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Learners and learning contexts:
New alignments for the digital age

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The Action Agendas of EDUsummIT2019

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The Action Agendas of EDUsummIT2019 – Laval University, Quebec City, Canada
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This publication is the collection of the two-page summary Action Agendas of the 13 thematic working groups (TWGs) of EDUsummIT2019, held at Laval University in Quebec City in September 2019. EDUsummIT (International Summit on IT in Education) is a global knowledge building community of internationally renowned researchers, educational practitioners and policymakers committed to supporting the effective integration of research and practice in the field of IT in education. EDUsummIT was founded in 2008 to extend and further develop the work undertaken by the editors and authors of the first edition of the *International Handbook of Information Technology in Primary and Secondary Education*, edited by Joke Voogt and Gerald Knezek (2008), published by Springer.

Since its inception, EDUsummIT has now been held six times; firstly, in the Hague (2009), then Paris (2011), Washington D.C. (2013), Bangkok (2015), Borovets (2017) and now Quebec City (2019). Between 70 and 140 participants from six continents have attended EDUsummIT meetings, with 150 participants from 38 countries attending EDUsummIT2019. As a consequence of the extensive impact of the first edition of the handbook and the previous EDUSummITs and their subsequent public outputs, Springer commissioned a second edition of the International Handbook which was published in 2018, edited by Joke Voogt, Gerald Knezek, Kwok-Wing Lai and Rhonda Christensen. This added to the evidence and knowledge in the field, further enriching the work of the EDUsummIT participants in Quebec.

While EDUsummIT participants meet biennially, thematic groups focusing on pertinent research topics in IT and education are formed prior to each EDUsummIT to prepare discussion papers. These papers are further developed during EDUsummIT. After each EDUsummIT, TWG findings are published in reports, international journals and presented at major conferences.

To maximise the dissemination of the EDUsummIT's work, each EDUsummIT has been organised in association with international and national organisations actively supporting the use of information technology in education. These organisations include UNESCO, the Society for Information Technology and Teacher Education (SITE), the International Society for Technology in Education (ISTE), Kennisnet (Netherlands), the International Federation for Information Processing (IFIP), the Association of Teacher Educators (ATE), the Centre de Recherche et d'Intervention sur la Réussite Scolaire (CRIRES) and the Platform Échange, Recherche et Intervention sur la SCOlarité: persévérance et réussitE (PÉRISCOPE).

EDUsummIT 2019

EDUsummIT 2019 was hosted by Laval University with additional sponsorship from the Canadian Commission for UNESCO, King's College London, DoCenter (The Netherlands), Ministry of Education (Quebec), CRIRES and PÉRISCOPE. The theme of EDUsummIT2019, "*Learners and learning contexts: New alignments for the digital age"* was chosen to consider misalignments due to the consequences of changing knowledge representations, human computer interactions, blurring of formal and informal learning, changes in leadership patterns and many more emerging influences from IT which require new alignments between traditional and innovative curricula, between learners and teachers, between learning and assessment etc. with long term implications for policymakers, practitioners and researchers in the digital age. This EDUsummIT is the first to have key deliberations and disseminations of important outcomes in French and English. The preliminary outcomes have already been used as the foundations for the follow on Francophone conference held at Laval University by the Centre de transfert pour la réussite éducative du Québec immediately after EDUsummIT (October 2nd & 3rd, 2019).

EDUsummIT2019 was co-chaired by Thérèse Laferrière (Laval University) and Margaret J. Cox (King's College London) supported by the EDUsummIT steering committee and the local programme committee, details of which are given in the EDUsummIT Programme and the EDUsummIT2019 E-book (https://edusummit2019.fse.ulaval.ca).

This report provides the misalignments identified by each of the 13 working groups, listed below, such as those between: curriculum, pedagogy and assessment; the fragmentation between policies and practices; and IT being compartmentalized and not integrated into teaching and learning. From these deductions, each working group has identified emerging questions on how to consolidate what is already known from the global evidence and what new alignments can be formed to help policymakers, practitioners and researchers develop effective strategies to be able to provide education which will make best use of ever changing technologies in a digital world.

The thematic working groups listed below were established to consider the most important issues, misalignments and challenges identified by the steering committee ranging from technological developments to knowledge building in the classroom and beyond. Building consensus toward proposed solutions for fast-tracking research into policy and practice, over the course of 2.5 days, was each group's primary goal.

TWG 1: Technology developments: how human computer interactions change with technological innovation.

TWG 2: Learners as learning leaders: how does leadership for learning emerge beyond the traditional teaching models?

TWG 3: Creativity for teachers and teaching.

TWG 4: State of the art in thinking about machine learning: Implications for education

TWG 5: Safe and responsible Internet use in a connected world: teaching critical thinking and accountability to promote cyber-wellness.

TWG 6: Putting learning back into learning analytics: optimizing learning through analysing the data.

TWG 7: Connected learning: online human interaction and interaction with digital resources.

TWG 8: Pedagogical reasoning and reflective practice: a framework for teaching in a digital age.

TWG 9: Advancing conceptual models of technology integration in education: Implications for researchers, practitioners and policymakers.

TWG 10: New approaches and paradigms for researching digital technologies: Achieving scalability and sustainability

TWG 11: Cross-cultural alignments, fertilization, differentiation: bridging the gaps through technology.

TWG 12: National policies in curriculum reforms: what makes a quality curriculum in a technological era?

TWG 13: Knowledge building/knowledge creation in the school classroom and beyond.

For more detailed information, see subsequent publications as well as the International Handbook of Information Technology in Primary and Secondary Education. The remainder of this action agenda published in the following pages provides strategies and guidelines for policymakers, researchers and practitioners which pave the way for successful new alignments for education in a digital age.

TWG 1: Technology developments: How human computer interactions change with technological innovation

Innovations in technology are challenging our beliefs and practices in teaching and learning. The content-orientated curriculum and lecture-based pedagogy can no longer meet the demands of the 21st century and the needs of diverse learners. Lately, there has been convergence on the part of educators and learners in responding to the digital age. Curriculum movements such as the Next Generation Science Standards (NGSS) are pushing towards process-orientated learning while students are making use of their electronic devices for learning purposes rather than entertainment alone. Looking to the future, then, we identified six technologies that will impact interfaces and in turn, teaching and learning, in the next 3-5 years: robots, wearables/mobile/sensors and controllers, natural language, AR/VR/3D, the cloud, and learning analytics. These technologies not only afford all learners, struggling learners to accelerated learners, opportunities to have a personalized, authentic, and never before possible learning experience, but they also give access to learning all the time and everywhere.

Co-leaders: Elliot Soloway (U of Michigan, USA), Cathie Norris (U of North Texas, USA).
Group members: Lydia Cao (McGill U, Canada/China), Ann-Louise Davidson (Concordia U, Canada), Ferial Khaddage (U of Balamand, Lebanon), Hiroaki Ogata (Kyoto U, Japan), Sabine Prévost (Commission scolaire de la Côte-du-Sud, Québec, Canada), Mélanie Tremblay (U of Québec at Rimouski, Canada), Henry "Trae" D. Winter III (NASA Goddard Space Flight Center, USA), C. Alex Young (NASA Goddard Space Flight Center, USA).

Issues and Assumptions

- Technology affords all learners opportunities to experience unique, authentic, high risk, never before possible phenomena.
- Technology affords all the time and everywhere learning.
- Internet-connected technology is readily accessible.

Identified Current Misalignments

- Traditional curricula focus on content, but digital technology affords a focus on process.
- Currently, technology is typically used to make traditional learning better as opposed to leveraging opportunities afforded by digital technology to make learning more experiential for all learners.
- Disconnect between current teacher preparation programmes and the needs of the teachers using digital technology in the classrooms.
- The goals of the policymakers are not always aligned with the goals of educators. For example, educators focus on the whole child whereas policymakers focus more on efficiency and cost effectiveness.

Emerging New Alignments

- Students using mobile devices not just for communication and entertainment.
- New curricula movements are putting process rather than content first.
- New assessments are being developed for the newly adopted process-oriented curricula.
- User activities, interfaces, and contexts are beginning to come together.

Strategies and Actions

Policymakers

- Experience the field and their policy decisions need to be informed by those experiences.
- Allocate significant funds for a concerted effort in professional development to bring all K-20 educators into the digital age.
- Change the assessments to align with technology-enabled, new curricula and pedagogies.

Practitioners

- Engaged in ongoing, community-based and remunerated professional learning.

Researchers

- Engaged in classroom-based research.

Stories: Examples from today, the foreseeable future, and the unforeseeable future!

Learning analytics (LA)

- Today: Currently, LA focuses on tracking learners' interactions with the interface and depicts learning progression through teacher dashboards. In Japan, the ministry of education plans to introduce e-textbooks in all K-12 schools by 2020. E-book readers will record all reading activities such as page flips, bookmarks and annotations. Using these data, teachers can develop evidence-based teaching strategies to respond to the individual needs of each student. Currently, the University of Kyoto is investigating e-book-based LA at five K-12 schools in Kyoto. The advancement in LA will enable smart interfaces to not only capture the learning processes, but also adapt to the needs of the learners to provide a personalized learning experience.

