

INTERNATIONAL SUMMIT ON ICT IN EDUCATION

EDU SUMMIT
2022-23

Moving forward to new educational realities
in the digital era

May 29th – June 1st, 2023

Kyoto, Japan

Moving forward to new educational realities in the digital era

Report of EDUsummit 2023



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EDUsummIT: Its origins and evolution

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Introduction

Under the patronage of UNESCO, the EDUsummIT 2022-23 took place from May 29-June 1, 2023 in Kyoto, Japan. EDUsummIT, the International Summit on Information Technology (IT) in Education, is a global community of researchers, policy-makers and practitioners committed to supporting the effective integration of IT in education by promoting active dissemination and use of research. EDUsummIT is an invitational summit. It is self-supporting and hosted on a voluntary basis.

EDUsummIT 2022-23 was hosted by Kyoto University. In a face to face gathering 70 researchers, practitioners and policymakers discussed the effective use of digital technologies in education after the COVID 19 pandemic. EDUsummIT attendees collaborated in nine thematic working groups. The groups' reports and the Call to Action that resulted from the intensive collaboration are reported in this e-book.

EDUsummIT 2022-23 was originally planned for 2021. However, due to the COVID 19 pandemic, the summit had to be postponed until 2023. However, EDUsummIT participants had been working in thematic working groups since 2021 with an interim online meeting in August 2022 and the face to face working meeting in 2023.

EDUsummIT has become a bi-annual gathering place for dialogue among thought leaders in the digital education domain. EDUsummIT 2022-23 in Kyoto was the seventh EDUsummIT in the series and the second that took place in Asia. Previous EDUsummITs were held in Quebec City, Canada (2019), Borovets, Bulgaria (2017), Bangkok, Thailand (2015), Washington D.C., USA (2013), Paris, France (2011) and The Hague, The Netherlands (2009). EDUsummIT 2025 is planned for Dublin, Ireland.

Origins and Evolution

EDUsummIT was originally conceived by the international group of section editors of the first International Handbook of Information Technology in Primary and Secondary Education, published in 2008 (Voogt & Knezek, 2008). A major finding of the Handbook was that evidence from research about the potential of digital technologies did not match with what was happening in schools and classrooms. This result, pointing to a gap between research, policy and practice, was the main reason to start a dialogue between researchers, key policy makers and practitioners about handbook findings and implementation issues hampering the integration of digital technologies in education. In collaboration with Kennisnet (The Netherlands), the International Society of Technology in Education (ISTE, USA) and BECTA (UK), EDUsummIT was born. The first EDUsummIT resulted in a Call to Action and an agenda for further work.

Each EDUsummIT is centered around a specific theme, determined by the EDUsummIT Steering Committee and the local host. Table 1 shows how the EDUsummIT themes evolved over the years.

Table 1 Evolution of EDUsummIT themes over the years from 2009 to 2023

The Hague, 2009	Under what conditions, does technology have a positive effect on teaching and learning
Paris, 2011	Building a global community of policymakers, researchers and teachers to move education systems into the digital age
Washington D.C., 2013	Research-informed strategies to address educational challenges in a digitally networked world
Bangkok, 2015	Technology advanced quality learning for all
Borovets, 2017	Rethinking learning in a digital age
Quebec city, 2019	Learners and learning contexts: New alignments for the digital age
Kyoto, 2023	Moving forward to new educational realities in the digital era

At the core of EDUsummIT are the Thematic Working Groups (TWGs). The dialogues between policymakers, researchers and practitioners in the thematic working groups bring together research findings, practical insights and ideas, culminating in face-to-face discussions with the aim to reach consensus in a two-and-a half day convening comprised of intensive and meticulously planned working sessions.

Within a chosen theme, specific topics are identified for discussion in the TWGs. The selection of topics is inspired by research evidence (such as the two International Handbooks on IT in education (Voogt & Knezek, 2008; Voogt et al, 2018), new developments in digital technologies and, last but not least, the discourse around digital technologies in education in the host country. Topics that need further discussion may reoccur in more than one EDUsummIT; each time they are approached and discussed from new perspectives and research-evidence. Each EDUsummIT also brings new topics to the agenda. In Kyoto these were “Special needs: Addressing challenges and opportunities using IT” and “Social Emotional aspects in new modes of learning”.

