of the future,' which also explains the futuristic capabilities of our episodic memory. Drawing on this constructivist perspective of our capacity to imagine the future, we also learn that episodic memory correlates with autonoetic or self-knowing consciousness. It refers to a self-reflective capacity that is surfaced when we recall the past or imagine the future and that allows us to consciously reflect on our experience in those mental spaces (Klein, 2016; Natsoulas, 2017), or as Tulving (1985, 5) describes:

> "A normally healthy person who possesses autonoetic consciousness is capable of becoming aware of her own past as well as her own future; she is capable of mental time travel, roaming at will over what has happened as readily as over what might happen, independently of physical laws that govern the universe."

Episodic memory combined with semantic memory, which allows us to remember events and facts *outside* of constructed simulations (Irish & Piguet, 2013; Madan, 2020), enables the neurological process of 'boundary extension' (Rhemann, 2019, 25), which allow us to construct possible futures to move beyond temporal restrictions.

Ingvar (1985, 128) also explains that we can remember our memories of the future. Memories of the future only work to generate new actions and strategies in the present if people can remember that content, which is more likely if people are exploring a time period closer to the present and if the future simulation is imagined frequently (Schacter et al., 2012). Therefore, it is essential to constantly and iteratively engage in the imagination of images of the future.

CREATIVITY

Creating images of the future that are *not* a projection *from* the present is the primary purpose of foresight, and so creativity is a crucial neurological process. The type of creativity required for futures thinking is a full brain process that involves some type of recombinant thinking, as imagining future experiences requires that details extracted from past experiences are flexibly recombined into a novel event (Schacter et al., 2012, 681). Therefore, it is this recombinant thinking that allows new perspectives and understandings of the present to emerge.

Moreover, according to Koontz (2019), it is the interconnection of three main neural networks that increases a person's creativity and capacity to imagine alternative futures: the *Executive Attention Network,* responsible for decision-making and action; the *Imagination Network*, which allows people to daydream and brainstorm, and this imagine the future, and the *Salience Network,* responsible for focus and attention. This latter network is the one that filters which information is relevant for problem-solving by deciding what information is worth paying attention to and which one is not. A new idea begins with increased activity in the Imagination Network, which the Salience Network recognizes that, noting this idea is new, switches the idea to the Executive Attention Network to create working memory retained by the brain.

FUTURE STANCE

People's tendency towards positive or negative emotions also creates a bias towards their views of the future. People with a positivity bias are more likely to remember positive events and view them as more plausible, especially when simulating a future event is repeated (Schacter et al., 2012, 688). A positivity bias also helps determine willingness to consider action in the present that has only long-term benefits. At the same time, negative emotions instead generate short-term thinking at the expense of longer-term benefits (Aspinwall, 2005, 219-222).

In his book *The Image of the Future,* Dutch sociologist Polak (1973) also provided 'quadrants' that allow people to examine their positive or negative views towards the future according to two-axis: essence and influence.

> It will be helpful to make distinctions between optimism and pessimism along the lines of the concepts of *Seinmülseen,* "what must be," and *Seinsollen* "what ought to be." It would then be possible to speak of *Seinoptimismus* or *Seinpessimismus,* which we will refer as essence-optimism or essence-pessimism, and *Willensoptimismus* or *Willenspessimismus,* which we shall refer to as influence-optimism or influence-pessimism. The essence categories refer to an unchangeable course of events; the influence categories refer to the supposed or rejected possibility of human intervention. The first point of view sees history as a book that has already been written; the second sees history as a process than man can or cannot manipulate (Polak, 1973, 17 in Hayward & Candy, 2017, 5-6)

CHAPTER 7

NAVIGATING THE JOURNEY: A TOOLKIT TO DECONSTRUCT AND RECONSTRUCT TEACHING ROLES

7. NAVIGATING THE JOURNEY: A TOOLKIT TO DECONSTRUCT AND RECONSTRUCT TEACHING ROLES

Even before the COVID-19 pandemic, interest in EdTech had increased considerably. Throughout the pandemic, it has become essential. As we strive to figure out a post-pandemic world (whenever that moment comes), interest, investments, and efforts in EdTech development will probably become one of the center-stage efforts in building the futures of educational systems. As we learned from our paleofuture analysis, there is a pattern of dominant metaphors underlying EdTech developers' understanding by improving teaching and learning. The solutions built have a high risk of addressing only a narrow perspective of the multidimensional roles of teachers. Therefore, we need inspiring images of the future built by teachers themselves, who live and face the complexities of their professional mission and roles and understand the full spectrum of challenges that come with it. Designing better EdTech should start with teachers envisioning the possible (and desirable) future evolutions of their roles and, in the second instance, their relationship with EdTech. These images of the future should be amplified and serve as the baseline inspiration for EdTech developers.

To guide that teachers through that futures exploration journey, I prototyped a toolkit that synthesizes the lessons learned from the literature review presented in the previous sections in the following structure:

SECTION	STRUCTURE	PURPOSE
Welcome to the journey	• A letter for teachers • Before you start. A tale of caution and an invitation • 10 thought about futures thinking to inspire your journey.	This initial section provides teachers with an invitation to become futures thinkers by explaining why their images of the future are essential for thriving teacher-technology relationships. It then provides a type of 'disclosure' that reveals an understanding of the power dynamics in educational systems, which often hinder teachers' change-making potential and understand the many demands placed on teachers' shoulders. This toolkit does not intend to ask teachers to become, in addition to everything, foresight practitioners, but it does introduce them, kindly, to futures thinking as a critical skill to amplify their understandings of past, present, and futures. Finally, it provides ten ideas by several foresight authors, as a way to introduce them to futures thinking.
Your time-traveller self	• Your purpose • Forces of influence • Travelled roads	The toolkit starts by providing teachers with an initial exploration of what has shaped them as a teacher and the particular role and style they play in the present. They will explore the foundations behind their purpose, their forces and sources of influence, and their teaching past. This section is designed from a constructivist understanding of the future, as transformation pathways necessarily derive from a complex and influential personal past that first needs to be surfaced to be challenged. This section is also intended to serve a grounding purpose. Challenging one's identity as a professional is no easy task, so this section helps teachers start their futures exploration by grounding them in their essential purposes and their capacity for change by inviting them to review their past transformational moments.

SECTION	STRUCTURE	PURPOSE

Prepare for the journey	• Your mind's visioning processes
	  • Futures stance
	  • Openness to experience
	  • Temporal focus
	  • Creativity
	• Take stock
	  • Your change power
	  • Your support network
	  • Share the journey
		The next part of the toolkit guides teachers through a series of 'warm-up' exercises to surface and understand the tacit mental processes involved when creating images of the future. This is encouraged before the deconstruction and reconstruction of their teaching roles through the redesigned CLA to help teachers understand their tacit mental processes that will influence their particular perspectives on the future. It would be difficult to challenge their thinking if these mental processes are not made explicit first.
		
		Then, the second part of this section invites teachers to 'take stock' by mapping their support networks and change-making capacities. Even if this toolkit is designed for individual work, collaboration is strongly encouraged.

On to time-travel	• Map your multidimensional role • Deconstruct your role • Explore future trends and implications • Reconstruct your role • Design your futures mosaic	There is no ONE image of the future that can express the full spectrum of what teaching entails. Therefore, this toolkit invites teachers to create, as an outcome, a 'mosaic' of the future, comprised of many different images. Teachers will accomplish this by first mapping the multi-dimensionality of their roles. Then, from that map, they will select a particular dimension and stakeholder and use those as a focusing lens to deconstruct that aspect of their role with the redesigned CLA. Then, they can explore a series of futures trends and analyze their implications to reconstruct their roles then. Teachers are encouraged to repeat this iteration by choosing different dimensions of their roles, related stakeholders, and future trends to explore.

SECTION	STRUCTURE	PURPOSE
Distill the future in the present	• Distill your insights: The future begins today • A letter to fellow teachers • A letter to EdTech developers	Finally, teachers are invited to distill their discoveries into present-day actions that they can apply to begin 'iterating' on their roles towards a future vision. They are also encouraged to identify conversation topics to start with other stakeholders, as profound transformation cannot happen when only one person is acting differently.

Table 2. Toolkit structure

The complete toolkit can be found in the Appendix.

CONCLUSION

CONCLUSION

A review of selected past images of the future revealed that images of the future are truly powerful, as they have the traction to steer the creation of certain futures; a metaphor pattern underlying contemporary 'disruptive' EdTech innovations such as Khan Academy can be traced back to the early 1900s. From the paleofuture analysis, we understood that EdTech developers could fall into two traps. First, they risk falling into the rhetoric of finding 'the magic formula' that will disrupt and transform education without considering the many social and human complexities. The second potential trap is that there is a clear pattern of dominant metaphors underlying what EdTech developers understand of improving teaching and learning. From the examples presented above, we can extrapolate that 'improving learning' from the EdTech perspective means increasing the outreach scale of learning experiences (disregarding the importance of context), enabling direct transmission of the knowledge for self-directed learning (ignoring the social element of learning), and relying on efficiency as the main criteria (focusing on what can be quantitatively evaluated about learning outcomes). These are some of the patterns and dominant assumptions that must be overcome to allow a more human, meaningful space for transformation in images of the future.

To steer the development of future educational technologies into a direction that resonates with the evolution of learning and the multidimensional transformation of teaching, we need to deconstruct, reconstruct, and socialize new images of the future inspired by teachers themselves.

For teachers to construct such images of the future, two elements arise as necessary starting points. One, as a profoundly vocational profession, introspection of the teachers' past, purpose, motivations, values and forces of influence is essential. As noted in the research, change within the teaching profession, whether it means incorporating EdTech or new methods, requires resonance with a teacher's fundamental beliefs and understanding of his/her/their identity. The second point is that, as non-foresight practitioners, teachers need more guidance in surfacing the tacit mental process that underlies the imagination activity to surface them and then challenge them.

As a profession in which change relies upon transformed individual action related to personal beliefs, expectations, and contextual demands, Causal Layered Analysis becomes a critical futures research method to guide reflection about possibilities for transformation. The method's poststructural roots allow for a deep understanding of social, economic,

political, and philosophical structures that shape the teaching profession as a system. However, it must be reinforced with a perspective that also invites reflection around the layers of personal meaning systems that influence teachers. The Nested Theories of Action model provides this layered understanding. A reimagined CLA overlapping these two models might provide a better-guided process for teachers to deconstruct and reconstruct their professional roles.

When educational technology, already significant, became a true backbone of educational systems all around the world in a time of crisis, more attention, investments, and efforts will be dedicated to it. It becomes essential to amplify teachers' voices as the primary agents of learning within the system to ensure that future developments resonate with their needs. That will come, first, from a better understanding of the possible transformation of teachers' roles. With this toolkit, I intend to provide a kind tool for teachers to begin that futures exploration journey and serve as a starting point for thoughtful provocation and empowerment. Further research is required to test, validate, and reiterate the toolkit. The literature review and first toolkit prototyping attempt served to provide some insights and guidelines to understand the multidimensional factors shaping the teachers' roles that need to be considered when exploring future transformations, some patterns in EdTech's understanding of the teaching role that must be challenged, and some key elements to guide teachers in a personal exploration of their possible future transformations.