Virtual Reality (VR)/Augmented Reality (AR)/3D/Mixed Reality (MR)

- Today: VR enables learners to have experiences that, due to physical constraints of the real world, are simply not possible. VR fosters active and embodied learning by immersing learners in an authentic learning context (even inaccessible situations). NASA Space Science Education Consortium (NSSEC) built a VR clean room, which is a replica of a spacecraft assembly clean room at Goddard Space Flight Center. This VR experience gives users an idea of what it is like for NASA scientists and engineers during the build phase of a satellite. Various instruments and components of the satellite are interactive, along with a few other surprises. This exploration will lead to a better understanding of NASA mission science and engineering and give users a unique look into Goddard and other NASA facilities that otherwise would not be possible.

Cloud-based Technology

- Today: Cloud-based technology facilitates collaboration and knowledge building among individuals everywhere all the time. NetLogo is a cloud-based multi-agent programmable modelling environment. Third year students at the University of Balamand in Lebanon experimented with NetLogo to develop artificial intelligence (AI) models based on agents and the environment. Students were presented with some scenarios, each of which facilitated agent design and simulation, thus satisfying the learning outcomes of the practical work of the course.

Natural language

- Today: In our daily lives, we speak with Alexa, Siri, and OK Google, on a regular basis. For example, how handy is it to ask Alexa when Delta flight 129 from Detroit is arriving in Dallas?

Robotics

- Today: Seymour Papert and his physical – and eventually virtual – "Turtle" pioneered the use of physical robots in the learning of coding.

Wearables/mobile/sensors & controllers

- Today: Mobile technology has made learning possible for all learners everywhere, all the time. For example, Scientists at NASA's Space Science Education Consortium (NSSEC) and the Center for Astrophysics| Harvard & Smithsonian (CfA) built the Eclipse Soundscapes App to make experiencing "total eclipses" accessible to everyone including people who are blind and visually impaired. Utilizing interfaces made possible by mobile device technology, accessible design practices, and innovative techniques, the Eclipse Soundscapes Project delivers an engaging and informative multi-sensory experience in real-time during an eclipse. Over 57,000 people used the app to learn about the eclipse, hear audio descriptions of eclipse features as they appeared in their local area, and interact with a "Rumble Map" that allows users to experience eclipse features through sight, sound, and touch.

In the foreseeable future: Learning analytics combined with machine learning will provide teachers with warnings about the specific needs of individual students and learning analytics will provide learners with more "scaffolded," personalized learning experiences.

In the unforeseeable future: Affordable AR/VR/MR/3D (for example) will render all manner of previously unexperienceable experiences experienceable for all learners. While the medium in which writers, painters, film makers, etc. work has limitations, for better or worse digital technologies dangle the possibility that finally the medium is not a source of limitations. Indeed, the only limitations for creating, expressing, designing will be our own imaginations.

TWG 2: Learners as learning leaders:
How does leadership for learning emerge beyond the traditional teaching models?

As we open up to the broadening of contexts for learning, facilitated by pervasive technology to individual learners, we need to think about how leadership for learning emerges and can be supported beyond the traditional teaching models in a technology-enriched environment. In formal as well as in informal contexts, learning leaders, willing to take responsibility for learning in their context, develop new technical competencies. Consequently, their capacity for innovation along the broad spectrum of human activity is enhanced and continues to evolve. Learning leaders, which may include teachers, students, and other educators, manifest their leadership through boundary spanning, deep understanding of authentic problems, relational agency, engaging in problem-solving, overcoming design challenges, game playing, etc.

"Leadership is about providing direction and taking responsibility for making it happen"
OECD. (2013). Leadership for 21st Century Learning. Paris: OECD Publishing.

Co-leaders: Alain Breuleux (McGill U, Canada), Rowland Baker (Santa Cruz County Office of Education, USA), Ola Erstad (U of Oslo, Norway).
Group members: Stephanie Beck (McGill U, Canada), Ron Canuel (Strategis, Canada), Eugenie Congi (Conseil des écoles catholiques du Centre-Est, Ottawa, Canada), Cheryl Ishii (STEM Pre-Academy in Hawaii, USA), Barry Quinn (King's College London, UK), Tengku Faekah Tengku Ariffin (U Utara, Malaysia), Guy Tetrault (Sun West School District, Saskatchewan, Canada).

Issues

Lack of principles for understanding learning, leading, IT, and change:

- Conflicting understandings of student success and well-being;
- Misunderstanding of IT as compartmentalized, potential "silver bullet";
- Imposed anonymity instead of recognition:
  - Equity and access;
  - Consistency/clarity of purpose.

Guiding Principles

- Lead learners need to interact collaboratively, build relationships and trust, and ensure continuous development.
- Leadership for learning is distributed amongst participants and dependent on the opportunities present.
- "IT" should also stand for "innovative teaching": technology should not be the main topic, but it should be integrated.

Identified Current Misalignments

- Structure does not allow risk taking and failures, which can prevent innovation.
- IT is compartmentalized and not integrated into teaching and learning.
- IT Access is not ubiquitous.
- Evaluation/assessment is not consistent with desired outcomes.
- The learning environment (space, time, participation structures) is not conducive to natural learning patterns.
- Incoherence between policy, research, and practice.

Emerging questions from discussions with other TWGs

- Need to create a joint understanding of "leadership".
- Need to contextualize the concept of "lead learners" (teachers? students?). Lead learners emerge depending on the context.
- "Distributed" leadership used in terms of "emerging" leadership was more or less welcomed, but some tensions still exist (e.g. cultural differences and assumptions in France).
- Distributed leadership: How do we define leadership and who we see as "leaders"? (opposed to working in silos, etc.).
- Distributed leadership: fostering, growing and practising leadership/mentorship skills with the goal of sustainable gains; sharing leadership (amongst staff/teachers/learners) to create sustainability; providing learners with progressively challenging leadership possibilities as their skills grow.
- TWG 7: leadership for learning as a "mindset" (being able to use a situation, working with others); issue of assessment (how does one assess learning across different contexts?).
- TWG 13: not everyone was a fan of the idea of "Innovative Teaching" to describe "IT"; platforms (outside companies playing too big of a role), knowledge creation and context need to be considered.
- IT is not necessarily innovative; teachers are using it but not necessarily innovating with it; do innovative practices respond to a need (e.g., empathy)?
- Some worry that the teacher role would disappear (Khan academy).
- Students can exercise leadership for learning by, e.g., creating tutorials for other students, similar to Khan Academy, created by students for students.
- Creativity requires tremendous amounts of risk-taking. This idea overlaps with one of our observations/discussions.
- Notion of "space" in learning environments.

Strategies and Actions

For All

- Pay attention to developing a joint understanding of leadership, as it applies to situations of leading learning and innovative teaching.
- Foster partnerships [untapped potential!] between researchers, practitioners, and policymakers.
- Get students involved.
- Advocate to policymakers and policy influencers Leadership for Learning beyond the traditional teaching models.
- Promote the outcomes of EDUsummIT and other similar programmes.
- [Risk-taking].
- [Knowledge mobilization towards policymakers].
- [Teacher preparation and professional development].

Policymakers

- Develop a joint understanding of leadership, as it applies to situations of leading learning and innovative teaching practitioners.
- Teacher preparation and professional development.

Researchers

- Teacher preparation and professional development.
- Knowledge mobilization towards policymakers.

TWG 3: Creativity for teachers and teaching

Creativity has been highly touted as a central concept for 21st-century thinking, teaching and learning. It is widely noted in both academic literature and popular discourse as being essential to the types of thinking skills and approaches to the world that students will need for the present and future. Moreover, creativity is vital in teaching, because students learn and adopt creative habits of mind when these are part of their learning environments. There is a deep intersection between technology and creativity, and the potential of both to inform each other in learning settings. Yet creativity and technology are complex areas which involve pedagogy, thinking skills, risk-taking, ideation, problem-solving, and more. TWG3 aims to explore the intersection of these constructs and provide insight into how we can develop creative thinking in teaching and learning.

Co-leaders: Michael Henderson (Monash U, Australia), Danah Henriksen (Arizona State U, USA).
Group members: Ana Amélia Carvalho (U of Coimbra, Portugal), Miroslava Cernochova (Charles U, Czech Republic), Edwin Creely (Monash U, Australia), Deepshikha Dash (Indian Institute of Technology Kharagpur, India), Trina Davis (Texas A&M U, USA), Punya Mishra (Arizona State U, USA), Erkko Sointu (U of Eastern Finland), Paolo Tosato (Ca' Foscari U of Venice, Italy).

Issues

Creative risk-taking and productive failure are essential in creative processes, in terms of iterations of failure that lead towards ultimate success; or in leading to contemplation or reflection on a given problem and its possibilities, and in enhancing learners' ability to manage ambiguity. Yet there are few existing guidelines, supports, tools or examples to help practitioners build risk-taking, productive failure, and creativity into their teaching. Systemically, educational environments are often unsupportive of risk-taking and failure. It is rare that good, original, creative work or ideas come together or succeed on the first try. Therefore, teaching and learning settings need to make allowances for and support risk-taking and productive failure in schools, in order for creativity to develop and flourish among teachers and students.

Identified Current Misalignments

- Much popular discourse on 21st century education denotes creativity as a critical thinking skill, but despite there is little support and few guidelines for implementing its elements of creative risk-taking and productive failure.
- Many educational environments focus on practices that run contrary to creative risk-taking and productive failure (e.g. high stakes testing, "curriculum crush", "teacher-proof" or scripted curricula, rewards/punishment-based approaches to grading).