Global influence and impact

One of the hallmarks of the EDUsummIT is its global outreach. Participants converge from all over the globe, bringing diverse perspectives, experiences and cultural insights to the table. The EDUsummIT 2022-23 welcomed participants from 30 countries. Usually, newcomers as well as old-timers participate in the EDUsummIT. In the EDUsummIT 2022-23 the percentage newcomers was approximately 30%. This diversity is not merely symbolic, it is intrinsic to the EDUsummIT’s ethos, reflecting a commitment of inclusivity and recognizing that the challenges and solutions in digital education are inherently global, but also context-based and case-sensitive.

Academic influence is pursued by conference presentations and contributions in peer-reviewed journals. Since EDUsummIT 2011 a dedicated special issue has been published, which includes articles that are contributed by the TWGs. Table 2 presents an overview of the published special issues. In addition, the outcomes of EDUsummIT 2019 were also published as a special issue of the Canadian Journal of Learning and Technology. In this way the EDUsummIT did not only have an impact on the local Canadian community, but also on the

francophone world. Technology, Knowledge and Learning offered to publish the outcomes of EDUsummIT 2022-23. The special issue is foreseen for the 4th issue of 2024.

Table 2 Special issue journals, number of articles published and number of Google scholar citations (per December 2023)

<i>Journal</i>	<i>Publication Year</i>	<i># articles</i>	<i># Google Scholar citations</i>
Educational Technology Research and Development	2021	13	442
Technology Knowledge and Learning	2018	10	615
Education, Technology and Society	2016	12	2069
Education and Information Technologies	2015	9	1464
Journal of Computer Assisted Learning	2013	8	1848

EDUsummIT participants play a crucial role in publishing and distributing the Call to Action and the e-book among policymakers and practitioners. UNESCO offices serve as vital channels for disseminating EDUsummIT outcomes to policy makers globally. Additionally, local hosts of EDUsummIT events actively engage relevant policymakers in the activities. As EDUsummIT enters its second decade of hosting the bi-annual summit it has gained recognition as a respected mechanism for facilitating meaningful dialogue among researchers, policy makers and practitioners about the use of digital technologies for teaching and learning.

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About EDUsummIT and this eBook

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Introduction

This E-book is a collection of outcome reports by the thematic working groups (TWGs) of EDUsummIT2022/3. EDUsummIT (International Summit on IT in Education) is a global knowledge building community of researchers, educational practitioners, and policy-makers committed to supporting the effective integration of research and practice in the field of IT in education. EDUsummIT was founded in 2007 by the Editors and section Editors of the first edition of the International Handbook of Information Technology in Primary and Secondary Education edited by Joke Voogt and Gerald Knezek (2008). The purpose was to disseminate the output from this handbook to the wider research community, to policy makers (and governments) and leading practitioners to enable them to build on what is already known and published in the handbook about IT in Education.

This EDUsummIT community brings together leading international researchers, practitioners and key policy makers every two years to review the knowledge and practices of IT in Education across the world in order to keep countries up to date on the role, scope and impact of IT in Primary and Secondary Education. Since its inception, EDUsummIT meetings have been held six times, firstly in the Hague (2009), then Paris (2011), Washington D.C. (2013), Bangkok (2015), Borovets (2019), Quebec (2019) and for this report most recently in Kyoto (2023). Between 70 and 140 participants from six continents have attended each of the EDUsummIT meetings. While EDUsummIT participants meet biennially (typically), thematic working groups (TWG) focusing on pertinent research topics in IT and education are formed prior to each Summit to prepare discussion papers. The latest knowledge and thinking provided in these discussion papers are further developed during EDUsummIT meetings. After each previous EDUsummIT, TWG findings have been firstly published in an E-book which is disseminated to all OECD countries and further afield, followed by numerous publications in international journals, reports and by groups and individual participants over the Internet and furthermore presented at major conferences.

As a consequence of the extensive impact of the first edition of the handbook and the previous EDUsummITs and their subsequent public outputs, the publishers, Springer commissioned a second edition of the International Handbook which was published in 2018, edited by founder members of EDUsummIT; Joke Voogt, Gerald Knezek, Kwok-Wing Lai and Rhonda Christensen.

To maximize the dissemination of the EDUsummIT's work, each EDUsummIT has been organized in association with international and national organizations actively supporting the use of information technology in education. These organizations 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 Network Échange, Recherche et Intervention sur la SCOLarité: persévérance et réussitE (PÉRISCOPE).