BIBLIOGRAPHY

BIBLIOGRAPHY

Adams, R. S. (1970, February 1). Analysing the teacher's role. *Educational Research*, *12*(2), 121-127. Taylor & Francis Online. https://doi.org/10.1080/0013188700120205

Ahvenharju, S., Minkkinen, M., & Lalot, F. (2018, December 1). The five dimensions of Futures Consciousness. *Futures*, *104*, 1-13. Elsevier. https://doi.org/10.1016/j.futures.2018.06.010

Aspinwall, L. G. (2005, December 29). The Psychology of Future-Oriented Thinking: From Achievement to Proactive Coping, Adaptation, and Aging. *Motivation and Emotion*, *29*(4), 203-235. Springer. https://link.springer.com/article/10.1007/s11031-006-9013-1

Atlantis Group. (2019). *System Failure: Why EdTech policy needs a critical update*. Varkey Foundation. https://www.varkeyfoundation.org/media/5484/ag-system-failure.pdf

Bakhshi, H., Downing, J. M., Osborne, M. A., & Schneider, P. (2017). *Future of Skills: Employment in 2030*. Pearson, Nesta, Oxford Martin School. https://futureskills.pearson.com/research/assets/pdfs/technical-report.pdf

Bell, W., & Wau, J. (1971). *Sociology of the Future: Theory, Cases and Annotated Bibliography*. Russell Sage Foundation. https://books.google.com.mx/books?hl=en&lr=&id=T_oWAwAAQBAJ&oi=fnd&pg=PA6&dq=images+of+the+future&ots=Pi1IrEcl3y&sig=o0rTciIbbhVhOkEBbl4YTq327LY&redir_esc=y#v=onepage&q&f=false

Berry, B., Byrd, A., & Wieder, A. (2013). Teacherpreneurs: Innovative Teachers Who Lead But Don't Leave. Jossey-Bass.

Brown, E. A. (2019, January 31). *Sal Khan envisions a future of active, mastery-based learning*. District Administration. https://districtadministration.com/sal-khan-envisions-a-future-of-active-mastery-based-learning/

Burkeman, O. (2009, October 23). Forty years of the internet: how the world changed forever. *The Guardian*. https://www.theguardian.com/technology/2009/oct/23/internet-40-history-arpanet

Christensen, C. M., Horn, M. B., & Johnson, C. W. (2008). Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns. McGraw-Hill.

Coates, J. F. (1999, August 1). Getting at assumptions is troublesome. *Technological Forecasting and Social Change*, *62*(1-2), 97-99. ScienceDirect. https://doi.org/10.1016/S0040-1625(99)00016-5

Conway, M. (2021, March 31). Exploring the Links between Neuroscience and Foresight. *Journal of Futures Studies*. https://jfsdigital.org/exploring-the-links-between-neuroscience-and-foresight/

Digman, J. M. (1990, February). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology*, *41*(1), 417-440. https://www.annualreviews.org/doi/abs/10.1146/annurev.ps.41.020190.002221?journalCode=psych

Duffy, F. M. (2009). Paradigms, Mental Models, and Mindsets: Triple Barriers to Transformational Change in School Systems. *International Journal of Educational Leadership*, *4*(3). ERIC. Retrieved March 2, 2021, from https://files.eric.ed.gov/fulltext/EJ1071002.pdf

Dweck, C. S. (2017, November). From Needs to Goals and Representations: Foundations for a Unified Theory of Motivation, Personality, and Development. *Psychological Review*, *124*(6), 689-719. https://moodle2.units.it/pluginfile.php/358466/mod_resource/content/1/2017%20Dweck%20PR.pdf

Dweck, C. S., & Yeager, D. S. (2019, May 14). Mindsets: A View from Two Eras. *Perspectives on Psychological science on Psychological science*, *14*(3), 481-496. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6594552/

Eickelmann, B., & Vennemann, M. (2017, November 16). Teachers' attitudes and beliefs regarding ICT in teaching and learning in European Countries. *European Educational Research Journal*, *16*(6), 733-761. Sage Journals. https://doi.org/10.1177/1474904117725899

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012, September 1). Teacher beliefs and technology integration practices: A critical relationship. *Computer & Education*, *59*(2), 423-435. https://doi.org/10.1016/j.compedu.2012.02.001

Gärdebo, J., Marzecova, A., & Knowles, S. G. (2017, April 12). The orbital technosphere: The provision of meaning and matter by satellites. *The Anthropocene Review*, *4*(1), 44-52. SAGE Journals. https://doi-org.ocadu.idm.oclc.org/10.1177/2053019617696106

Genlott, A. A., Grönlund, A., & Viberg, O. (2019, September 24). Disseminating digital innovation in school - leading second-order educational change. *Education and Information Technologies*, *24*(5), 3021-3039. Springer. https://link.springer.com/article/10.1007/s10639-019-09908-0

Hawkins, R., Trucano, M., Cobo, C., Twinomugisha, A., & Sánchez Ciarrusta, I. (2020). *Reimagining Human Connections: Technology and Innovation in Education at The World Bank*. The World Bank. http://documents1.worldbank.org/curated/en/829491606860379513/pdf/Reimagining-Human-Connections-Technology-and-Innovation-in-Education-at-the-World-Bank.pdf

Hayward, P., & Candy, S. (2017, December 1). The Polak Game, Or: Where Do You Stand? *Journal of Future Studies*, *22*(2), 5-14. https://static1.squarespace.com/static/58727b5a9de4bbf0b38db631/t/5b26a77f0e2e72364809da54/1529259904818/the+futures+game.pdf

Higgins, S., Xiao, Z., & Katsipataki, M. (2012). *The Impact of Digital Technology on Learning: A Summary for the Education Endowment Foundation*. Durham University. https://educationendowmentfoundation.org.uk/evidence-summaries/evidence-reviews/digital-technology/

Inayatullah, S. (1998, October 1). Causal Layered Analysis: Poststructuralism as a method. *Futures*, *30*(8), 815-829. Elsevier. https://www.sciencedirect.com/science/article/abs/pii/S001632879800086X

Inayatullah, S. (2008, February 22). Six pillars: futures thinking for transforming. *foresight*, *10*(1), 4-21. http://www.benlandau.com/wp-content/uploads/2015/06/Inayatullah-2008-Six-Pillars.pdf

Inayatullah, S. (2009). Causal Layered Analysis: An Integrative and Transformative Theory and Method. In *Futures Research Methodology* (3rd ed.). The Millennium Project. https://www.metafuture.org/wp-content/uploads/2016/01/Causal-Layered-Analysis-FRM-version-3-2009.pdf

Ingvar, D. H. (1985, January 1). "Memory of the future": an essay on the temporal organization of conscious awareness. *Human Neurobiology*, *4*(3), 127-136. https://europepmc.org/article/med/3905726

Institute for the Future. (2018). *The next era of human-machine partnerships*. https://www.iftf.org/fileadmin/user_upload/downloads/th/SR1940_IFTFforDellTechnologies_Human-Machine_070717_readerhigh-res.pdf

Institute of Play. (2013). *Seven things to appreciate about teachers*. Connected Learning Alliance. http://www.instituteofplay.org/2013/05/seven-things-to-appreciate-about-teachers/

The International Task Force on Teachers for Education 2030. (2020). *World Teacher's Day 2020 Fact Sheet*. UNESCO Institute for Statistics. http://uis.unesco.org/sites/default/files/documents/world_teachers_day_fact_sheet_2020.pdf

Irish, M., & Piguet, O. (2013, April 3). The pivotal role of semantic memory in remembering the past and imagining the future. *Frontiers in behavioral neuroscience*, *7*, 1-11. https://www.frontiersin.org/articles/10.3389/fnbeh.2013.00027/full

Johnson-Laird, P. N. (2004). The history of mental models. In *Psychology of Reasoning: Theoretical and Historical Perspectives* (1st ed., pp. 179-212). Ken Manktelow & Man Cheung Chung. http://www.modeltheory.org/papers/2005HistoryMentalModels.pdf

Jones, N. A., Ross, H., Lynam, T., Perez, P., & Leitch, A. (2011, March 1). Mental Models: An Interdisciplinary Synthesis of Theory and Methods. *Ecology and Society*, *16*(1). JSTOR. https://www.jstor.org/stable/26268859?seq=1#metadata_info_tab_contents

Karniol, R., & Ross, M. (1996, February). The motivational impact of temporal focus: Thinking about the future and the past. *Annual Review of Psychology*, *47*(1), 593-620. https://www.researchgate.net/profile/Michael-Ross-37/publication/5322622_The_Motivational_Impact_of_Temporal_Focus_Thinking_about_the_Future_and_the_Past/links/600455a1a6fdccdcb85cf7c4/The-Motivational-Impact-of-Temporal-Focus-Thinking-about-the-Future-and

Khan, S. (Director). (2011). *Let's use video to reinvent education* [Film]. TED. https://www.ted.com/talks/sal_khan_let_s_use_video_to_reinvent_education/up-next?language=en

Khan, S. (2013). The One World Schoolhouse: Education Reimagined. Twelve Books.

Klein, S. B. (2016, February). Autonoetic consciousness: Reconsidering the role of episodic memory in future-oriented self-projection. *Quarterly Journal of Experimental Psychology*, *69*(2), 381-401. SAGE Journals. https://doi.org/10.1080/17470218.2015.1007150

Koontz, A. (2019, March 12). *The Circuitry of Creativity: How Our Brains Innovate Thinking*. Caltech Letters. https://caltechletters.org/science/what-is-creativity

Lalot, F., Ahvenharju, S., Minkkinen, M., & Wensing, E. (2019, December 2). Aware of the future? Development and validation of the Futures Consciousness Scale. *European Journal of Psychological Assessment*, *36*(5), 874-888. https://doi.org/10.1027/1015-5759/a000565

Madan, C. R. (2020, September). Rethinking the definition of episodic memory. Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale, 74(3), 183-192. APA PsychNet. https://doi.org/10.1037/cep0000229

Makovec, D. (2018). The teacher's role and professional development. *International Journal of Cognitive Research in Science Engineering and Education*, *6*(2), 33-45. ResearchGate. https://www.researchgate.net/publication/327190779_The_teacher%27s_role_and_professional_development

Makovec, D. (2018, October 1). The Dimensions of Teacher's Professional Development. *Journal of Contemporary Educational Studies / Sodobna pedagogika*, *69*(2), 106-125. ResearchGate. https://www.researchgate.net/publication/339843969_The_Dimensions_of_Teacher's_Professional_Development

Marconi, G. (2020, November 19). *Give teachers a say: Tackling teachers' work-related stress during coronavirus*. OECD Education and Skills Today. https://oecdedutoday.com/give-teachers-a-say-tackling-teachers-stress-during-coronavirus/