'Emerging' New Alignments

- New opportunities for creative risk-taking and productive failure have arisen because of technology (e.g., virtual reality, robotics, coding). By virtue of the fact that they are new, the outcomes are uncertain, and we need to realign how we think about technology, pedagogy, and content.
- New forms of organisation of teaching and learning offer opportunities for creative risk-taking. For instance, transdisciplinary/cross-curricula teaching, requires teachers to discover new ways of working and new curriculum designs that in-of-themselves involve creative risk-taking behaviours. The recent interest in entrepreneurial thinking, preferences creative mindsets including that of design, iterative development.

Strategies and Actions

Policymakers

- Currently, risk-taking and failure has a negative connotation within curriculum policy frameworks. Policy documents should positively reframe these concepts as part of creative learning processes.
- Recognize creative risk-taking as a key competence of all stakeholders in education systems and workforce in alignment with the interests of creative workforce development, and futures thinking.
- Create space for alternative assessments and formative assessments that encourage and expect creative risk-taking, as the current high stakes testing environment is antithetical to creativity.

Practitioners

- Teachers should:
  - Build classroom environments that are supportive of creative risk-taking and make allowances for productive failure.
  - Teach students strategies to "fail forward" or turn a failure into iterations of creative work.
  - Design activities that purposely integrate opportunities to try new ideas, fail, and then regroup and persist toward learning and creative outcomes.
  - Identify how technologies, as tools to think with, can allow students to trial and practice ideas and iterations of creative work.
  - Model processes of creative risk-taking and productive failure in their own practices.
- Local education leaders should promote creativity by valuing creative risk-taking and productive failure in teachers (i.e. reward or recognition structures aligned with creative risks).
- Teachers and administrators should recognise the role of learners' family and peers in their capacity to engage in creative risk-taking. Communication between school and home should emphasize creative risk and potential failure for students' preparation for work and life.
- Teacher educators, both pre- and in-service, must integrate conceptual and practical learning around creative risk-taking and productive failure into coursework and field experiences.

Researchers

- There is a lack of research around creative risk-taking and productive failure in the field of education. More empirical studies are needed to reveal how creative risk-taking and productive failure enhance learning, and how they are best supported. In particular, risk-taking and failure are grounded in context, so we need more deep, rich studies (including longitudinal work) to enhance understanding of these concepts within and across varied contexts.
- The nature of creativity for learning, including the role of risk-taking and process of productive failure, continues to be misunderstood in educational policy and practice. Creativity researchers need to better understand why this misalignment exists, and how it can be realigned.
- There is little research relating to the role that technology can play in supporting (and constraining) creative risk-taking and productive failure. Researchers should begin by connecting with existing relevant research areas such as resilience, persistence and personal skills.
- Assessment regimes, including the high stakes testing in most education systems, have been identified as a critical impediment to cultures of creative risk-taking. Creativity researchers should seek to integrate their work into existing conversations around assessment. Allowances for trialling, failure and iteration are needed within assessment structures.

TWG 4: State of the art in thinking about machine learning: Implications for education

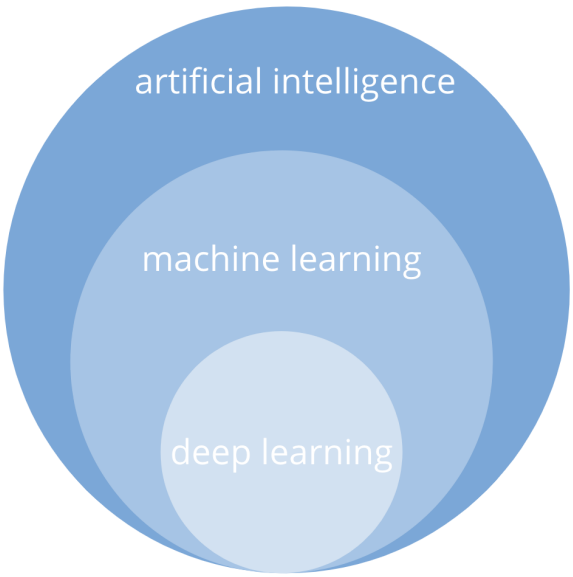
New partnerships between humans and machines are changing learning interactions, and the scope and range of learning opportunities. Artificial intelligence applications, such as language and voice recognition and intelligent personal learning environments, are changing learning. Decisions are being made based on the new affordances that machine learning offers, resulting in new challenges for learners, teachers, researchers and administrators. Machine learning, simply stated, is a way for computers to learn from data; for example, detecting patterns, classifying data and making predictions. Deep learning often increases the complexity and reduces the transparency of the machine learning processes. The increasing prevalence of machine learning raises questions such as: Who will be teaching whom, who will be leading whom and what roles will be available to humans and machines?

Co-leaders: Mary Webb (King's College London, UK), Andrew Fluck (U of Tasmania, Australia).
Group members: Michelle Deschênes (U Laval, Québec, Canada), Silvia Kheirallah (Conseil des écoles catholiques du Centre-Est, Ottawa, Canada), Irene Lee (Massachusetts Institute of Technology, USA), Johannes Magenheim (U of Paderborn, Germany), Joyce Malyn-Smith (Education Development Center, Cambridge, USA), Guillaume Paré (Collège des Compagnons, Québec, Canada), Raymond Trippe (Lucas Onderwijs, Netherlands), Juliet Waters (Kids Code Jeunesse, Québec, Canada), Jason Zagami (Griffith U, Australia).

Issues

To optimize student learning there is a need to identify machine learning concepts necessary to be understood by teachers and students by the end of compulsory education, to prepare for lifelong learning.

There is, however, a lack of clarity around literacies needed to support the development of machine learning in education. Data, algorithm and machine learning literacies need to be described.



How machines make decisions/predictions can be a "black box" because deep learning algorithms and models can be very complex. There is a need for transparency so that decisions and conclusions made by machines can be explained. This transparency is essential to minimize bias and ensure that decision making based on machine learning is fair, interpretable and accessible for all.

Creators of machine learning systems/models should be held accountable for these issues of bias and transparency.

Because biases can be built into machine learning systems (intentionally and/or unintentionally) there is a need for a code of conduct to guide the development of machine learning for education.

There is limited information on the policy and practice of machine learning in countries around the world.

For machine learning to be useful and equitable, data must be of high quality, accurate, complete and diverse. Conversely, there can be negative consequences when data used are unidentified, unstructured, incomplete, and/or mislabelled.

Adoption of machine learning in education is complex and impacts many areas of education including policy development, curriculum development (ethics, social-emotional, cognitive aspects), professional development (discernment and self-efficacy) and equity (allowing for learner and cultural differences).

As humans and machines become partners in learning and problem solving, there is a need to explore and better understand human-machine power relationships.

To develop their conceptual understanding of algorithms, models and how machine learning works, students must have opportunities to use and apply machine learning.

As a powerful tool that may not be used to its full potential, there is a need for students to understand how machine learning can be used to identify and solve real-world problems.

It is difficult to keep curriculum and professional development up to date with the rapidly evolving machine learning field.

Strategies and Actions

- Reform curricula to ensure that all students develop a strong background in machine learning. (policymakers, practitioners, researchers, and/or developers).

- Identify and define emerging literacies related to machine learning, algorithm, data/big data, and modelling (practitioners and/or researchers).

- Report on the status of policy and practice of machine learning in education across various countries around the world. (researchers).

- Update policies and practices to keep pace with developments in the field. (policymakers, practitioners and researchers).

- Develop a Code of Conduct for machine learning in education for users and developers. (policymakers, researchers and learners).

- Provide machine learning professional development and resources for teachers, educational leaders and other key stakeholders to support education reform. (policymakers, practitioners, researchers, and/or developers).

- Support educators and learners in conducting risk analysis in the use of machine learning in education. (policymakers, learners, and/or developers).

TWG 5: Safe and responsible Internet use in a connected world:
Teaching critical thinking and accountability to promote cyber-wellness

Cyber-wellness (CW) involves an understanding of online behaviour and keen awareness of how to inform and protect oneself in cyberspace. The focus of CW is on helping students to become responsible digital learners and citizens. Given the broad reach of the World Wide Web and access to children which that provides, information and media literacy, and awareness of the potential dangers inherent in participating in that environment, have become increasingly important. Ensuring that young people develop a deep understanding of the importance of the need to take responsibility for their online safety (including how their online behaviour and activity affect both oneself and others) and developing skills to critically assess online information, will be essential for improving CW moving forward.

Co-leaders: Dale Niederhauser (West Virginia U, USA), Cathy Lewin (Manchester Metropolitan U, UK), Nancy de Las Mercedes Castillo Valenzuela (U del Bío-Bío, Chile).
Group members: Akira Sakamoto (Ochanomizu U, Japan), Remco Pijpers (Kennisnet, Netherlands), Roger Sherman (Cambodia Foundation for Higher Education, USA/Cambodia), Toshinori Saito (Seisa U, Japan), Francois Guité (Independent Educational Technology Consultant, Québec, Canada), Audrey Miller (École branchée, Québec, Canada), Alexandre Brzozowski (Hainaut Enseignement and U de Mons, Belgium), Patrick Hould (Ministry of Education and Higher Education, Québec, Canada), Quinn Johnson (U Laval, Québec, Canada).