Thematic Working Groups and their outcomes

The overall theme of EDUsummIT 2023 is “Moving forward to new educational realities in the digital era”. The theme came about when reflecting on the immediate shift to and adaptation of online technology during COVID-19. Before COVID-19, researchers, practitioners and policy makers have been working for decades to integrate technology in education with different rates of successes. Now there are new ways that educational communities have taken on the pandemic challenge around the world and questions such as “Where do we go from here?”, “In what ways do we go back to prior practices?”, and “In what ways do we change and evolve?” emerge. In this era of rapid technological advancement, the combined efforts of the nine Thematic Working Groups (TWGs) at EDUsummIT 2023 offer a clear and comprehensive view of how technology is changing education. The TWGs and their respective themes are:

- TWG1: Artificial Intelligence (AI) for Teaching and Learning
- TWG2: Special Needs - Addressing Challenges and Opportunities Using IT
- TWG3: Inclusion of Excluded Populations
- TWG4: Fostering Self-Regulated Learning in Technology-Supported Environments
- TWG5: Extending Learning Beyond Traditional Classrooms
- TWG6: Agile Policymaking in Education
- TWG7: Innovative Learning Environments and Spaces
- TWG8: Pedagogical reasoning and reflective practice: Teacher's Professional Development (TPD) in online education.
- TWG9: Social and Emotional Learning in the Digital Era

This eBook, born from their collaborative work, covers a wide range of topics: from the integration of technology in classrooms to shaping educational policies, enhancing teacher skills, and conducting impactful research. It delves into the specific needs of diverse learners, including those with special educational needs, and emphasizes the crucial role of emotional and social learning in today's digital world.

The TWGs at EDUsummIT 2023 cohesively underscore the transformative role of technology in education, championing its strategic application to enhance pedagogy and learning. TWG1 delves into the multifaceted challenges and prospects of Artificial Intelligence (AI) in education, scrutinizing not only the technological intricacies but also the ethical, practical, and pedagogical implications, such as the sensitive matter of data ownership in the context of special needs (TWG1). In tandem, TWG4 accentuates the necessity of fostering self-regulated learning (SRL) within tech-supported milieus, cultivating learners' autonomy and critical thinking—skills that are indispensable in today's digitized world (TWG4).

Further extending these notions, TWG5 champions learning that transcends the confines of conventional classrooms, endorsing the fusion of informal and non-formal learning contexts to broaden the horizons of educational experiences (TWG5). In parallel, TWG3 propounds the inclusion of excluded populations, ensuring access and optimized learning through IT in the post-pandemic era, thus tackling the multiple dimensions of educational exclusion (TWG3).

Policy innovation emerges as a recurrent motif, with TWGs such as TWG2, TWG3, TWG6, and TWG7 advocating for the formulation of inclusive and visionary policies. These policies ought to accommodate the variegated requirements of all learners, notably those with special needs

(TWG2) and marginalized communities (TWG3), while also anticipating the fluid educational demands propelled by digital technologies (TWG6; TWG7).

The TWGs unanimously highlight the criticality of teacher training and professional development for acclimatizing to this technology-augmented educational paradigm. Preparing educators with the necessary competencies to adeptly harness digital technologies is stressed, incorporating critical thinking and technology awareness (TWG3), and a profound comprehension of SRL in digital settings (TWG4).

TWG2 casts a spotlight on the often-overshadowed domain of IT support for students with special needs, while TWG9 illuminates the significance of social and emotional learning (SEL) within the digital education sphere, an aspect that is frequently sidelined amidst the fervor to cultivate cognitive competencies (TWG9).

In a synthesis of their collective insights, the TWGs proffer a panoramic and progressive viewpoint on educational technology. Their contributions are instrumental for guiding policymakers, educators, and scholars towards fostering an inclusive, efficacious, and holistic educational landscape.

Call to Action



*Moving forward to new educational realities
in the digital era*

**International Summit on ICT in Education
EDUsummit 2023
Kyoto, Japan
May 29- June 1, 2023**

COVID presented education around the world with fundamental challenges, resulting in new educational realities. The lockdowns enforced education systems to shift to emergency remote learning. This impacted the grammar of schooling, teachers' identities learners' wellbeing and their relation to learning.

Approximately 90 leading researchers, policy makers and practitioners from all continents and over 30 countries gathered in Kyoto, Japan, from May 29 to June 1, 2023, to discuss emerging themes and to define corresponding action items.

A Call to Action

Personalized and Flexible Learning

- Extend the boundaries of formal education to include teaching and learning in informal and non-formal contexts using diverse technologies, in order to foster self-directed learning of students and teachers.
- Promote organizational flexibility and funding for design and development of innovative teaching and learning environments.
- Create mechanisms to credit non-formal and informal learning practices in formal education systems.
- Construct communities of practice consisting of various stakeholders in order to co-design innovative teaching and learning environments.
- Promote the creation of digital spaces where practitioners, researchers and policymakers work together to leverage co-creation of ideas and sustainable innovations.