McBain, L., & Solomon, L. K. (2020, October 2). *Educator as Futurist: Moving beyond "Preparing for the future" to "Shaping the future"*. Medium. https://medium.com/stanford-d-school/educator-as-futurist-moving-beyond-preparing-for-the-future-to-shaping-the-future-56d8b4346364#:~:text=Responses-,Educator%20as%20Futurist%3A%20Moving%20beyond%20%E2%80%9CPreparing%20for%20the%20future,%E2%80%9D%20to%20

McCrae, R. R., & Costa Jr, P. T. (1987, January). Validation of the Five-Factor Model of Personality Across Instruments and Observers. *Journal of personality and social psychology*, *52*(1), 81-90. http://www.psychometric-assessment.com/wp-content/uploads/2013/01/5FMPeerValidationCostaMcCrea.pdf

McCrae, R. R., & John, O. P. (1992, June). An Introduction to the Five-Factor Model and Its Applications. *Journal of Personality*, *60*(2), 175-215. Wiley Online Library. https://doi.org/10.1111/j.1467-6494.1992.tb00970.x

Miller, R. (2018). *Transforming the Future: Anticipation in the 21st Century*. Routledge. https://www.taylorfrancis.com/books/oa-edit/10.4324/9781351048002/transforming-future-riel-miller

Natsoulas, T. (2003, April 1). What Is This Autonoetic Consciousness? *The Journal of Mind and Behavior*, *24*(2), 229-254. JSTOR. https://www.jstor.org/stable/43854001

Noer, M. (2012, November 2). *One Man, One Computer, 10 Million Students: How Khan Academy is Reinventing Education*. Forbes. https://www.forbes.com/sites/michaelnoer/2012/11/02/one-man-one-computer-10-million-students-how-khan-academy-is-reinventing-education/?sh=50e3264444e0

Novak, M. (2008, April 22). *Auto-Tutor (1964)*. Paleofuture. https://paleofuture.com/blog/2008/4/23/auto-tutor-1964.html

Novak, M. (2011, August 24). *The Push-Button School of Tomorrow (1958)*. Paleofuture: The history of the future. https://paleofuture.com/blog/2011/8/24/the-push-button-school-of-tomorrow-1958.htmlhttps://paleofuture.com/blog/2011/8/24/the-push-button-school-of-tomorrow-1958.html

Novak, M. (2012, May 29). *Predictions for Educational TV in the 1930s*. Smithsonian Magazine. https://www.smithsonianmag.com/history/predictions-for-educational-tv-in-the-1930s-107574983/

Petko, D. (2012, May 1). Teachers' pedagogical beliefs and their use of digital media in classrooms: Sharpening the focus of the 'will, skill, tool' model and integrating teachers' constructivist orientations. *Computers & Education*, *58*(4), 1351-1359. ERIC. https://eric.ed.gov/?id=EJ955363

Reich, J. (2020). Failure to Disrupt: Why Technology Alone Can't Transform Education. Harvard University Press.

Rhemann, M. (2019, March). Deepening Futures with Neuroscience. *World Futures Review*, *11*(1), 51-68. SAGE Journals. https://doi.org/10.1177/1946756718785908

Riedy, C. (2008, March 1). An integral extension of causal layered analysis. *Futures*, *40*(2), 150-159. Elsevier. https://opus.lib.uts.edu.au/bitstream/10453/9782/1/2007001241.pdf

Rothman, J., & Feinberg, S. (2020, May 21). 'I'm Teaching into a Vacuum': 14 Educators on Quarantine Learning. *The New York Times*. https://www.nytimes.com/2020/05/21/business/coronavirus-teachers.html

Schacter, D. L., Addis, D. R., Hassabis, D., Martin, V. C., Spreng, R. N., & Szpunar, K. K. (2012, November 21). The Future of Memory: Remembering, Imagining, and the Brain. *Neuron*, *76*(4), 677-694. https://doi.org/10.1016/j.neuron.2012.11.001

Schleicher, A. (2020). *Teaching and Learning International Survey TALIS 2018: Insights and Interpretations*. OECD. https://www.oecd.org/education/talis/TALIS2018_insights_and_interpretations.pdf

Senge, P. M. (1990). The Fifth Discipline: The Art & Practice of The Learning Organization. Doubleday.

Shapere, D. (1971, May 14). The Paradigm Concept. *Science*, *172*(3984), 706-709. Jstor. Retrieved March 2, 2021, from https://www.jstor.org/stable/1732040?seq=1

Shipp, A. J., Edwards, J. R., & Lambert, L. S. (2009, September 1). Conceptualization and measurement of temporal focus: The subjective experience of the past, present, and future. *Organizational Behavior and Human Decision Processes*, *110*(1), 1-22. Elsevier. https://doi.org/10.1016/j.obhdp.2009.05.001

Smillie, L. (2017, August 15). *Openness to Experience: The Gates of the Mind*. Scientific American. https://www.scientificamerican.com/article/openness-to-experience-the-gates-of-the-mind/

Soto, C. J., & Jackson, J. J. (2013). Five-Factor Model of Personality. In *Oxford Bibliographies in Psychology*. Oxford University Press. https://www.oxfordbibliographies.com/view/document/obo-9780199828340/obo-9780199828340-0120.xml#:~:text=The%20five%2Dfactor%20model%20of,Experience%20(sometimes%20named%20Intellect).

Thompson, C. (2011, July 15). How Khan Academy is Changing the Rules of Education. Wired. https://www.wired.com/2011/07/ff-khan/

Tulving, E. (1985, January). Memory and consciousness. *Canadian Psychology/Psychologie canadienne*, *26*(1), 1-12. APA PsycNet. https://doi.org/10.1037/h0080017

UNESCO. (2020, December 16). *From COVID-19 learning disruption to recovery: A snapshot of UNESCO's work in education in 2020*. UNESCO. https://en.unesco.org/news/covid-19-learning-disruption-recovery-snapshot-unescos-work-education-2020

UNESCO, UNICEF, & The World Bank. (2020). *What have we learnt? Overview of findings from a survey of ministries of education on national responses to COVID-19*. http://tcg.uis.unesco.org/wp-content/uploads/sites/4/2020/10/National-Education-Responses-to-COVID-19-WEB-final_EN.pdf

UNESCO Institute for Statistics. (2020). *COVID-19: a global crisis for teaching and learning*. UNESCO Digital Library. https://unesdoc.unesco.org/ark:/48223/pf0000373233?posInSet=45&queryId=N-4498186a-954f-4fc3-a8a4-d7cfe3f2a8a2

Van Der Heijden, K. (2005). *Scenarios: The Art of Strategic Conversation* (2nd ed.). John Wiley & Sons. http://www.untag-smd.ac.id/files/Perpustakaan_Digital_1/CREATIVE%20THINKING%20Scenarios,%20The%20art%20of%20strategic%20conversation.pdf

Voros, J. (2005, April 1). A generalised 'layered methodology' framework. *Foresight*, *7*(2), 28-40. Emerald. https://www.researchgate.net/profile/Joseph-Voros/publication/235294072_A_generalised_layered_methodology_framework/links/556d076408aec22683054b6c/A-generalised-layered-methodology-framework.pdf

Watters, A. (2015, February 19). *The History of the Future of Education*. Hack Education. http://hackeducation.com/2015/02/19/the-history-of-the-future-of-education

Webley, K. (2012, July 9). *Reboot the School*. Time. http://content.time.com/time/subscriber/article/0,33009,2118298,00.html

The World Bank. (2021, January 22). *Urgent, Effective Action Required to Quell the Impact of COVID-19 on Education Worldwide*. The World Bank. https://www.worldbank.org/en/news/immersive-story/2021/01/22/urgent-effective-action-required-to-quell-the-impact-of-covid-19-on-education-worldwide

World Health Organization. (2020, April 27). *WHO Timeline - COVID-19*. World Health Organization. https://www.who.int/news/item/27-04-2020-who-timeline---covid-19

Zimbardo, P. G., & Boyd, J. N. (1999). Putting Time in Perspective: A Valid, Reliable Individual-Differences Metric. *Journal of Personality and Social Psychology*, *77*(6), 1271-1288. https://www.researchgate.net/profile/Philip-Zimbardo/publication/232460587_Putting_Time_in_Perspective_A_Valid_Reliable_Individual-Differences_Metric/links/541888830cf2218008bf3fb8/Putting-Time-in-Perspective-A-Valid-Reliable-Individual-Differences-Metric.

IMAGE CREDITS

Image 1: Villemard (1910). At School [Online image]. The Public Domain Review. https://publicdomainreview.org/collection/a-19th-century-vision-of-the-year-2000

Image 2: Carlin, C. (1935). Smithsonian Magazine. https://www.smithsonianmag.com/history/predictions-for-educational-tv-in-the-1930s-107574983/

Image 3: Push-Button Education [Online image]. (1958). Paleofuture. https://paleofuture.com/blog/2011/8/24/the-push-button-school-of-tomorrow-1958.html

Image 4: Popular Science. (1961). Teaching Machines [Online image]. https://books.google.com.au/books?id=ISEDAAAAMBAJ&lpg=PA62&ots=ghiXD9SLgH&dq=popular%20science%20crowder%201962&pg=PA59#v=onepage&q=popular%20science%20crowder%201962&f=false

Image 5: Automated Schoolmarm [Online image]. (1964). Paleofuture. https://paleofuture.com/blog/2008/4/23/auto-tutor-1964.html

Image 6: Homework in the future [Online image]. (1981). Paleofuture. https://paleofuture.com/blog/2007/4/28/homework-in-the-future-1981.html

APPENDIX

BY TEACHERS FOR TEACHERS

A TOOLKIT TO REIMAGINE THE FUTURE OF THE TEACHER-TECHNOLOGY SYMBIOSIS

WELCOME TO THE JOURNEY

Dear teacher,

To some extent, we have all experienced the significant disruptions brought by the COVID-19 crisis. Your strength, resilience, and creativity to adapt to Emergency Remote Teaching and keep guiding learning under the harshest circumstances have been admirable. As we lost our' ways of doing' amid the COVID-19 crisis, many understandings about the challenges and complexities of education and the job of teaching arose, and tensions intensified. Misunderstandings about the complex role of the teacher can create drastic differences between what teachers need and what is offered or mandated. We've understood something, teachers are true heroes, and as such, it is your voice the one that should be primarily heard.

Digital technology 'kept us going' in a time of crisis, and everyone has realized how essential it is. Moving forwards, there will be even more attention on EdTech, but we face an already familiar risk; that teachers' voices could be the last ones heard. Thus it becomes even more important to raise your voices and put forward the images of the future that represent what you need and want.

I write to you with an invitation of hopeful defiance. This is an invitation to use all your abilities, strengths and dreams to lead the future of education and educational technology to drive positive change in your institution and community. Change starts with oneself. This is an exploration journey within you and the possible futures you, and what type of technology you would need to aid you in the process and augment your good practice.

Indeed, the future will be brighter if we listen to teachers. They have devoted their lives to students and their communities and shine a light on new possibilities.