Our work has been guided by a set of questions:

a. What information can be trusted? How to recognize and deal with fake news; what information should be posted online and what not? How to develop information literacy and media literacy?

b. How can we make sure that children and youngsters feel safe in the digital world and that they can take such responsibility for their own use of technologies?; How can young people and others recognize and deal with cyberbullying, predators, phishing and potential identity theft?

c. How can public awareness of online children's protection and cyber-wellness (digital citizenship notion) be improved?

d. What kind of policies (at micro, meso, macro level) should be developed in order to promote CW?

e. What activities and practices can promote and develop young people's CW? How could and should school curricula be changed?

To promote and develop CW we need to look beyond school and consider informal as well as formal learning contexts. We need to be aware of the multiple stakeholders involved from teachers and parents to community members and commercial technology providers. A key aim should be to instill a healthy scepticism (critical thinking) in young people and ensure that they are proactive. Young people need to be empowered through the development of attitudes and skills. They need resilience which must be developed through experience, risk-taking, and failure. Young people must be enabled to help themselves.

Issues

- We need to unpack cyber-wellness and the elements/characteristics of cyber-wellness; link this to wellness in order to solidify and contextualise our understanding.
- Developments in technology are presenting threats to maintaining cyber-wellness (e.g. increasing surveillance, managing students' personal behaviour, data and learning analytics).
- We need to convince others of the importance/value of the idea of overall wellness.
- We need diverse, flexible and sustainable practices to support the development of cyber-wellness across learning environments within social contexts in a civil society (cultures, socio-economic backgrounds, ideologies, etc.).

Identified Current Misalignments

1. The focus is on cyber-wellness when it should be focused on wellness more broadly. Cyber-wellness is a component of wellness.
2. Rather than being focused on the cyber-well-being of the learner, the role of technology in education systems is driven by outside forces (commercial interests, government entities, political interests, propaganda, etc.).
3. The focus tends to be on setting limits and regulation, rather than focusing on a strength-based approach that encompasses balanced skill-building towards empathy, compassion, self-regulation, self-awareness, community awareness and support structures.
4. We are lacking guidance, training, and tools for practitioners that ground theory and practice. Current curricula do not effectively integrate well-being.

'Emerging' New Alignments

We view these as emerging trends that need to be accounted for rather than solutions:

- The heightened importance of the ability to comprehend the validity of information.
- Artificial intelligence is emerging as a new digital approach in education.
- Stakeholders have access to much more data than ever before.

Strategies and Actions

Strategies (the numbers in brackets refer to the misalignments identified above)

- Create a balance between learning opportunities and use of protocols in cyber-wellness education [1] [4].
- Have educators take more responsibility in developing these practices [2].
- Create an understanding of the mutual relationship between technology and humans; we are shaping the technologies that we use and that the technologies that we use are shaping us [3].
- Establish an ongoing cycle of evaluation of the technologies that we use [1] [2].

Actions

- Develop consensus on a concise definition of wellness and cyber-wellness (social, psychological, physical and cognitive) [1] [4].
- Increase awareness of the fact that cyber-wellness is part of overall wellness [1].
- Promote self-awareness of how we learn and are influenced by technology [2][3][4].
- Increase involvement of young people in designing and conducting research and informing policy and practice [1] [3] [4].
- Develop and integrate communities:
    - to provide peer-to-peer support in response to issues that arise [3].
    - of stakeholders for discussing and determining the proper use of technology [3].
- Provide guidelines so that stakeholders can make informed choices relating to cyber-wellness [2].
- Encourage stakeholders to integrate wellness across curricula [3][4].

TWG 6: Putting learning back into learning analytics: Optimizing learning through analysing the data

Learning analytics have been defined as the use of static and dynamic information about learners and learning environments, assessing, eliciting and analysing it, for real-time modelling, prediction and optimization of learning processes, learning environments, as well as educational decision-making. To target the outcomes of data systems is a new challenge for computer scientists and engineers as well as educators. For instance, learning analytics of student data sets can be used for formative and summative assessments, but issues related to privacy and usability are growing concerns. For example, with large data sets available to teachers and learners, who owns these data, which data are available, and which are private? Furthermore, who analyses these data and who is the data analysed for? What can teachers do with all these data and what feedback and monitoring of learning might students expect from learning analytics? How can fair uses of techno-led/enabled assessment be ensured and what are the risks associated with data use for promoting students' achievements? The group identifies how learning analytics may influence policy and teaching practices.

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Issues and Challenges

There are numerous missed opportunities for effective use of learning analytics systems to drive improvements in student learning and success at scale, with corresponding impacts on the whole society, due to several problems, tensions and barriers.

- There is a widespread lack of knowledge and understanding about learning analytics and the need to select and use learning analytics systems for supporting learning, teaching and assessment, tracking progress and informing decision-making.
- Guiding principles and policies need to be updated to help institutions make use of learning analytics.
- Standards are needed for ethical design and use of learning analytics systems by educational data services providers and users; ensuring quality (e.g. auditing, transparency, reporting), sustainability and scalability.
- Flexible, user-centred designed tools are needed for different learning levels, ages and stakeholder groups in their unique educational contexts.
- There is a need to apply and advance educationally relevant research-based knowledge to:
    - engage key stakeholders of learning (e.g. students, parents, teachers, school leaders);
    - create and ethically use rich data models and methodologies to advance learning;
    - integrate instructional theory, design and delivery with analytics data and insights;
    - safeguard security, privacy and control of data;
    - understand the impacts of combining data types from all sectors (health, socio-emotional, SES, etc.) on interactions with the individual;
    - enhance data interoperability with standardized measures.

'Emerging' New Alignments

- Literacy, fluency and control over data are linked.
- Global differences in learning analytics impact uses, meanings, and methods.
- Advancing educational research is needed for analytics theory and methodology.
- Bridging data science and learning sciences requires improved multi-disciplinarity and frameworks.

Strategies and Actions

We recommend the following actions for policymakers (PM), researchers (R) and practitioners (PR) each strategy linked to the corresponding challenges identified above:

- *In order for evidence-based practice to be led by analytics:*
    - Develop learning analytics policy that focuses on leadership, professional learning, enabling mechanisms, and data governance. (PM, R)
    - Ensure open access to resources and best practices. (All)

- *To promote the adoption of learning analytics*
    - Develop standards, guiding principles and policies as well as best practices for the use of learning analytics. (PM)
    - Enable organizational change to support stakeholders to utilize learning analytics for learning. (PR)

- *To inform and guide data services providers and users:*
    - Promote trustworthy, ethical quality assurance through mechanisms such as standards, accreditation processes, audits and recommendations. (PM)
    - Promote sustainability and scalability, for example via embedded and just-in-time services. (R)

- *To impact learning via analytics tools:*
    - Ensure educationally relevant data literacy levels (knowledge, understanding and capacity for decision-making) of all stakeholders is raised. (All)
    - Provide specific analytics tools for different stakeholders (age groups, learning levels), using evidence informed context and impact insights. (All)

- *To leverage the relationship between instructional design and learning analytics, and to extend to course and curriculum analytics, e.g. via AI:*
    - Use learning analytics to inform the advancement of instructional design for quality learning, teaching and assessment. (R, PR)
    - Enable multidisciplinary and participatory research for quality assurance as well as for keeping pace with the technology lifecycle of enabled learning environments. (All)

- *To understand the impacts of combining data types from all sectors (health, socio-emotional, SES, etc.) on interactions with individuals; improving data models and leveraging AI and related technologies.*
    - Provide data privacy and security for interoperability (e.g., using health data, socio-economic data, behavioural, social-emotional, academic data, etc. to advance learning goals). (R, PR)
    - Guarantee the control and ownership of data is clear, transparent and in the hands of the person who is the subject of the data (e.g. EU-GDPR, ISO standard on privacy). (All)

TWG 7: Connected learning:
Online human interaction and interaction with digital resources

Definition: In an age of ready access to people and information, connected learning is a combination of individual interests, networked and interdependent relationships, and interconnected experiences that transcend temporal, spatial and cultural boundaries. Connected learning leverages media and technology for expanded access to global communities and cross-cultural and interdisciplinary learning pathways across the lifespan. Connected learning involves socially embedded and interest-driven interactions among diverse participants who collaborate, co-create, re-craft and leverage each-other's diverse insights and perspectives while building knowledge in and for the community.