- Design digital learning environments for students that support SRL (self-regulated learning) development, and acknowledge opportunities and limitations of these environments.
- Include SRL and ways to support SRL by technology in existing competency frameworks for teachers, and incorporate this into teacher education.
- Initiate research that clarifies the role of technology in SRL, both theoretically and empirically.
- Initiate new multidisciplinary research methods that are design-based and embedded in practice to inform infusion and sustainability of technology in innovative teaching and learning environments.

Teacher Professional Learning and Development

- Ensure that practitioners participate in the development and evaluation of data-based approaches to modeling teaching and learning that they can trust, thereby promoting teacher agency.
- Develop participatory research and implementation of adaptable, context-based systems for making informed decisions, to foster a culture for professional learning and development, rather than evaluation.
- Develop theories of teacher professional learning, pedagogical reasoning, and effective practice that consider new global educational realities involving new data, new practices and also considering new roles and identities of teachers.

Equity and Inclusion

- Focus the learning ecosystem towards inclusion of excluded populations: develop digital competence and adopt critical approaches towards technology bias and opportunities.
- Encourage agile policy making framed within values and a vision of education in the digital era, respecting diversity and leading to inclusion and equity.
- Promote research-based policies to fund effectively-tailored ICT resources and assistive technologies that support students with special needs.
- Call on practitioners to hear the voices of special needs students about their experiences using ICT (including assistive technologies), in order to make informed adjustments to teaching and learning in the digital era.
- Enable policies that sustain digital technology accessibility and usability for marginalized communities and individuals, and promote regulation and accountability of EdTech developers and providers.
- Encourage research and develop tools to measure and monitor digital equity in educational contexts.

Artificial Intelligence (AI)

- Identify and support new roles of educational stakeholders, pedagogical practices and policies for AI and data literacies in educational contexts.
- Foster Human-AI-Alliance in education through institutional strategies and actions to support teachers' agency and to avoid deprofessionalisation of educators.
- Build and use a rigorous body of open knowledge and evidence about AI in education to support evidence-informed development of AI applications and pedagogical practices.
- Prioritize privacy and ethical considerations through a multiperspective and interdisciplinary approach as the core of AI in education.

Social Emotional Learning

- Develop a taxonomy for SEL (social emotional learning) in digital contexts to be used by practitioners, taking into account ethical principles in teaching practices.
- Construct communities of practice using online technologies to solve key problems related to SEL.
- Integrate SEL in digital educational contexts in pre- and in-service teacher training programs.
- Conduct research across different countries and cultures to understand the role of technology in development of SEL competencies and their impact on learning and flourishing of students.

AND

Prioritize well-being of young people and teachers in the digital era, in order to empower them to leverage digital technologies in ethical and meaningful ways in teaching, learning and assessment practices.

EDUsummit is a global community of researchers, policy-makers and practitioners committed to supporting the effective integration of Information Technology (IT) in education by promoting active dissemination and use of research.

More information: <https://www.let.media.kyoto-u.ac.jp/edusummit2022/about/>

Thematic Working Group 1 - Artificial Intelligence (AI) for Teaching and Learning: Implications for School Leaders, Teachers, Policymakers and Learners

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Background

Artificial intelligence (AI) in education is a generic term which describes a wide collection of different technologies, algorithms, and related multimodal data applied in formal, non-formal and informal education settings. It encompasses data mining, machine learning, pattern recognition, natural language processing, large language models, generative models, neural networks. The still-emerging field of AI in education has been informed by new frameworks, methodological approaches, and empirical investigations into educational research; for example, novel methods in educational research include machine learning, network analyses, and empirical approaches based on computational modelling experiments (Gibson & Ifenthaler, 2020). The new frameworks and adoption models focusing on learning analytics are required for the successful integration of AI systems into educational organizations (Buckingham Shum & McKay, 2018). However, these models of practice and adoption vary across different organizations due to situational and historical conditions, within any individual organization due to disciplinary and contextual idiosyncrasies and across different countries due to these as well as cultural differences (Klasen & Ifenthaler, 2019).

While AI in education has been a theme of research in the educational technology community (Zawacki-Richter et al., 2019; Zheng et al., 2021), this working group aims to systematically investigate the following objectives:

1. To review recent research and innovations in artificial intelligence in education and their link to supporting learning, teaching, and educational decision-making in order to identify key issues and trends in policy and practice.
2. Showcase best practice deployment of artificial intelligence in education in organizations.
3. To examine the potential for further development and innovation in artificial intelligence in education.
4. To make recommendations for policy, practice and research.