Welcome to the journey.

HOW TO USE THIS TOOLKIT

This toolkit is comprised of four sections:

1. **'Your time-traveller self'** will invite you to reflect on the origins and already travelled journey that has shaped you as a teacher.

2. **'Prepare for the journey'** will provide you with several exercises to explore the unconscious mental processes that influence how you imagine the future. You must surface these processes so that you can challenge your own thinking and make room for alternative, provocative images of the future. In this section, you will also have a chance to take stock of your capacities for transformation and your support network. Every journey is better when you have someone to share it with, as they can point out interesting things that are escaping your attention present different perspectives.

3. **'On to time-travel'** will guide you through mapping the many dimensions of your teaching role, and through a deconstruction of the different layers that influence your teaching self. Then you will be presented with a collection of futures trends that have the potential to impact your work as a teacher. By analyzing their implications, you will then change to reconstruct your role imagining yourself 10 years from now. You will be able to repeat this process many times, choosing different focus elements so that you can create your 'futures mosaic' and present the many possibilities for your future as a teacher.

4. **‘Distill the future in the present'** will provide you with final reflection questions to help you distill your discoveries into present-day actions that can set you on an iterative path you become that future you.

The last thing that teachers have available is time, so each section is broken down into short activities, of a maximum of 20 minutes, that you can do every day to kindly walk through this journey. Exploring your potential future transformation should not be a marathon or a shock, but a slow, constant activity where you can enjoy the journey and have room and time to explore the many different corners of your imagination.

BEFORE YOU START. A TALE OF CAUTION AND AN INVITATION

We have all felt the demanding load of our profession, not only the weight of administrative tasks but the emotional toll of problems beyond our circle of influence. This is not the time to be naive. The power dynamics in place and the resistance to change are real. Not everything relies on you, and it is not your responsibility to solve every single problem out there. But, it is true: as teachers, we always need to speak out and advocate every time.

Even if we do not have all the power to change things, I invite you to make good trouble with kindness and respect: ask questions, tell stories to motivate others, challenge assumptions.

Imagining the future, thinking and sharing new possibilities is an endless adventure for a change maker. It is not about living through the finish line and holding the trophy. It is more about cultivating a long-term vision and taking care of the now and the new generations to come. It is more about learning to live on the edge. It is about maintaining good practices and growing with every step. You need to be ok to live in the creative tension of what is and what could be.

We, as teachers, are capable of using our mind eye and being present as well as sustaining visions for the future because we know what is at stake. Roman Krznaric said it perfectly: it's about being good ancestors.

Take this toolkit as a catalyst for change and a provocation to look inside us and focus on the process of feeling and living the change. It is more important what we accomplish and impact down the road than the goal itself.

Now, it is time. Give yourself permission to imagine better futures for yourself and your profession. Every step will boost your creative confidence: your ability to courageously take your ideas into action.

TEN THOUGHTS ABOUT FUTURES-THINKING TO INSPIRE YOUR JOURNEY

THERE ARE NO FACTS ABOUT THE FUTURE, ONLY POSSIBILITIES

Futures thinking is better described as possibility thinking. “There is not ONE future reality to be discovered, but rather a field of possibilities. [Futures thinking] helps people exercise their imagination muscles to widen that field of possibilities.” -*Kathi Vian*

IMAGINATION SHAPES OUR REALITY

“While imagination is intangible, it creates and shapes our reality; while a mental tool, it affects our behavior and expectations. The kind of futures we imagine, would depend on the quality of our imagination.” -*Ziauddin Sardar*

WE ARE ALL IMMIGRANTS TO THE FUTURE

Margaret Mead famously wrote about the profound changes wrought by the Second World War, “All of us who grew up before the war are immigrants in time, immigrants from an earlier world, living in an age essentially different from anything we knew before.” It appears that it is our turn to be immigrants in time in a world after COVID-19.

THE FUTURE IS A NEUTRAL SPACE WHERE ANYTHING CAN BE DIFFERENT

“The future is where people can abandon their immediate turf interests and think about new possibilities, new constituencies, things that may be unthinkable.” -*Marina Gorbis*

FUTURE IS A VERB

“People need a motivating vision of what comes next and the awareness that more will happen after that... the future is a process, not a destination. The future is a verb, not a noun.” -*Bruce Sterling*

TEN THOUGHTS ABOUT FUTURES-THINKING TO INSPIRE YOUR JOURNEY

THE FUTURE IS A SOCIAL ENDEAVOR

"Futures for all cannot be imagined by the few." *-Pupul Bisht*

THE STATUS QUO CAN CHANGE, BUT IT TAKES A LOT OF GOOD EXAMPLES

"Without exposure to alternative insights into what it means to be a professional educator in a changing world, there is less and less opportunity for the future to exist in the present." *-John MacBeath*

ASK COURAGEOUS, PROVOCATIVE QUESTIONS

"An answer is always the part of the road that is behind you. Only questions point to the future." *-Jostein Gaarder*

OWNING OUR UNCERTAINTY MAKES US MORE ALIVE

"Morality lay not in our relationships with what we know, but in how admirably we deal with what we don't. In the face of what we don't understand, how curious are we? How fearfully strict? How deferential to others? It's this sort of morality that we need more of in our whirlwind era. Owning our uncertainty makes us kinder, more creative, more alive." *-Anton Chekov*

MEMORY AND FUTURE LIVE IN THE SAME PART OF OUR BRAINS

"The abilities to remember the past via episodic autobiographical memory or to imagine possible future events, represent important expressions of the human memory system [that enable] not only the capacity for retrieval from our personal past but also [encompass] the ability to imagine and envisage possible future scenarios." *-Muireann Irish & Olivier Piguet*

PART 1

YOUR TIME-TRAVELLER SELF

YOUR TIME-TRAVELLER SELF

This journey will be a rollercoaster. You will set out to the fringes of your world to find and understand the signals and drivers of change that have the potential to redefine your reality. You will also undertake a deep exploration into yourself to understand the possibilities of change within you. This will be a transformational journey, and as such, the first important step is to deeply understand who is taking on that transformation. This is the moment to explore who you are as a teacher and revisit your past to identify what has brought you here.

In this section, you will explore your professional purpose and the motivations behind it, the forces of influence that shape your teaching role and style, and revisit your professional journey to reflect back on your milestones and defining moments.

YOUR PURPOSE

What motivated you to become a teacher?	Why do you teach?
What is your mission?	**What keeps you going?**

YOUR FORCES OF INFLUENCE

Who/what has inspired the way to teach?
What have you learned from them/that?
How is that influence reflected in your teaching?

YOUR TRAVELLED ROADS

What have been your defining moments as a teacher?	What have you learned from those moments?
What are the most rewarding moments that you have experienced as a teacher?	**What are the most challenging moments that you have experienced as a teacher?**
What are the most important changes that you have experienced as a teacher?	**What was it that made you change, and how did it impact you?**

PAUSE AND REVIEW

What did you discover about yourself in this section?
Bringing together your purpose, forces of influence, and travelled roads, how would you write your teaching autobiography?

PART 2

PREPARE FOR THE JOURNEY

PREPARE FOR THE JOURNEY

Now it is time to pack for the journey. Exploring the future, especially the most uncertain, unexpected corners of it, can be daunting. It will force us to challenge our assumptions and beliefs, to be able to envision different alternatives, the ones that we prefer, but also the ones that we maybe wouldn't agree with or that we would not prefer. It is certainly no easy task. But do not worry. We all have the capacities to embrace that futures thinking journey within us. In this section, you will explore and practice some key futures thinking skills. Consider it a warm-up for the long walk ahead of you.

YOUR FUTURE STANCE

Our views of the future are influenced by our emotional perception of it and our sense of agency.

Frederik Lodewik Polak was a Jewish Dutch sociologist who survived the Holocaust, hiding out in the German-occupied Netherlands. He wrote a magnum opus, *The Image of the Future,* about how various human cultures have shaped their own destinies through their collective images of the future. In his book, Polak explained the role that optimism and pessimism play in the power of the image of the future:

> It will be helpful to make distinctions between optimism and pessimism along the lines of the concepts of *Seinmülseen,* "what must be," and *Seinsollen* "what ought to be." It would then be possible to speak of *Seinoptimismus* or *Seinpessimismus,* which we will refer to as essence-optimism or essence-pessimism, and *Willensoptimismus* or *Willenspessimismus,* which we shall refer to as influence-optimism or influence-pessimism. The essence categories refer to an unchangeable course of events; the influence categories refer to the supposed or rejected the possibility of human intervention. The first perspective sees history as a book that has already been written; the second considers history a process that man can or cannot manipulate.

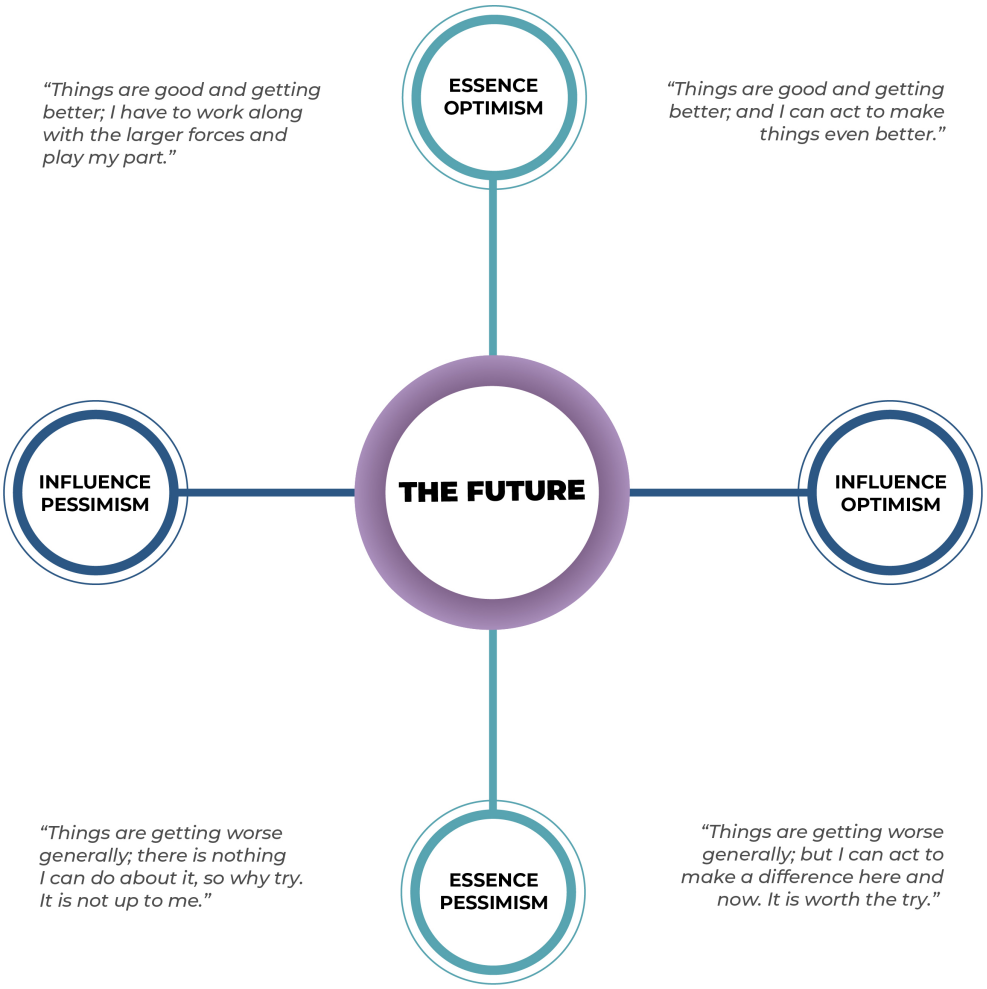
These factors, according to Polak, seem to give every image of the future its underlying logic, moral basis, and power to attract people and create culture. Let us explore now where you stand in your emotional perception of the future and your sense of agency to influence it.