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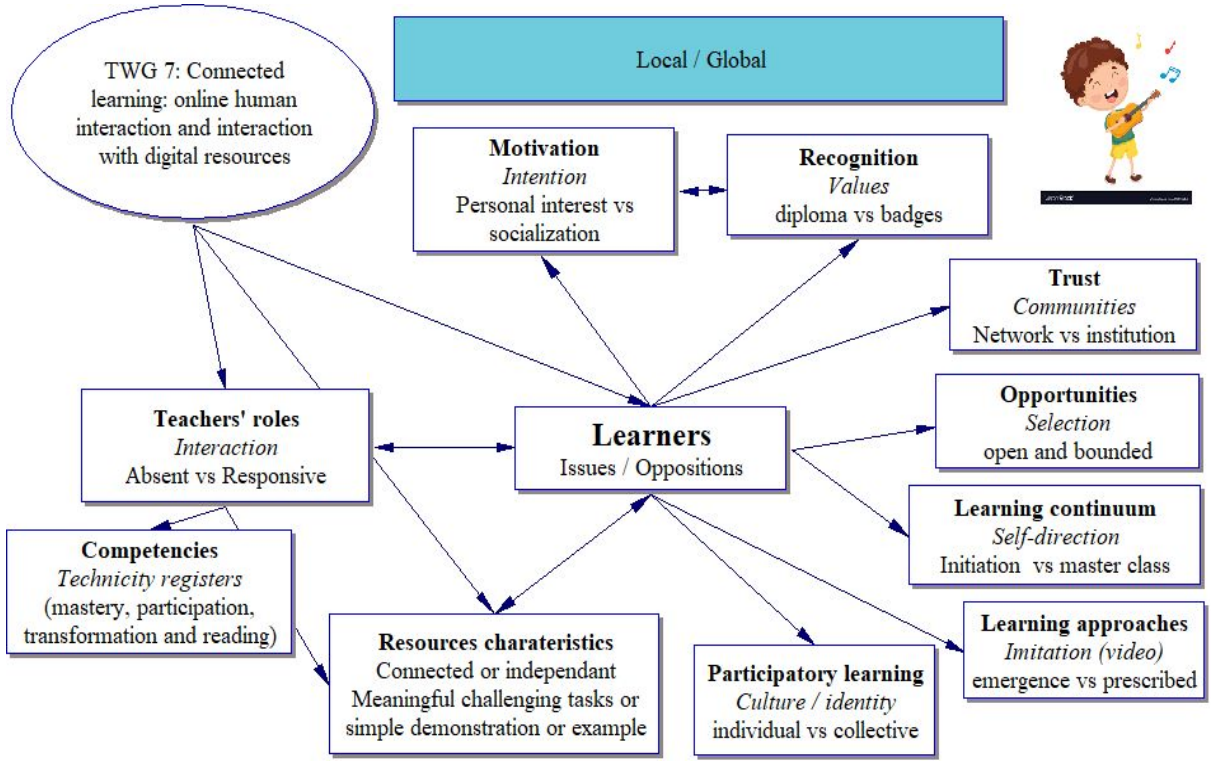

Figure 1. Connected learning model and a picture of a child playing guitar is added as we think that how to learn to play guitar is a good example for thinking about many aspects of connected learning

Legend of figure 1

- **Bolded terms**: key issues
- *Italicized words*: examples or the location in the learning process
- Terms at the bottom: oppositions relevant to that specific issue

Identified Current Misalignments

open and bounded

- free range in context of privacy, security and ethical constraints.

global and local

- policy, practices and programmes; the continuum of linguistic, ethnic, cultural, economic, epistemological diversity.

top down and bottom up

- goals, agency, decision-making, identity, risk-taking (institution: teacher; school leader: teacher; teacher: learner); national or provincial/state curriculum and assessment: teacher professionalism, choice and autonomy.

emergence vs prescribed

- expanded connected approaches versus standardized curricular and assessment frameworks.

idealized connected learning within formal structures and systems

- explore assumptions, concessions, caveats.

rise of a new class of social influencers, entrepreneurs, and leaders who leverage power of network and social media

- Whose voices and perspectives are privileged; whose are excluded; authoritative knowledge and expertise versus fake news /opinion.

'Emerging' New Alignments

- Forms of education that encourage connection: formal, non formal, informal.
- Just-in-time (immediate need) versus just-in-case learning (might need in the future).
- Recognition: badges, but online education resistance.
- New actors: social influencers.
- Choose tailor-made pathways that are made up of a variety of courses delivered online in various forms world-wide through different learning opportunities, including new ones (e.g. virtual visits to museums, libraries, zoos and or social media interactions).
- Main question: under what conditions, for which learners, for what purpose, in which contexts does connected learning work?

Implications and Suggestions

Policymakers

- Regulate for quality and value. Define and disseminate policies and priorities to achieve designed goals.

Practitioners

- Orient teacher/learners to develop competencies for engagement in connected learning. Use connected learning opportunities to make learning more visible and develop metacognition.

Researchers

- Develop mature connected learning theories, frameworks, models and design principles to guide inquiry and practice.

TWG 8: Pedagogical reasoning and reflective practice: A framework for teaching in a digital age

Pedagogical reasoning and reflective practice are important means for teachers to continually professionalize and improve their teaching. These concepts also help us to understand why, how and with what results practising and prospective teachers use technology in their teaching. This emancipative form of professional development taps into teacher agency for digital technologies and resources. It is also critical for bringing new teachers into the practice, and enhancing the techno-pedagogical skills, knowledge and action through the joint lens' of TPACK (Technological Pedagogical Content Knowledge) and PR&A (Technological Pedagogical Reasoning and Action). This is particularly important when considering the transition from novice to expert educator using technologies.

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Issues

TWG 8 identified three themes relevant to PR&A in relation to new alignments for learners and their learning contexts, namely:

- How might we better connect understandings of teachers' knowledge to their classroom practices in technological-rich contexts?
- What new ethical challenges are presented to teachers' decision-making when educational technologies are used in classrooms?
- How does the PR&A of pre- and in-service teachers differ? How might we better develop the decisions of all teachers?

Identified Current Misalignments

Connecting knowledge and action in technological-rich contexts

- We currently have models of teacher knowledge and of teacher decision-making; however, these models are currently seen to be separate from one another.
    - TWG 8 sees the separation of knowledge and decision-making as a misalignment.
- We do not have an integrated model that considers teachers' attitudes, beliefs and dispositions together with teachers' knowledge to better understand their decision-making processes.
    - TWG 8 sees the lack of a more comprehensive model as a misalignment.

Ethical decision-making based on PR&A

- Teachers are increasingly required to make classroom decisions based on the data provided by software developed by third party commercial companies. The algorithms that generate these data are not transparent creating challenges for teachers to make effective decisions.
    - TWG 8 sees a lack of transparency in third-party software as a misalignment.
- The increased prevalence of learning analytics software, often imposed upon teachers by system or school leaders, threatens to automate many classroom decisions and reduce teachers to managers rather than active, professional decision-makers.
    - TWG 8 sees PR&A as a hallmark of professional teachers and the automation of their decisions as a misalignment.

PR&A of pre- and in-service teachers

- In many contexts there is a lack of practical-authentic experience for preservice teachers resulting in limited opportunities for decision-making and self-reflection opportunities.
    - TWG 8 sees the lack of guided professional experience for pre-service teachers as a misalignment.

- In-service teachers are often isolated in terms of exposure to different practices which can limit their decision-making repertoire.
    - TWG 8 sees the lack of ongoing, shared classroom experiences as a misalignment.

Emerging New Alignments

Connecting knowledge and action in technological-rich contexts

- Representations of teachers' epistemic frames provide new opportunities to connect teachers' knowledge, attitudes, beliefs and dispositions with their decision-making processes allowing for reflective opportunities and a more comprehensive model of PR&A.

Ethical decision-making based on PR&A

- A code of conduct developed by policymakers that requires software developers to detail decision-making algorithms in plain language. This would allow teachers to understand the basis for software recommendations and to be able to make autonomous decisions regarding the appropriateness of software recommendations for their classroom practice.

PR&A of pre- and in-service teachers

- Collaborative shared classroom experiences, digital simulations or text-based scenarios involving teams of in-service and pre-service teachers provide opportunities to enhance the repertoire of decisions available to teachers. This approach will also develop an evidence base while making explicit new opportunities and processes for pre-service teachers.

Strategies and Actions

Policymakers

- Individual teacher PR&A is an essential aspect of effective, sustainable educational technology integration and enhanced learning outcome.
- PR&A must be an individual consideration rather than a systemic endeavor. Teachers should be able to develop their personal reflective and decision-making processes for their particular context. Time needs to be allocated to allow for teacher professional development to engage in these progressions.
- A code of conduct should be developed that requires software developers to detail decision-making algorithms in plain language allowing teachers to make autonomous decisions about the appropriateness of their use in classrooms.

Practitioners

- Take advantage of a range of professional development opportunities (including digital simulations and augmentations). PR&A about technology integration could be undertaken collaboratively or individually.
- Teacher educators should explicitly develop, model and discuss PR&A about educational technology integration with their students.
- Encourage leadership within the teaching community to develop a culture of PR&A, that will in turn impact learning and learning outcomes.

Researchers

- Extant literature in related fields provides opportunities to connect aspects of epistemic frames to conceptualisations of teacher knowledge and their connection to action.
- Broaden the use of developing software to examine the correlations between elements of teachers' epistemic frames.
- Co-explore the current reasoning with practitioners to develop a nuanced understanding of the aspects of knowledge, beliefs and attitudes that underpin practice in different contexts.

TWG 9: Advancing conceptual models of technology integration in education: Implications for researchers, practitioners and policymakers

In the past decades, researchers and practitioners have proposed numerous conceptual models on how technology in schools can be integrated more successfully. Conceptual models are especially promising in this regard as they provide a simplified representation of the complex interplay of factors for technology integration in schools. These typically use graphical representations, which makes them easy to understand and to communicate. Models can also be empirically tested and validated. Some models have triggered international research efforts (e.g., TPACK, Will Skill Tool Model, Technology Acceptance Models) while some have remained largely untested. Early models tended to focus on the removal of barriers (anxieties, fears), while more recent ones have featured continuous or step-wise development of knowledge and skills. In the 21st century pedagogical practices incorporating technologies have become widely acknowledged as very important, whereas before, they were largely overlooked.