The members of the Thematic Working Group 1 (TWG1), representing six countries, followed a Delphi study approach (Scheibe et al., 1975) which involved collecting, reviewing and synthesizing evidence from research publications, resorts, correspondences, an expert survey, and practitioner conversations around AI in education. This enabled TWG1 to identify current

and potential issues around the use of AI in education. The TWG1 report suggests strategies and actions, as well as recommendations for policymakers (PM) researchers (RE) and practitioners (PR) to attempt to overcome the potential issues we foresee.

The top three trends that emerged from the initial two phases of the Delphi study:

Privacy and Ethical use of AI and Big data in Education

This trend emphasizes the importance of data privacy (data ownership, data access, and data protection) in relation to the development, implementation, and use of AI systems in education. Inevitably the handling of these data privacy issues has significant ethical implications for involved stakeholders. For instance, Adejo and Connolly (2017) discuss ethical issues related to using learning analytics tools and technologies, focusing on privacy, accuracy, property, and accessibility concerns. Further, a survey study by Ifenthaler and Schumacher (2016) examined student perceptions of privacy principles in learning analytics systems. The findings show that students remained conservative in sharing personal data, and it was recommended that all stakeholders should be involved in the implementation of learning analytics systems. More recently, Celik (2023) focuses on teachers' professional knowledge and ethical integration of AI-based tools in education and suggests that teachers with higher knowledge in interacting with AI tools have a better understanding of their pedagogical contributions.

Trustworthy Algorithms for Supporting Education

This trend focuses on trustworthiness, defined as the security, reliability, validity, and accuracy of AI algorithms used in education. It particularly focuses on the impact of algorithmic bias (systematic and repeated errors resulting in unfair outcomes) on different stakeholders and stages of algorithm development. For instance, Baker and Hawn (2022) review algorithmic bias in education, discussing its causes and empirical evidence of its manifestation, focusing on the impacts of algorithmic bias on different groups and stages of algorithm development and deployment in education. Alexandron and colleagues (2019) raise concerns about reliability issues and identify the presence of fake learners who manipulate data, as well as demonstrate how their activity can bias analytics results. Li and colleagues (2023) also mention the inhibition of predictive fairness due to data bias in their systematic review of existing research on prediction bias in education.

Fairness and Equity of AI in Education

This trend emphasizes the need for explainability and accountability in the design of AI in education. It requires lawful, ethical, and robust AI systems to address technical and social perspectives.

Current research related to the three trends overlap and emphasizes the importance of considering stakeholder involvement, professional knowledge, ethical guidelines, as well as the impact on learners, teachers, and organizations. For instance, Webb and colleagues (2021) conducted a comprehensive review of machine learning in education, highlighting the need for explainability and accountability in machine learning system design. They emphasized the importance of integrating ethical considerations into school curricula and providing recommendations for various stakeholders. Further, Bogina and colleagues (2021) focused on

educating stakeholders about algorithmic fairness, accountability, transparency, and ethics in AI systems. They highlight the need for educational resources in addressing fairness concerns and provide recommendations for educational initiatives.

Moving forward to new educational realities in the digital era

A third phase of the Delphi study identified emerging educational realities with AI in education as follows:

New Roles of Stakeholders in Education

AI is omnipresent in education, which inevitably involves stakeholders interacting with AI systems in an educational context. New roles and profiles are emerging beyond traditional ones. For instance, Buckingham Shum (2023) emphasizes the need for enterprise-wide deployment of AI in education which is accompanied by extensive staff training, and support. Further, new forms of imagining AI and of deciding its integration in socio-cultural systems will have to be discussed by all stakeholders, particularly minority or excluded collectives. Hence, AI deployment is reflecting different levels of influence, partnership and adaptation that are required to introduce and sustain novel technologies in the complex system that constitutes an educational organization. Further, Andrews and colleagues (2022) recommend appointing a Digital Ethics Officer (DEO) in educational organizations who would be responsible for overseeing ethical guidelines, controlling AI activities, ethics training as well as creating an ethical awareness culture and advising management.

Human-AI-Alliance in education

AI in education shifted from being narrowly focused on automation-based tasks to augmentation of human capabilities linked to learning and teaching. Seeber and colleagues (2020) propose a research agenda to develop interrelated programs to explore the philosophical and pragmatic implications of integrating human and AI in augmenting human collaboration. Similarly, De Laat and colleagues (2020), as well as Joksimovic and colleagues (2023) emphasize the challenge in bringing human and artificial intelligence together in such a way that learning in situ and in real-time will be supported.