WHERE DO YOU STAND? THE POLAK GAME[1]

1. In the following chart, locate where you stand regarding the optimism-pessimism spectrum about the essence of the future (vertical axis). According to your experience, do you feel that the changes happening around you lead you to a better or worse future?

2. Locate where you stand regarding the optimism-pessimism spectrum about your influence in shaping the future (horizontal axis). Do you think that you have the power to influence the future, or not?

3. Connect the dots in the vertical and horizontal axis to see where you stand within the quadrants.



1 Adapted from Peter Hayward and Stuart Candy. Read more in https:// www.researchgate.net/ publication/322144099_The_Polak_Game_or_Where_do_you_stand

PAUSE AND REVIEW

Why did you locate yourself on that side of the essence axis? What experiences or beliefs are influencing your choice?	Why did you locate yourself on that side of the influence axis? What experiences or beliefs are influencing your choice?
How do you think that your overall position influences your attitudes and behaviours towards the future and change?	

Along the journey, remember where you stand. There will be opportunities for you to analyze how your position influences particular visions of the future and moments where you will be able to challenge yourself by exploring different perspectives if you were standing on other quadrants.

OPENNESS TO EXPERIENCE

Openness to Experience is one of the Big Five factors of personality, used by modern psychological researchers to describe the level of a person's engagement with abstract thinking and the degree to which she/he/they are imaginative, creative, and intellectually curious.

HOW OPENED TO EXPERIENCE ARE YOU?[2]

Read each of the following statements and mark with an “x” the more closely related box.

	Not me!	Sort of	Sounds like me!
I have a vivid imagination.			
I enjoy wild flights of fantasy.			
I love to daydream.			
I like to get lost in thought.			
I believe in the importance of art.			
I see beauty in things that others might not notice.			
I like poetry.			
I enjoy going to art museums.			
I experience my emotions intensely.			
I feel others’ emotions.			
I often notice my emotional reactions.			
I understand people who get emotional.			
I prefer variety to routine.			
I do not prefer to stick with things that I know.			

[2] *Adapted from Truity. Do not take this exercise as a fully accurate assessment of your Openness to Experience personality trait. This activity is only an approximation for reflective purposes. Read more about the original test in https://www.truity.com/test/how-open-are-you*

	Not me!	Sort of	Sounds like me!
I like changes.			
I am not attaches to conventional ways.			
I love to read challenging material.			
I do not avoid philosophical discussions.			
I do not have difficulty understanding abstract ideas.			
I am interested in theoretical discussions.			
I tend to vote for liberal political candidates.			
I believe that there is no absolute right and wrong.			
I do not tend to vote for conservative political candidates.			
I do not believe that we should be tough on crime.			
TOTAL			

If the majority of your ”x” fell in the ‘**Sounds like me!’** column, you probably tend to have a creative imagination, a higher aesthetic sensitivity, emotionality, adventurousness, intellectual curiosity, and also tend to be more liberal. This personality trait will come in handy for you to flexibly and creatively explore provocative possibilities for the future. Challenging your own assumptions might not only be easier but exciting for you.

If the majority of your “x” fell in the **‘Not me!’** column, you probably feel better by sticking to experiences and situations that are familiar to you. You value more what is practical and concrete over what is abstract. You might also tend to be more conservative. This does not mean that you cannot engage in futures exploration. It only means that you will need more provocations to challenge your own thinking and make room for alternative possibilities. It also means that you will need more care to avoid overstressing when you are invited to deconstruct the familiarity and conventionality of your role.

If most of your "x" fell in the **'Sort of'** column, you are in the middle ground; you have some openness to experience, abstraction, creative imagination but are also grounded in some familiarity and concreteness.

PAUSE AND REVIEW

What did you discover about yourself?	What life experiences do you feel have influenced this aspect of your personality?
What would you need to be more opened to experience and more comfortable challenging your own thinking	**What type of new experiences do excite and inspire you?**
Can you make a list of people/experiences/places/sources that challenge your thinking, give you the courage to embrace new experiences and dive into the unknown? Make you connect with them throughout this process.	

TEMPORAL FOCUS

Temporal focus is the attention individuals devote to thinking about the past, present, and future. The concept is important because it affects how people incorporate perceptions about past experiences, current situations, and future expectations into their attitudes, cognitions, and behaviour. Let us explore what your temporal focus is and how it could influence your perception of the future.

WHAT IS YOUR TEMPORAL FOCUS?[3]

Read each of the following statements and mark with an "x" the more closely related box.

		Never	Sometimes	Frequently
1	I think about things from my past.			
2	I replay memories of the past in my mind.			
3	I reflect on what has happened in my life.			
4	I think back to my earlier days.			
5	I live my life in the present.			
6	I focus on what is currently happening in my life.			
7	My mind is on the here and now.			
8	I think about where I am today.			
9	I think about what my future has in store.			
10	I focus on my future.			
11	I imagine what tomorrow will bring for me.			
12	I think about times to come.			

[3] *Adapted from the Temporal Focus Scale by Shipp, Edwards & Lambert, 2009. Do not take this exercise as a fully accurate assessment of your Openness to Experience personality trait. This activity is only an approximation for reflective purposes. Read more about the original scale in: http://public.kenan-flagler.unc.edu/faculty/edwardsj/Shippetal2009.pdf*

Where did the majority of your “Frequently” x’s fall?		
1-4 = Past focus	5-8 = Current focus	9-12 = Future focus

None of these perspectives are wrong; we need to consider them all. You will just need to be aware of how they are influencing your framing of the future to force yourself to break from that frame and consider other perspectives.

PAUSE AND REVIEW

What did you discover about yourself?	What life experiences do you feel have influenced this preference for temporal focus?
What would you need to be more comfortable embracing other temporal focus?	**Can you make a list of people/experiences/ places/sources that challenge your thinking, give you the courage to different temporal focus and dive into the unknown? Make you connect with them throughout this process.**

CREATIVITY

Creativity is an essential skill if we talk about imagining different, alternative, and provocative futures. Creativity is, paradoxically, a habit. As professional dancer and choreographer Twyla Tharp says:

> "After so many years, I've learned that being creative is a full-time job with its own daily patterns. That's why writers, for example, like to establish routines for themselves. The most productive ones get started early in the morning when the world is quiet, the phones aren't ringing, and their minds are rested, alert, and not yet polluted by other people's words. [...] the real secret is that they do this every day."

Let us start by exploring your creative DNA to boost your creative confidence and some creative routines that could be useful for you through your journey.

YOUR CREATIVE AUTOBIOGRAPHY[4]

Your creative DNA is some kind of creative code hard-wired into our imaginations. The better you know yourself, the more you will see when you are playing to your strengths. You can answer all of the following questions or choose some of them, to go back to your origins and explore the sources of your creative potential.

1. What is the first creative moment you remember?	2. Was anyone there to witness or appreciate it?
3. What is the best idea you have ever had?	**4. What made it great in your mind?**

[4] *Extracted from Tharp, T. (2003) The Creative Habit: Learn It and Use it For Life. SIMON & SCHUSTER*

5. What is the dumbest idea you have ever had?	6. What made it stupid?
7. Can you connect the dots that led you to this idea?	8. What is your creative ambition?
9. What are the obstacles to this ambition?	10. What are the vital steps to achieving this ambition?
11. How do you begin your day?	12. What are your habits?
13. Describe your first successful creative act.	14. Describe your second successful creative act.

15. Compare them.	16. What are your attitudes toward money, power, praise, rivals, work, play?
17. Which creatives do you admire most?	18. Why are they your role models?
19. What do you and your role models have in common?	20. Does anyone in your life regularly inspire you?
21. Who is your ‘muse’?	22. Define muse.

23. When confronted with superior intelligence or talent, how do you respond?	24. When faced with stupidity, hostility, intransigence, laziness, or indifference in others, how do you respond?
25. When faced with impending success or the threat of failure, how do you respond?	26. When you work, do you love the process or the result?
27. At what moments do you feel your reach exceeds your grasp?	28. What is your ideal creative activity?
29. What is your greatest fear?	30. What is the likelihood of either of the answers to the previous two questions happening?

31. Which of your answers would you most like to change?	32. What is your idea of mastery?
33. What is your greatest dream?	

WHERE IS YOUR PENCIL?[5]

We all have some objects or experiences that boost our creativity. For example, A Manhattan writer never leaves his apartment without reminding himself to "come back with a face." Whether he's walking down the street or sitting on a park bench or riding the subway, or standing on a checkout line, he looks for a compelling face and works up a detailed description of it in his mind. When he has a moment, he writes it all down in his notebook. Not only does the exercise warm-up his descriptive powers, but studying the crags, lines, and bumps of a stranger's face force him to imagine that individual's life.

Some cartoonists always carry a pen and pad to sketch what they see, photographers who always have a camera in their pockets, composers who bring Dictaphones to capture a snatch of vagabond melody that pops into their heads. They are always prepared.

[5] *Adapted from Tharp, T. (2003) The Creative Habit: Learn It and Use it For Life. SIMON & SCHUSTER*

Where is your pencil? What is the one tool that feeds your creativity and is so essential that you feel naked and unprepared without it?	What is it about that object/source that inspired you? Make sure you keep it close to you throughout this journey.

FACE YOUR FEARS[6]

Just as the future, creativity is about possibility, alternative, "blank space," and that can be scary. Where there was nothing, there will be something that has come from within you. Where there was something comfortably familiar, there will be something challenging different. That's a scary proposition. Putting a name to your fears helps cut them down to size.

What are your five biggest fears about being creative?	What are your five biggest fears about change?
What are your five biggest fears about the future?	**What are your five biggest fears about teaching?**
What are your five biggest fears about EdTech?	

[6] *Adapted from Tharp, T. (2003) The Creative Habit: Learn It and Use it For Life. SIMON & SCHUSTER*

PAUSE AND REVIEW

What would you describe as the source of your creative potential?	What resources can you draw on to overcome your fears?

What did you discover about yourself?