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Issues

Today, there are numerous conceptual models informing researchers and practitioners on technology integration in education. However, it is a challenge to identify models that fit specific purposes and to judge these models according to overarching quality criteria.

Identified Current Misalignments

There is no consensus on what characteristics define conceptual models in the field of technology integration in education (e.g. compared to theories, taxonomies and frameworks)

So far, there are few guidelines for finding suitable conceptual models for different purposes, contexts and stakeholders.

To date, there is insufficient agreement on dimensions and indicators to judge the quality of these conceptual models.

Previous models have often focused on teacher and school factors while omitting learner factors and context specific aspects.

'Emerging' New Alignments

Good models should be aligned to four quality dimensions and related indicators, proposed by the working group experts:

- Goal orientation
    - Focuses on educational practice and/or learning.
    - Helps to specify roles of ICT for educational purposes.
    - Incorporates contributions of stakeholders.
    - Helps to analyse contextual conditions.
    - Describes dynamic processes.
    - Proposes ways for technology integration.
- Reduction of complexity
    - Catches attention.
    - Is clearly conceptualized.
    - Focuses on most important aspects.
    - Simplifies relations between aspects.
    - Has a Gestalt/ontology.
- Validation
    - Relates to other models/frameworks/theories.
    - Demonstrates expert validity: practitioners and researchers.
    - Demonstrates construct validity.
    - Is empirically tested.
    - Acknowledges known limitations.
- Generalizability/specificity
    - Displays sensitivity to context.
    - Applies to specific/multiple aggregation levels of the educational system.
    - Is relevant for different grades or educational levels.

Strategies and Actions

Policymakers

- Align technology-integration policies with quality conceptual models.
- Ensure the quality of conceptual models used to design policies.
- Use quality conceptual models as tools for discussions among relevant stakeholders.

Practitioners

- Align technology-integration practices with quality conceptual models.
- Use proven conceptual models to design integration strategies.
- Use quality conceptual models as tools for discussions among relevant stakeholders.

Researchers

- Use the quality criteria to develop and expand technology integration models.
- Build upon existing models and elaborate on relevant aspects.
- Strive for conceptual and empirical validation of technology integration models.
- Expand technology integration models to include learner-related and contextual aspects.

TWG 10: New approaches and paradigms for researching digital technologies: Achieving scalability and sustainability

For technological innovations in education to be sustainable and scalable, it is critical to support these efforts through research that is embedded in context and developed in collaboration with stakeholders. In contemporary educational spaces, learning and teaching contexts include physical, online, and digital spaces, which may be formal, informal, or non-formal. To fully explore learning and teaching in this new paradigm, new approaches to the research underpinning technological innovation are needed. These must involve examining the sources of data from new technologies and approaches (e.g. machine learning and connectedness), be flexible and nimble, collaborative, participatory, and deeply contextual to appropriately explore this new paradigm of learning and teaching.

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Issues

One of the aims of educational technology research has been to inform the scalability and sustainability of technological innovations. Despite this, we have not been successful at sustaining or scaling technological innovation. This is a result of attempting to sustain or scale an innovation without being sufficiently attentive to the context of the innovation and stakeholder needs. We argue that these terms need to be reconsidered to take advantage of new research approaches, such as machine learning, automation, analysis of digital behaviours, etc. Rather, purposeful decisions need to be made in collaboration with stakeholders to understand what is relevant and necessary for innovation in their learning spaces. Specifically, core issues in this area have been:

- Difficulty understanding the new paradigm of learning and teaching to be able to design appropriate research supporting technological innovation.
- Limited critical stakeholder engagement with the concepts of sustainability and scalability in regard to how they support context and educational needs in technological innovation.
- A need for research analysing the affordances of new research approaches to support scalability and/or sustainability of technological innovation in new learning and teaching paradigms.
- A better understanding of risks and implications of new research approaches is needed, specifically, potential long-term and hidden effects of some research decisions, e.g. bias in data and assumptions of generalizability when scaling methods to new contexts.
- Ethical and governance procedures and policies are needed to implement new research approaches in educational organizations.

Identified Current Misalignments

- Different stakeholder expectations of how new research outputs can inform technological innovation and the realities that new research approaches can actually produce.
- Competing agendas and understand among researchers and other stakeholders in relation to the aims and goals of technological innovation in new research approaches and new paradigms of learning and teaching.
- Widespread use of and excitement about data-informed practice, with little understanding of the issues, such as data bias, data trust' and data ethics, which results in public data 'backlashes' and risk aversion about data use.
- Difficulty making research outputs from new research approaches meaningful and relevant in new learning and teaching paradigms, limiting scalability and sustainability.

- Educational organizational culture does not include the conditions necessary to support researcher and other stakeholder collaborations and participatory research within new learning and teaching paradigms.

'Emerging' New Alignments

Illustrated below, we present an emerging new paradigm that takes into account a variety of dimensions, including participants, stakeholders, researchers, and other contextual factors.

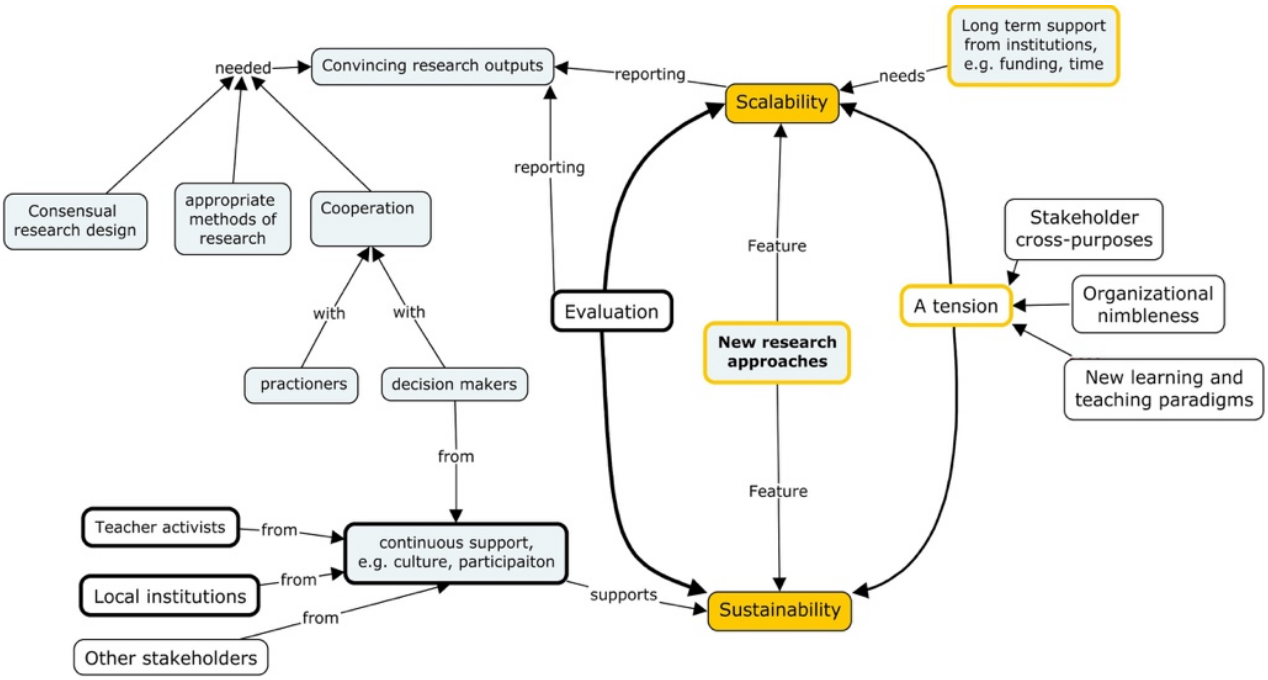

Figure 1. New Paradigm for researching digital technologies

Strategies and Actions

For new research approaches, such as machine learning, virtual reality, analysis of digital behaviours, to result in sustainable and scalable new knowledge, strong collaborative groups supporting the process are needed, which should include policy, researcher and educational stakeholders in order to understand what works for whom in which context. To this end, the following strategies are important:

- Research is needed to identify how new research approaches are able to usefully inform sustainability and scalability of technological innovations, through continuous analysis and evaluation of what works for whom.
- Researchers need to consider new research approaches in concert with the needs of educational contexts, and in collaboration with stakeholders.
- Where possible key stakeholders should actively participate in research of technological innovations to support better understanding of new research approaches.
- Research designs need to incorporate how to permeate through to the pedagogical level and up to the level of policy to inform new paradigms of learning and teaching.
- Research designs should be the result of purposeful decisions among stakeholder groups regarding what will be scalable and what will be sustainable.
- Use of new approaches in digital technology research should be documented and disseminated to inform research and professional fields.