Precautionary Preemptive Policies Precede Practice for AI in Education

Overwhelmed by the rapid change in the technology landscape, decision-makers tend to introduce restricting policies in reaction to initial societal concerns with emerging AI developments. Jimerson and Childs (2017) highlight the issue of educational data use and how state and local policies fail to align with the broader evidence base of educational organizations. As a reaction toward uninformed actions, Tsai and colleagues (2018) introduced a policy and strategy framework which may support large-scale implementation involving multi-stakeholder engagement and approaches toward needs analysis.

Key insights from other TWGs

With reference to TWG5 (Learning beyond formal schooling: human-computer-human interactions in a digital inter-connected era), AI might bridge formal, non-formal, and informal learning opportunities and pathways. Similarly, TWG8 (Pedagogical reasoning and reflective

practice: Teacher's professional development) AI could enhance teachers' professional learning. In addition, TWG4 (Fostering self-regulatory skills in learners: challenges and opportunities for assessment) and TWG9 (Social Emotional aspects in new modes of learning) identified the benefits of AI in supporting the development of complex skills such as self-regulated learning and socio-emotional components of learning. TWG 2 (Special Needs: addressing challenges and opportunities using IT) highlighted the need to move into Human in the *lead* (instead of just Human in the loop) and awareness about the sensitivity of data in the context of special needs education. TWG7 (Post-pandemic online learning: Sharing the lessons learned on digital teaching for future education) emphasized technology and AI as one of the major factors in determining learning design in a given learning space.

Strategies and actions

Based on the findings of the three phases of the Delphi study as well as current work by other researchers, we recommend the following actions for policymakers (PM), researchers (RE), and practitioners (PR), each strategy linked to the corresponding challenges identified above:

1. In order to support the new roles of stakeholders in education

- Identify the elements involved in the new roles (RE)
- Identify and implement pedagogical practices for AI in education (PR, RE)
- Develop policies to support AI and data literacies through curriculum development (PM)

2. In order to support Human-AI-Alliance in education

- Encourage and support collaborative interaction between stakeholders and AI systems in education (RE)
- Take control of available AI systems and optimize teaching and learning strategies (PR)
- Promote institutional strategies and actions in order to support teachers' agency and avoid teachers' de-professionalization (PM, PR)

3. In order to support evidence-informed practices of AI in education

- Use both the results of fundamental research into AI and the results of live case studies to build a robust body of knowledge and evidence about AI in education (RE)
- Support open science and research on AI in education (PM)
- Implement evidence-informed development of AI applications (RE, PR)
- Implement evidence-informed pedagogical practices (PR, RE)

4. In order to support ethical considerations of AI in education

- Forefront privacy and ethical considerations utilizing a multiperspective and interdisciplinary approach as the core of AI in education (PM, RE, PR)
- Consider the context, situatedness, and complexity of AI in education's impacts at the time of exploring ethical implications (PR)
- Continuously study the effects of AI systems in the context of education (RE)

Actions from the TWG

TWG1 members will be invited to co-author a journal-length article based on the group's process, deliberations, and outcomes from EDUsumMIT 2022-23. Members are invited to utilize the outcomes of the meeting at conferences and to make presentations that include the group's ideas. The group is planning to present a panel at the APSCE ICCE 2023 (<https://eds.let.media.kyoto-u.ac.jp/ICCE2023/>) conference on ethics of AI related to cases from different countries and 'new educational realities'. In addition, a workshop for EATEL 2024 (<https://ea-tel.eu>) will be proposed. Another option includes a short paper for LAK 2024 (<https://www.solaresearch.org/events/lak/lak24/>) conference as well as a paper building on the findings of TWG1 for EAPRIL 2023 (<https://eapril.org>).

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Thematic Working Group 2 - Special Needs: Addressing Challenges and Opportunities Using IT

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Background

TWG2 began a collaborative exploration of the use of information technology (IT) in the broad field of special education. This resulted in a complex mind map showing IT for six categories of special needs, including dyslexia, dyscalculia, social-emotional, motor, hearing, and visual impairments. We then decided, based on the knowledge and experience in our group, to limit our focus to severe learning and behavioral difficulties, targeting specific learning disorders (SLD), autism spectrum disorder (ASD), and attention deficit and/or hyperactivity disorder (ADHD). An overarching challenge that arises when different cultures and countries are considered lies in the varying definitions of these special needs. A sensible approach to this problem is to base the definition of the different categories of special needs on widely accepted and commonly used diagnostic criteria. Thus, in our work, SLD (impairment in reading, impairment in written expression and impairment in mathematics), ADHD and ASD are defined in accordance with the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR®), as published by the American Psychiatric Association (APA) in 2022.