TAKE STOCK

As we have said, engaging in a futures exploration is a rollercoaster. There are exciting moments that shine a light on exciting possibilities and other stressful moments that challenge our most deeply held assumptions about who we are as teachers. The most important thing is that you have a good support network so that, overall, the journey becomes empowering. Now it is time to map that support network that can accompany this journey.

YOUR SUPPORT NETWORK

Who inspires you?	Who boosts your creativity?
Who calms you down?	**Who encourages you?**
Who can you disagree with but keep the conversation going?	**Who challenges you?**
Who grounds you?	

Reach out to those people and share with them the journey that you are embracing. Make sure you share conversations about your progress and invite their insight. An outsider's perspective will always be useful to push your thinking.

YOUR CHANGE POWER

When engaging in a personal futures exploration, it is also helpful to revisit our past and remember the most transformative moments that we have already lived through. Placing those capacities for change within you will keep you going through the journey.

1. What have been the most transformative moments that you have lived as a person?	2. What have been the most transformative moments that you have lived as a teacher?
3. Why/how did they change you?	**4. Reflecting on those moments, how would you describe your inner capacities for change?**

PAUSE AND REVIEW

What did you discover about yourself?

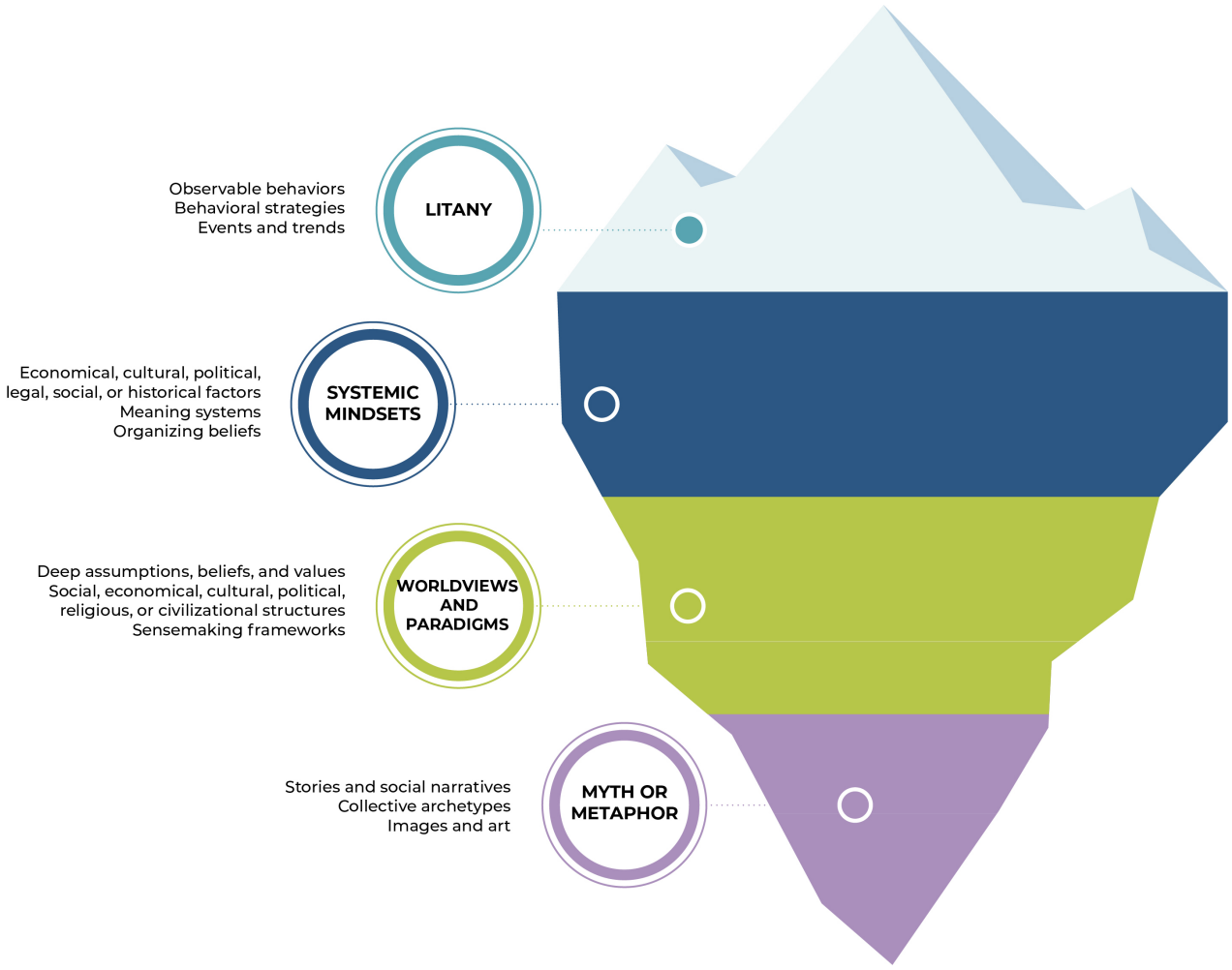
PART 3

ON TO TIME-TRAVEL

ON TO TIME-TRAVEL

Your teaching role results from complex, layered constructs that come from you as an individual and from your context. The following tool, Causal Layered Analysis, will allow you to understand those deeper levels that influence your teaching role.

This futures exploration tool consists of four levels.



The **litany** layer of your teaching role refers to what is made visible through your actions and expressions; how you present yourself to different stakeholders. It includes both your performed, observable behaviours, as well as your planned actions.

The **systemic mindsets** layer includes economic, cultural, political, legal, social, and historical factors shaping that litany. This layer also refers to your own meaning systems and organizing beliefs about teaching and learning, your institution's culture, your community's visions on teaching and learning, and the educational policy of your context.

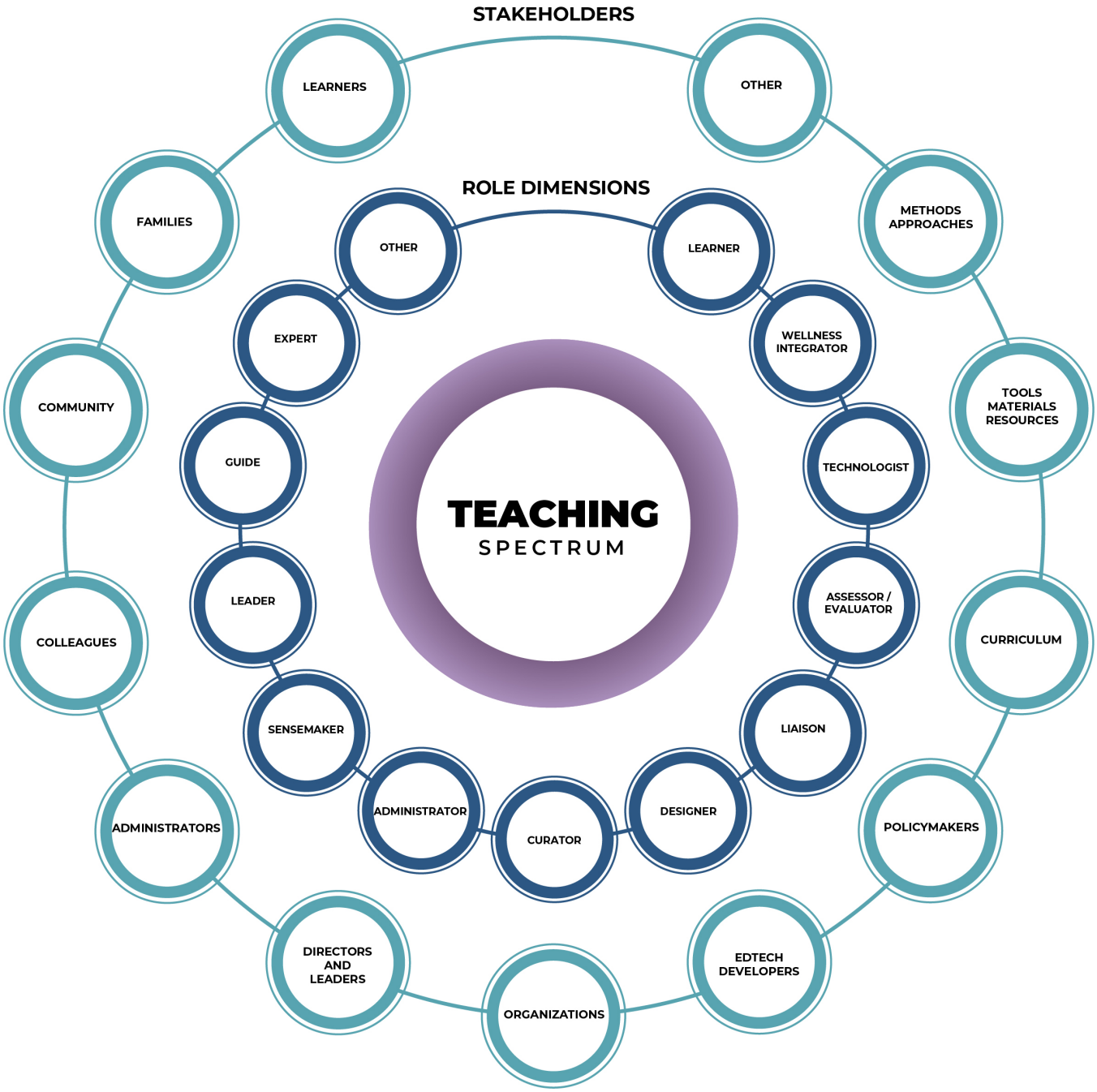
The **worldviews and discourses** layer refers to the deeply held assumptions, generalizations, and images that influence your understanding of teaching. It includes social, economic, cultural, political, religious, or civilizational structures, as well as sensemaking frameworks and the constellations of shared values and practices.