TWG 11: Cross-cultural alignments, fertilization, differentiation: Bridging the gaps through technology

In the digital era where globalization and migration are part of education, it is difficult to define cultures and determine how much it is related to nationality, religion or identity. Culture includes traditions, heritage, language, religion, ancestry, aesthetics, thinking patterns and social structures. Digital technologies represent a two-edged sword that may either contribute to the destruction or the revitalization of cultures. The effects of media and related technologies have contributed to the loss of culture and languages. This trend underscores the importance of language awareness across the globe. Although the Internet has contributed to globalization and the homogenization of culture, it also provides new opportunities for the revitalization of culture and for fostering cross-cultural understanding. In recent years, the use of online projects providing opportunities for collaborative learning in a multi-cultural environment, even between hostile cultures, has been increasing. Information and communication technologies (ICT) serve as a significant lever for learning, with affordances for various teaching and learning approaches. The digital environment enables the formation of heterogeneous groups that were not possible in the past due to physical limitations. Such an environment creates learning opportunities with students from different cultures and countries to interact and learn together. It allows for the formation of relationships without the influence of stereotypes that may arise from external appearances and can even contribute more successfully to cross-cultural understanding than a face-to-face intercultural meeting. Examples of projects that use ICT to connect cultures: *TEC (Technology, Education and Cultural diversity); The Dissolving Boundaries Program; NASA's STEM Innovation Lab; The Four Directions Project; Research Project – Culturally responsive use of ICT to support indigenous students' learning; Africa Digital Schools [BADILIKO] project; The LOCH project; The Micool (Mobile Intercultural Cooperative Learning) Project.*

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Issues

- Characteristics of learners and educators.
- Individual, social and cultural differences between learners.
- Language differences.
- Awareness of cultural diversity of learners.
- Different values of learning in different societies.

Identified Current Misalignments:

- Professional development and awareness of cultural diversity of learners.
- External human resources to help teachers in class.
- Curriculum designed for majority population, not for minorities.
- Digital disruption.
- Top down.
- Cultural barriers (religion, ethics, language).
- Digital divides (access; competence/skills).
- Digital culture (influenced by American/ majority culture).
- Lack of social justice orientation.
- Social/political structures that limit access and information.

'Emerging' New Alignments

- Universal design to cater diverse students.
- New technologies addressing differences.
- International standards (UNESCO, OECD, ISTE etc.).
- International projects (GLOBE, TEC, International Space Weather Initiative etc.).

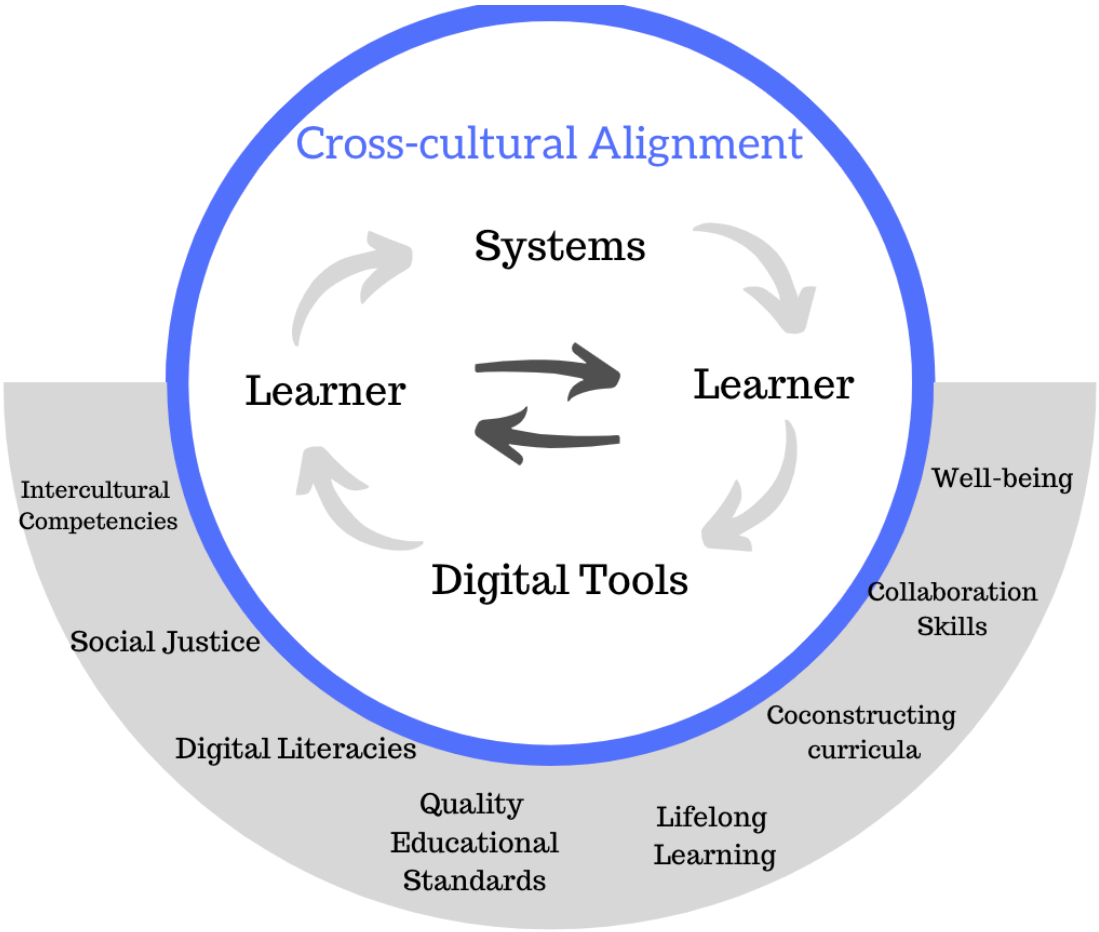

Figure 1. Cross Cultural Alignment (CCA) Model for learning in the digital age

Strategies and Actions

- Ensure the basic foundations: social justice; lifelong learning; well-being; quality educational standards.
- Take care to provide learner with intercultural competencies, collaboration skills, digital literacy.
- Provide international infrastructures for cross-cultural learning, including funds, ongoing support, pedagogy informed by research.
- Form a sustained international committee for international education that will include policymakers, practitioners, researchers from diverse cultural backgrounds.
- Support teachers to work online with a diverse student population.
- Co-construct the curriculum by all the partners (learners, policymakers, practitioners, researchers).

Policymakers and practitioners should follow the CCA model, and researchers should examine the model and validate it by empirical studies.

TWG 12: National policies in curriculum reforms:
What makes a quality curriculum in a technological era?

We live in a rapidly changing technological world, with a range of demographic and environmental challenges. Emerging technologies challenge traditional learning, teaching and assessment processes and many countries are reforming (parts of) their curricula in an effort to reflect these challenges. Pre EDUsummIT, discussions of TWG12 focused on what makes a quality curriculum in a technological era. These discussions considered what the purposes of education systems should be in a rapidly changing world, and thus what educational visions, policies and practices might be most appropriate (Butler et al. 2018). In addition, the Group members considered; (i) What knowledge, skills, attitudes and values will today's students need to thrive and shape their world? (ii) How can instructional systems develop these knowledge, skills, attitudes and values effectively? (e.g. Howells, 2018). This work highlighted existing tensions within many national education systems including: using technology to enhance existing curriculum subjects and the need to educate next generations of workers to adapt to a rapidly changing technological world, and; the contrast between the rhetoric of policy documents and actual classroom practice in many countries. Despite reform at curriculum level, it has not always translated into concerted action at the classroom level.
The complexity of translating policy into practice emerged as a key factor in the discussions of TWG12 at EDUsummIT and in particular, the misalignment across and between the various levels of individual national education systems. Group members stressed that if any curriculum is to be successfully implemented, there is a need to consider all of the levels of the system in a coordinated and coherent way (see Figure 1). The main thrust of the group accordingly centred on ***collaboratively co-constructing curriculum.***

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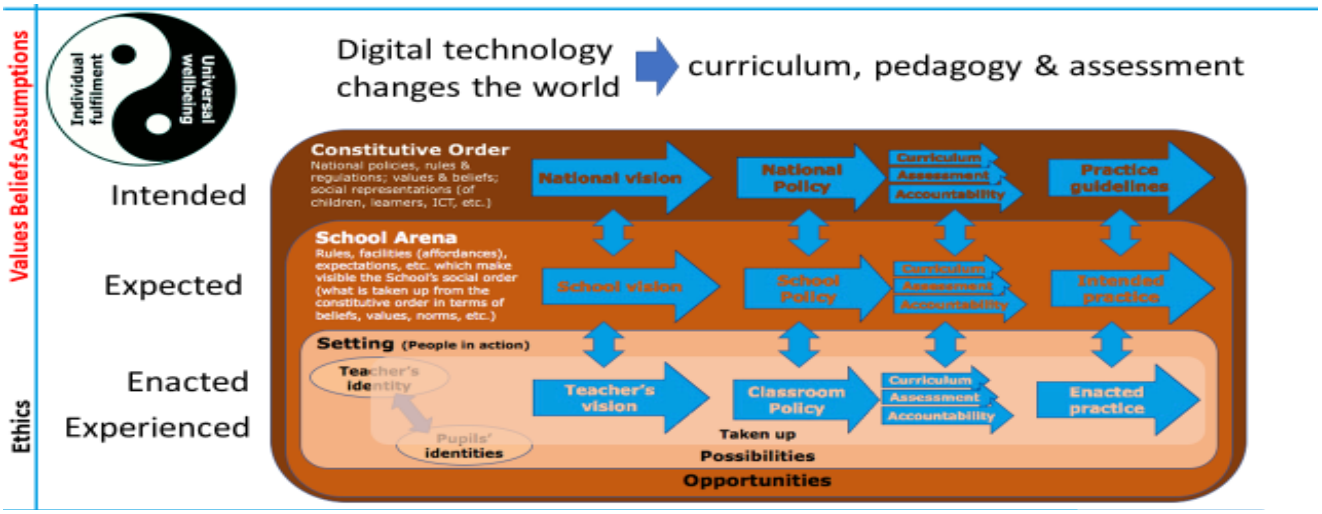

Figure 1. Levels of alignment to be considered in a coordinated and coherent way for curriculum reform.