Our goal was to explore the challenges and opportunities of IT regarding the accessibility of educational materials and learning outcomes for the three target groups (SLD, ADHD and ASD). To this end, we focused on assistive technology, educational software (e.g., Kärnä-Lin et al., 2007) and learning analytics (e.g., Hirsto et al., 2022; Toyokawa et al., 2022). Some software in these categories was specifically developed for SLD, ADHD or ASD. However, the use of software for these types of disorders is not very common. Software possibilities are developing quickly due to the recent advances in (availability of) AI. We covered a wide age range, from early childhood to adulthood. Consequently, we pay attention to the use of IT for special needs in primary, secondary, and tertiary education.

Moving forward to new educational realities in the digital era

In several countries (e.g., Japan, and the Netherlands), we see a paradoxical trend where the overall number of students is decreasing, but the number of students in special schools is rising. In some other countries (e.g., Finland) the categorization of special needs varies and the number of students receiving intensified support (i.e., lower tier from special education support) has increased, while the level of special education support has remained stable. These phenomena prompt us to question the dynamics of inclusion support for students with special needs and differences in various (national) support systems. In the daily practice of schools, inclusion requires tailored support and resources for special needs. However, mainstream schools often lack allocated resources, hindering their ability to support students

with special needs effectively. This is even more so in third-world countries (e.g., Nepal) where a multitude of factors hinder the availability of IT for special needs support.

New educational realities

During our online and face-to-face (f2f) meetings we reflected on three major realities in special education: the current state of imprecise policies and lack of funding for adequate ICT resources, lack of student voice in the use of IT, inconclusive research about the effectiveness of assistive and learning software and the concomitant pedagogy. Our discussion dealt with various levels of education from primary, lower secondary, upper secondary and tertiary (e.g., higher education) levels of education.

Even though technology is omnipresent in education, special needs students are often not adequately supported by technology in schools. Specific learning software that is used in education may even prove harmful to the development of students with special needs (Regan & Jesse, 2019), as was also borne out during COVID-19 (e.g. Sakarneh, 2021). A well-reasoned balance between the virtual world and the physical classroom environment is especially important for this population. Moreover, there is a wide variation in the use of IT to support special needs students. While there are examples of the beneficial use of IT to support students with special needs, such as the use of assistive software for dyslexia, too often these examples depend on the skills and inclinations of individual educational professionals. In part, this relates to imprecise policies and inadequate funding, as well as to inconclusive results from research on the use of IT for special needs students. In addition, there is limited understanding of the perspectives of students with special needs regarding the support provided by IT. A better understanding of these perspectives may lead to a better understanding of important support mechanisms.

Key contributions of the TWG to the new educational realities

On the basis of our discussions, we formulated three main realities:

1. Policy

In the digital era, special needs students require tailored IT resources (e.g., assistive software, learning software, learning analytics). Imprecise policies and lack of appropriate funding for these IT resources hinder effective support for students with special needs and generate inequalities.

2. Practice

With technology being omnipresent in special education, student voice is critical and should be solicited in various ways. Currently, student opportunities to flourish may be reduced by extensive use of drill and practice software; potentially stifling their learning process, their freedom to make mistakes and their right to play. Also, more systematic listening to student voices may enhance our insight into effective technologies and pedagogies to support students with special needs.

3. Research

Effectiveness research rooted in pedagogy and learning science is essential for using IT to support students with special needs. Currently, research is inconclusive about the effectiveness of assistive and learning (analytics) tools for special needs and about the pedagogy that is needed for effectiveness.

Key insights from other TWGs

Our TWG2 had an opportunity to collect expert understanding from 3 TWG's: Artificial Intelligence (AI) and big data for teaching and learning: implications for school leaders, teachers, policy makers and learners (TWG1); Aligning Educational Policies with the New Realities of Schooling (TWG6); and Social Emotional aspects in new modes of learning (TWG 9).

TWG 1: With TWG 1 we identified the challenge of sensitive data regarding special needs and AI. A major question was the ownership of the data. Should the data be owned by parents/students (depending on age)? The current reality is that students and/or parents often don't have access and that ownership is claimed by educational institutions and vendors. Also, we talked about the future possibilities of generative AI for writing problems and research about the use of AI in learning analytics for special needs.