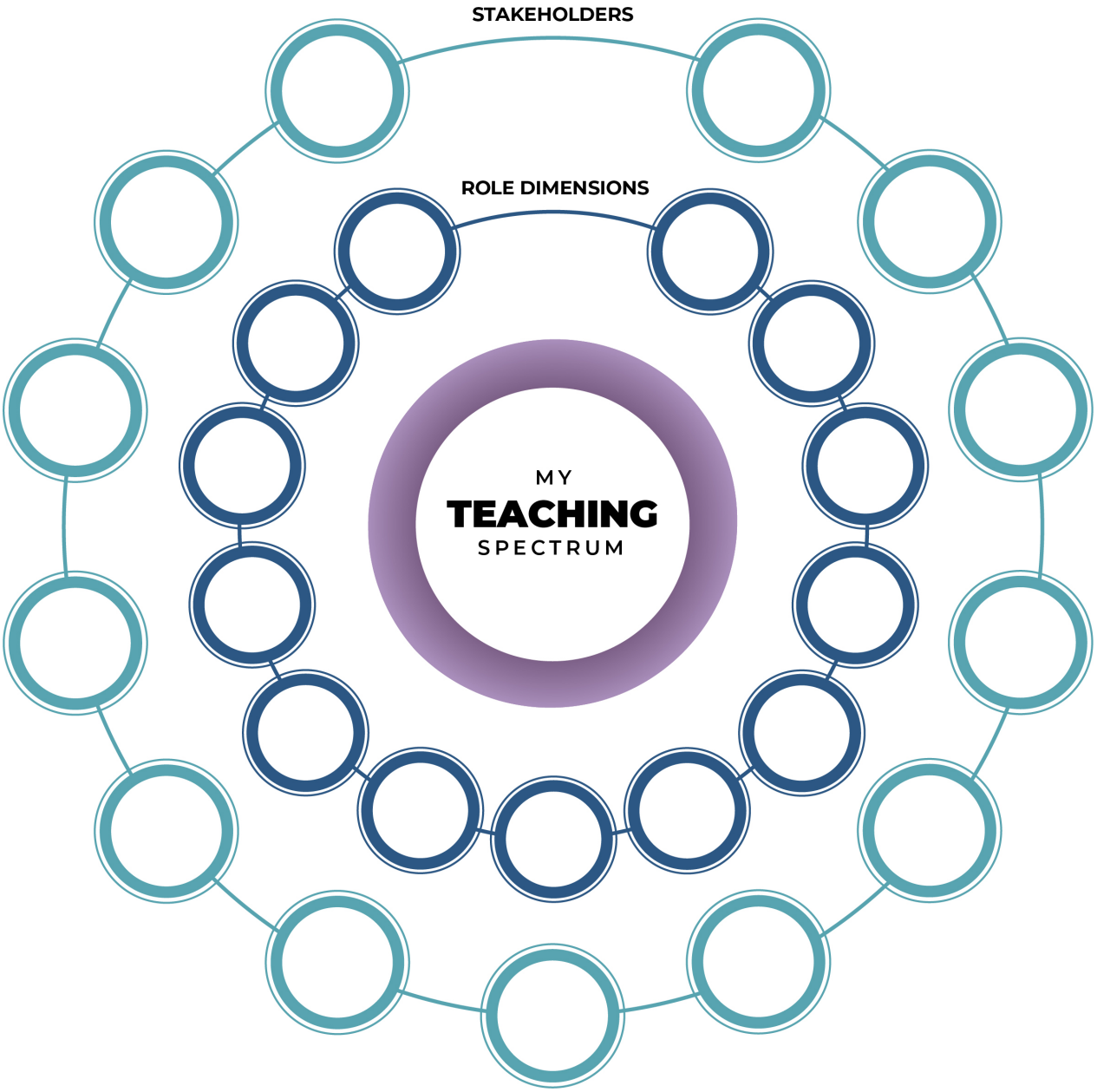
The **metaphors and myths** layer influencing teaching roles refer to the stories, collective archetypes, and social narratives about education and teaching. A reimagination of your role can be done by moving up and down these layers of analysis.

Teaching is highly complex; there are many dimensions to what the profession entails. Attempting a deconstruction and reconstruction of your role, considering everything at once, could be very daunting and confusing. Therefore, I invite you to start by mapping your role's many dimensions and the stakeholders you relate to. Then you can choose one dimension and one stakeholder as your focus lense for the Causal Layered Analysis. I invite you to run several iterations of this process by selecting different dimensions of your roles and stakeholders each time, to reach an overview of your role's full-spectrum, interconnectedness and complexity. You might even be able to surface contradictions or tensions that coexist within your role.

MAP YOUR MULTIDIMENSIONAL ROLE

Take the following map as an example and starting point of the multidimensionality of a teaching role. Then in the blank space, map the elements of your role. Use the inner circle to include the dimensions of the role you play and the outer ring to map the different stakeholders you directly or indirectly relate to.





Choose one dimension of your role and one stakeholder. Maybe start with the most important one for you or the one that takes up more time and effort. Try to answer all the following sections with that dimension and stakeholder in mind.

MY FUTURES EXPLORATION LENS	
Role dimension	**Related stakeholder**

DECONSTRUCT YOUR PRESENT TEACHING ROLE

LITANY

Considering your futures exploration lens use the following guiding questions to frame the litany of your teaching. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE LITANY OF MY PRESENT TEACHING	
GUIDING QUESTIONS	**NOTES**
Observable behaviors	
• How do you describe what you do as a teacher? • What would an action log of your routine day/week/month/term show? • What list of actions describes your practice as a [role dimension] with [stakeholder]? • How would [stakeholder] describe you? • What do you express as success? What are you achieving? • What do you express as failure or challenge? What are you struggling with? • What are your primary methods?	
Behavioral strategies	
• How do you organize your time? What do you allocate time for and prioritize? What do you not allocate time for or prioritize? • What do you prepare/train/learn/research for? • What are the pedagogical/learning theories underlying your teaching interventions? How does it shape your practice? • How would you describe your 'principles for action'?	

SYSTEMIC MINDSETS

Considering your futures exploration lens use the following guiding questions to uncover the systemic mindsets that frame the litany of your teaching. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE SYSTEMIC MINDSETS UNDERLYING MY TEACHING	
• What is your concept of 'good teaching'? • How does one become a good teacher? • Who are your role models of 'good teaching'? Who/what has inspired your teaching ideals? • What is 'bad teaching'? • What is your concept of 'learning'? • What is your concept of a 'successful' or 'good learner'? • What is your institution's concept of 'good teaching'? (Expressed, for example, in evaluated aspects and areas of feedback) • What types of behaviors does your institution's culture encourage/support/ celebrate? • What aspects of teaching does your community punish/undermine/neglect/ reject? • What is the educational policy framing your practice?	

WORLDVIEWS AND PARADIGMS

Considering your futures exploration lens use the following guiding questions to uncover the worldviews and paradigms that frame the systemic mindsets of your teaching. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE WORLDVIEWS AND PARADIGMS UNDERLYING MY TEACHING	
GUIDING QUESTIONS	**NOTES**
Mental models • Why are teachers needed? • How do teachers 'make a difference'? • What is absolutely essential about teaching? • What are the aspects of your teaching that you would never want to change? Why? • What is 'irreplaceable' about teaching? • What makes a teacher a teacher? • How and where does learning happen? • What is needed for learning to happen?	
Paradigms • What are your philosophical views about education? • "Education is a means to..." • What is the dominant paradigm guiding your teaching practice? (Industrial Age, Knowledge Age, Imagination Age)	

METAPHORS / MYTHS

Considering your futures exploration lens use the following guiding questions to uncover the myths and metaphors that underlie the worldviews and paradigms of your teaching. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE MYTHS AND METAPHORS UNDERLYING MY TEACHING	
GUIDING QUESTIONS	**NOTES**
• What metaphors express the idea of education? • What metaphors express what teaching is? • What media representations or stories of teacher resonate here?	

PAUSE AND REVIEW

What did you discover about yourself?
Pulling together the four layers of your role, analyzed through the specific lens of your choice, how would you write your teaching autobiography?

EXPLORE SOME TRENDS DRIVING CHANGE IN EDUCATION AND TEACHING

In this card deck, you will find a very brief introduction to some significant trends in the broader horizon that have the potential to drive change in education and teaching. Choose two of them to analyze their implications for the future of your role and then use them as a provocation to reconstruct your role by situating yourself 10 years into the future.

SOCIAL TRENDS		
Civic superpowers	**Equity-oriented pedagogy**	**Mental-health and well-being headlining**
Individuals, nonprofits and volunteer organizations are flexing their civic muscles. They are using participatory media, machine learning and data analytics to fill a growing governance gap, with hopes of reweaving the social fabric and redefining civic engagement. (Knowledgeworks, 2018)	Developing inclusive educational opportunities requires thinking about equality in opportunities to access education and equity. Each student can achieve similar positive outcomes, regardless of their background and characteristics such as gender, disability, or ethnicity. (Innovating Pedagogy, 2021)	Already a perennial concern in education, mental health issues have been exacerbated by recent disruptions and changes to our social, political, and educational landscapes and have presented institutions with additional challenges in ensuring the safety and well-being of not only students but also educators and staff. (Innovating Pedagogy, 2021)

TECHNOLOGICAL TRENDS		
Automating choices	**Accelerating brains**	**Enriched realities**
Algorithms and artificial intelligence are becoming embedded in our lives. They are automating many of our experiences, services, and interactions to achieve efficiency and personalization and raise questions related to trust, bias, and individual agency. (KnowledgeWorks, 2018)	Rapid advances in technology and neuroscience are combining to transform our cognitive abilities in intended and unintended ways. They are reshaping how we partner with digital tools, relate with one another and engage with our surroundings. (KnowledgeWorks, 2018)	It is increasingly common to enrich reality with technology such as virtual reality (VR) or augmented reality (AR), and several types of reality can be blended. When learners cannot be in the same place simultaneously, (AR) and virtual reality (VR) can be used to make some exciting and memorable shared experiences possible. (Innovating Pedagogy, 2021)

ECONOMIC TRENDS		
Widening of the digital divide	**Demand for new/different workforce skills**	**Changing skills, redefining readiness**
The COVID-19 pandemic has laid bare the digital inequities that exist between students sharing the same courses. To the extent that education in the future will continue to rely on remote technologies and digital networks for learning experiences, the gap will only widen between those with every digital advantage and those who struggle to gain access to even the basic devices and network necessities. (EDUCAUSE, 2021)	The sudden shift to online service and course delivery across most institutions, and the potential of longer-term investments in these modes of delivery, have and will continue to create new demands for skills and staff in areas such as instructional technology and design for supporting teachers and students. (EDUCAUSE, 2021)	As the nature of work and social life evolves, new skills are needed to thrive and participate in economic, political, cultural, and social lives. What it means to build readiness for life from education is up for redefinition. (KnowledgeWorks, 2017)

ECOLOGIC TRENDS		
Climate Change	**Sustainable Development**	**Environment-based learning**
The global effects of climate change are worsening and becoming a more present and urgent issue for building a sustainable future. Institutions are already living through these effects. However, these new realities also present opportunities as institutions develop new research programs, curricula, and practices educating and equipping new generations of climate leaders. (EDUCAUSE, 2021)	Environmental and community activists call attention to the global opportunity that may now be before us to build a post-pandemic world rededicated to sustainable development goals (SDGs). Realities of environmental waste and social inequity have been brought to light through our collective crisis. There may be a stronger will now that in recent years to pursue aggressive new policies and sustainable practices to address these issues. Institutions will be critical partners in this pursuit of a more sustainable future through both curricula and operations that raise awareness of the importance of sustainability. (EDUCAUSE, 2021)	By integrating an outdoor inquiry-based education model into their curriculum, teachers can help their students develop critical thinking skills, become better problem solvers, learn "deep" content knowledge, gain an appreciation for their surroundings, and through this process, become more environmentally literate citizens. (Roanoke Higher Education Center, 2021)