Issues and Challenges

Alignment across and between levels is key to collaboratively co-constructing curricula. TWG12 discussions focused on three core issues which were viewed as paramount when developing national policies to ensure quality curriculum in a technological era: partnership with curriculum stakeholders, teacher professionalism and assessment.

Partnership with stakeholders

- Traditionally, curriculum reform can be a top-down process and may only reflect the concerns and interests of an exclusive group of stakeholders (e.g. policymakers) without considering other stakeholders in education including students, parents, teachers, researchers, commercial companies, NGOs etc. While the process of curriculum development may sometimes appear to include broad consultation, this can be limited or tokenistic with a lack of feedback to inform stakeholders how the consultation process informed the curriculum design. This lack of transparency may result in disengaged stakeholder groups, cynicism and lack of trust in policy and processes.

Teacher Professionalism

- Teachers are often not engaged in the consultation process when decisions are made in relation to the curriculum. Consequently, they may feel disempowered leading to a perception of de-professionalism.

Assessment

- Attempts to define "a quality curriculum" without simultaneously addressing pedagogy and assessment can be viewed as counter-productive. Changing the culture of assessment practices can often be a point of resistance by parents, teachers and policymakers. This raises the question of the purpose of assessment, who it is for and how it is used. Standard approaches to summative assessment are unable to capture the aspects of new curricula focussed on skills and attributes. For example, and not unreasonably, teachers tend to focus on those things for which they are held accountable; i.e. predominantly high stakes test results. In practice, this means that they continue to focus on content to the exclusion of skills and attributes. Unless solutions are found to the assessment problem, the gap between the rhetoric of national curricula and the reality of practice in schools will remain.

Possible actions to overcome misalignment to enable new alignments

- Removing education policy from short term political cycles (e.g. Finland/Sri Lanka) would enable a more realistic timeframe to engage in consultation informed by research and feedback.
- Raising the status of teachers and teaching as a profession is pivotal as "the quality of an education system cannot exceed the quality of its teachers" (Barber & Mourshed, 2007). Consequently, valuing and nurturing of the teaching profession is paramount to attracting high calibre people who engage in continuous professional learning; this must be coupled with a strong support system to ensure quality teaching appropriate for a technological era
- Developing a robust framework for meaningful ongoing consultation so that all stakeholders (students, parents, teachers, policymakers, companies, NGOs, and other stakeholders) have a voice in the reform process; this should help to reduce the power imbalance thus creating trust, a sense of ownership and greater engagement.
- Understanding curriculum reform as an iterative process (e.g. recent curriculum reform process in the Netherlands entailed six loops of consultation); informed by research in which the curriculum is envisioned and designed in co-creation with all stakeholders. Consultation should to be a part of each cycle of the reform practice i.e. feedback and explanation of decisions made should be provided to stakeholders as part of each cycle (transparency).
- Rethinking the purpose of assessment and exploring the possibilities of new forms of assessment (e.g. intrinsic feedback from computational materials; AI/data mining/learning analytics; portfolios; micro credentialing/badges etc).

Barber, M. & Mourshed, M. (2007). *How the world's best-performing schools systems come out on top*. McKinsey & Company.

Butler, D., Leahy, M., Twining, P., Akoh, B., Chtouki, Y., Farshadnia, S., Moore, K., Nikolov, R., Pascual, C., Sherman, B. & Valtonen, T. (2018). Education Systems in the Digital Age: The Need for Alignment. *Technology, Knowledge and Learning*, *23*(3), 473-494.

Howells, K. (2018). The future of education and skills: education 2030: the future we want.

TWG 13: Knowledge building/knowledge creation in the school classroom and beyond

Knowledge building/knowledge creation is critical to the future of societies, but a common belief holds that only the highly capable ones can create new ideas. A modern theory of knowledge creation is needed to realize the vision of an inclusive knowledge society. The traditional "genius" conception serves to increase the gaps between knowledge rich and poor, and, in turn, undermine society's natural, abundant, untapped resource; the ideas of its citizens. What is needed is a way to engage all citizens, including children and youth, in generating and refining ideas for public good in environments that enhance collective as well as personal well-being.

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Issue

Knowledge Building/knowledge creation, supported by Knowledge Forum® technology, is an educational approach that aims to enhance society's health and wealth by the most direct means possible; engaging students in the actual work of a knowledge society (Scardamalia & Bereiter, 2014).[1] Through Knowledge Building practices and technology, students work together in rich multimedia environments with a way in for everyone and means to build on each other's ideas, locally and globally. Embedded assessment and analytic tools provide formative and transformative feedback to support continual improvement of community knowledge. Sustained idea improvement in socially and emotionally supportive contexts is the principal day-to-day work of knowledge building communities. This educational approach has been implemented in classrooms, schools, and school systems in over 20 countries synergizing research, policy and practice. Knowledge Building International[2] is a global design community of researchers, teachers, engineers, designers, educators and policymakers working together to create models for an inclusive knowledge society.

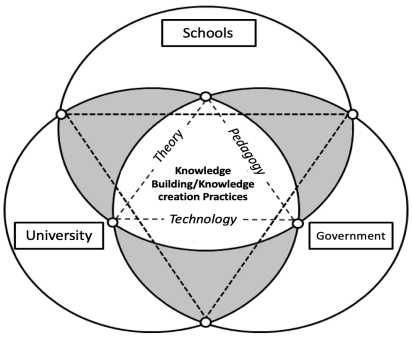

Figure 1: A tripartite model of school-university-government partnership.

Misalignments and emerging new alignments

Although knowledge creation is now increasingly emphasized in education (e.g., UNESCO ICT competency framework for teachers)[3], there are issues relating to how it should be addressed within education policies and enacted in school practices. Misalignments are prevalent in schooling for knowledge creation, including learning, curriculum, and assessment, and the introduction of new pedagogies and technologies often leads to more misalignments. Based on over three decades of research evidence and learning outcomes[4], Knowledge Building offers a holistic integration of theory, pedagogy, technology to enculturate students into authentic knowledge work, with new forms of assessment and interdisciplinary knowledge practices supported globally through innovation networks. Table 1 shows misalignments and problems in schooling for knowledge creation and emerging realignments through Knowledge Building.

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[1] Scardamalia, N., & Bereiter, C. (2014). Knowledge building and knowledge creation: Theory, pedagogy, and technology. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences*, 2nd Edition (pp. 397–417). New York: Cambridge University Press. (Note: Knowledge Building and knowledge creation are synonymous).

[2] Knowledge Building International: http://ikit.org/kbi/

[3] UNESCO ICT competency framework for teachers (2011) Accessed at https://url.cn/5v83Qin

[4] Chen, B., & Hong, H. Y. (2016). Schools as knowledge building organizations: Thirty years of design research. *Educational Psychologist, 51*, 266–288.

Table 1: School and policy practice misaligned with knowledge creation in education and emerging realignments through Knowledge Building Model

Misalignments with knowledge creation	Knowledge Building emerging realignments
Traditional views of learning as individualistic; knowledge as static and immutable; knowledge creation for knowledge elites	Knowledge Building/knowledge creation is dynamic, and part of a cultural effort engaging all through collective responsibility
21st century learning is about mastery of predetermined, discrete skills	Beyond 21st century skills; competence emerges from student engagement in authentic knowledge creation
Assessment focused on static snapshots of individual achievement; individual assessment misaligned with collaboration and creation	Assessment illuminates learning as it proceeds; transformative collective assessment supported by collaborative technology
Knowledge creation is for the privileged; only high achievers and capable students can do it	Knowledge creation is for everyone; all students can contribute and improve ideas
Generic digital technologies and classroom activities as add-ons; more to-do lists of work	Digital technologies optimized for knowledge creation; principle-based pedagogy and change in classroom culture
Change in policy and practice for innovation is fragmented, often focusing on separate parts	Change based on the systemic and holistic integration of research, practice, technologies, and policy action through Knowledge Building

Strategies and Actions

TWG13 advocates international tripartite partnerships (school-university-government) (SUNG) grounded in coherent Knowledge Building/creation theory, pedagogy and technology to support the development of open and connected knowledge-building communities in education. We propose interrelated strategies for policymakers, practitioners and researchers to be taken in systemic manners.

Policymakers

- Adopt systemic, holistic and ecological approaches; a diversity of paths to increase sustained innovation.
- Engage in participatory politics to build relationships; co-construct policies involving different stakeholders.
- Provide accessible and functional technological environments to support Knowledge Building in schools.

Practitioners

- Engage in Knowledge Building/creation both as teacher and learner in knowledge building communities.
- Use principle-based practice supported by analytics tools to enhance evidence-based teaching improvements.
- Work with fellow teachers in professional learning networks and communities and involve in Summer/Winter Institute exchanges to advance Knowledge Building practices.

Researchers

- Develop a framework and repository for compiling and synthesizing evidence to impact policy and practice.
- Work with practitioners to identify and create exemplars and case studies of Knowledge Building/creation practice.
- Develop and provide customized communication of research findings to stakeholders (e.g., research briefs for policymakers; vignettes & visualizations for practitioners).

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