POLITICAL TRENDS		
Increase in Online Globalization	**Rise of Nationalism and Neo-tribalism**	**Cybersecurity and data ethics frameworks**
Though global industries and collective human experiences dependent on physical gatherings have appreciably declined since the spring of 2020, new online platforms and opportunities for connection and relationship have emerged and promise to transform the global community in lasting ways. They will contribute to new opportunities for global education. (EDUCAUSE, 2021)	Global politics is becoming more fractured as many nations have made an inward turn, what some have called the "de-globalization." Educational institutions will have to evaluate their approaches to educating and preparing students as global citizens. (EDUCAUSE, 2021)	The growing use of digital technologies in educational contexts is accompanied by an ever-increasing range of ethical questions. There are many ethical issues centred on data, such as who owns the data, how the data should be interpreted, and how the privacy of learners and teachers should be protected. Engaging with data ethics is part of how institutions are developing effective learning cultures in a digital world. (Innovating Pedagogy, 2020)

OTHER EDUCATIONAL TRENDS		
From schools to local learning ecosystems	**Student co-created teaching and learning**	**Evidence-based teaching**
Learning ecosystems comprise diverse combinations of providers (schools, businesses, community organizations, and government agencies), creating new learning opportunities and pathways to success. They are usually supported by an innovative credentialing system or technology platforms that replace or augment the traditional linear system of examinations and graduation. They need no, however, be confined to their geographic location in terms of resources overall. They may exploit the technologies now available to choreograph global learning resources. (WISE, 2019)	The co-creation of teaching and learning materials by teachers and students can lead to greater student empowerment and better relationships. Students can share responsibility with teachers for designing materials and activities as well as assessments. They can co-create new content and experiences or amend existing ones. (Innovating Pedagogy, 2021)	Evidence-based teaching is about using research evidence to inform decisions about the best pedagogical approach to apply in a given domain. These decisions may relate to which teaching strategy to adopt to teach a specific topic, capture the progress students makeover time, or assess the effectiveness of one's teaching. (Innovating Pedagogy, 2021)

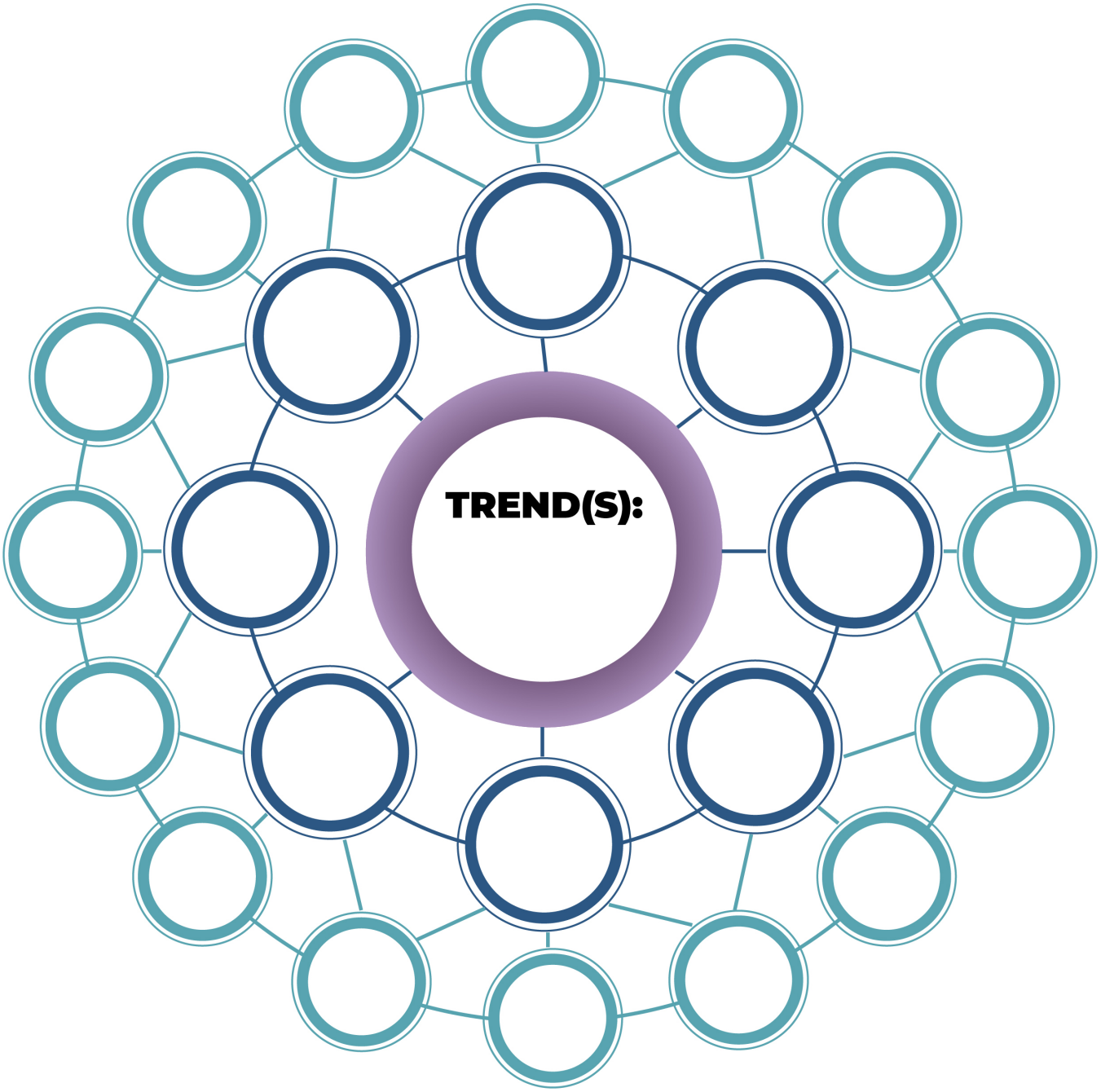
EXPLORE FUTURE IMPLICATIONS FOR YOUR TEACHING ROLE

Choose two trends from the card deck and explore the future implications that they present for your teaching role. Use the futures wheel, an exercise developed in 1972 by John Glenn, to aid you in that process.

1. In the inner circle, brainstorm possible direct, first-order consequences of those trends for your teaching role. Remember to keep your chosen role dimension and stakeholder as a focus lens.

2. In the outer circle, brainstorm indirect, second-order consequences of those trends for your teaching role. You can keep adding rings to analyze third and fourth-order consequences if you wish to expand your time horizon.

3. List critical implications and questions that you can extrapolate for a re-imagination of your role in the future, considering these trends.



Key implications and insights	Key questions

RE-CONSTRUCT YOUR FUTURE TEACHING ROLE

METAPHORS / MYTHS

Considering your futures exploration lens (now including the chosen trends), use the following guiding questions to re-imagine a new image, metaphor, myth, or story to express a possible future role that you might play ten years from now. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE MYTHS AND METAPHORS UNDERLYING MY TEACHING	
GUIDING QUESTIONS	**NOTES**
• What new metaphors express the idea of education? • What new metaphors express what teaching is?	

WORLDVIEWS AND PARADIGMS

Considering your futures exploration lens (now including the chosen trends), use the following guiding questions to re-imagine the worldviews and paradigms that your new metaphor would unlock. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE WORLDVIEWS AND PARADIGMS UNDERLYING MY TEACHING	
GUIDING QUESTIONS	**NOTES**
Paradigms	
• What paradigm would that metaphor/myth support? • Remember, a paradigm is a sensemaking framework or a constellation of values that organizes practice. • What philosophical views about education would that metaphor support? • "Education is a means to..." • Industrial Age, Knowledge Age, Imagination Age, Ecological, • What beliefs about human nature and teaching are embedded in your guiding metaphor?	
Mental models	
• What formal principles of teaching and learning are suggested by the new metaphor and paradigm? • What definition of teaching is suggested by the metaphor and paradigm? • What personal assumptions are implicit or explicit in the metaphor and paradigm? • Why are teachers needed? • How do teachers 'make a difference'? • What is absolutely essential about teaching? • What are the aspects of your teaching that you would never want to change? Why? • What is 'irreplaceable' about teaching? • What makes a teacher a teacher? • How and where does learning happen? • What is needed for learning to happen?	

SYSTEMIC MINDSETS

Considering your futures exploration lens (now including the chosen trends), use the following guiding questions to re-imagine the systemic mindsets that the new worldviews and paradigms would enable. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE SYSTEMIC MINDSETS UNDERLYING MY TEACHING	
GUIDING QUESTIONS	**NOTES**
• What definition of 'teaching' is suggested by your guiding metaphor? • What is your concept of 'good teaching'? • How does one become a good teacher? • Who are your role models of 'good teaching'? Who/what has inspired your teaching ideals? • What is 'bad teaching'? • What is your concept of 'learning'? • What is your concept of a 'successful' or 'good learner'? • What is your institution's concept of 'good teaching'? (Expressed, for example, in evaluated aspects and areas of feedback) • What types of behaviors does your institution's culture encourage/support/celebrate? • What aspects of teaching does your community punish/undermine/neglect/reject? • What is the educational policy framing your practice?	

LITANY

Considering your futures exploration lens (now including the chosen trends), use the following guiding questions to re-imagine the litany that the new systemic mindsets would support. Do not take this as an exhaustive list, you can consider other elements that come to your mind.

THE LITANY OF MY FUTURE TEACHING	
GUIDING QUESTIONS	**NOTES**
Behavioral strategies	
• How do you organize your time? What do you allocate time for and prioritize? What do you not allocate time for or prioritize? • What do you prepare/train/learn/research for? • What are the pedagogical/learning theories underlying your teaching interventions? How does it shape your practice?	
Observable behaviors	
• How do you describe what you do as a teacher? • What would an action log of your routine day/week/month/term show? • What list of actions describes your practice as a [role dimension] with [stakeholder]? • How would [stakeholder] describe you? • What do you express as success? What are you achieving? • What do you express as failure or challenge? What are you struggling with? • What are your primary methods?	

ILLUSTRATE YOUR NEW IMAGE OF THE FUTURE

1. Create a drawing, illustration, collage, etc. that represents your re-imagined role.

2. Complete the following caption and attach it to your image: “I am a teacher that [describe your role] and I use EdTech to augment my practice by [what would you need EdTech for].”

“I am a teacher that [describe your role] and I use EdTech to augment my practice by [what would you need EdTech for].”

COMPLETE YOUR MOSAIC OF THE FUTURE

Run as many iterations of this toolkit as you wish. Choose different dimensions of your role, related stakeholders, and trends to explore different angles and possibilities of your teaching spectrum.

PART 4

DISTILL THE FUTURE IN THE PRESENT

DISTILL THE FUTURE IN THE PRESENT

DISTILL YOUR INSIGHTS: THE FUTURE BEGINS TODAY

Take a second look at your mosaic of the future and map the following key actions to start iterating on your future today.

ACTIONS	CONVERSTATIONS	LEARNINGS
What are some key actions that you could start trying today to iteratively transform into your preferred future roles?	**What are some important conversation topics about future possibilities and challenges that you need to start and with who?**	**What are some key things that you need to start learning and exploring to transition into your possible future roles?**

WE ARE CALLED TO BE ARCHITECTS OF THE FUTURE, NOT ITS VICTIMS.

-R. BUCKMINSTER FULLER