TWG6: A challenge recognized by TWG6 and strongly agreed with by TWG2 is that policymaking does not seem to keep pace with the evolution of IT. Policymaking seems to be an afterthought rather than an active consideration. Research should be consulted before policy is defined. When insufficient research is available, a policy still must be written but will need a cyclical refinement process that considers new knowledge from research. This will prevent naive, imprecise policies that can harm education and its outcomes. Our considerations also overlapped in relation to teacher professional learning and digital competencies. From the special needs perspective, specific digital and concomitant pedagogical competencies should be considered in various levels of teacher training (i.e., pre-service and in-service teacher training) and policymaking should support this.

TWG9: Both TWG2 (i.e., special needs) and TWG9 (i.e., social-emotional learning) were new groups in EDUsummit 2022-2023 and partially overlapped. However, TWG9 had additional approaches such as Social Emotional Learning (SEL). Consideration of SEL approaches with IT is new and may also provide a further understanding of the special needs area. For our TWG supporting social-emotional learning with IT is an interesting challenge as it is an emerging field.

Strategies and actions

We call on **policymakers** to use research to inform policy and funding aimed at supporting students with special needs through IT. Moreover, national-level policies, documentation and planning should benefit the needs of practice.

We urge **practitioners** to interact extensively with special education students about their experiences using IT. This will help practitioners to make informed instructional adjustments.

Moreover, research-based decision-making benefits practices at different levels of schooling. Therefore, we call on **researchers** to systematically study the pedagogical and technological aspects that lead to effective IT support for special needs.

Actions from the TWG

Our aim is to continue the work in ongoing collaboration and to have a similar TWG in the next EDUsumMIT. We also aim to expand the group to include more people from policy, practice and research. There are also interesting and important bridges with other EDUsumMIT TWG's, so the aim will be to have ongoing discussions with other TWG's.

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Thematic Working Group 3 - Inclusion of Excluded Populations: Access and Learning Optimization via IT in the Post-Pandemic Era

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Background

Thematic Working Group (TWG) 3's theme is "Inclusion of excluded populations: access and learning optimization via IT in the post-pandemic era". A focal concern is established by the presence of the first word – 'inclusion' – and how this relates to 'excluded populations'. Much of the research in this field has focused on inclusion for individuals; however, the evidence shows that educational exclusion has multiple dimensions (Passey, 2014). To accommodate this within the current focus, therefore, identifying key dimensions of 'excluded populations' will be a key concern of this document. 'Access' will be considered beyond physical technology access, involving aspects of accessibility, agency and empowerment. These aspects relate to a definition of access that concerns the needs for individuals to develop and have digital capabilities and abilities to select applications appropriate to purpose, as discussed, for example, by Helsper (2021) and Passey et al. (2018). Taking this wider concern for access, 'learning optimization' will be explored as a term that highlights the need to focus on technological access and provision enabling successful outcomes. Given the fact that the intention of the work of TWG3 is to explore findings in the 'post-pandemic' context, communication technologies as well as just information technology, 'IT', are clearly important and need to be considered. Additionally, exclusion factors to be addressed need to be clearly identified so that inclusion can be accommodated and ensured in the context of specific excluded populations. However, inclusion should not be implemented as an imposition in the context of digital technologies, as some populations do not wish to use digital technologies (Wetmore, 2007), and in this respect the issue of the need to acknowledge diversity is important.

Moving forward to new educational realities in the digital era

Inclusion of excluded populations is a well-known and encompassing educational challenge, as it relates to educational groups including girls and women, students with special needs,

students from low socio-economic backgrounds, refugees, and politically-discriminated students (e.g., students from visible minorities). The relationship of inclusion to technology is ambivalent (according to Selwyn, 2016); while some studies indicate that technology can contribute to maintain and reinforce educational exclusion, some tend to show that technology could help include traditionally excluded populations given the necessary conditions to do so (Warshauer, 2004). Cultural contexts and educational policies and practices are seen as playing a key role in determining how technologies relate to excluded populations. One of the main questions, then, is how to align context, policies and practices with educational technologies to make sure they support inclusion of excluded populations. Though this line of questioning is not new, it has certainly gained renewed attention due to new educational realities, such as those that have arisen from the Covid-19 pandemic, including greater reliance upon and uses of communication technologies such as video-conferencing.

New educational realities

TWG3 has focused on six main realities that have been brought into attention as a result of the Covid-19 pandemic: emerging technologies, pandemic impacts, a digital divide that excludes populations, teacher shortages, capability gaps, and educational technology (EdTech) companies. Excluded populations are in some respects specifically unique, due to the complexities of features they encompass – which can arise as a result of a mix of specific geography, gender, culture, context, religion, beliefs, and special needs.

New technologies, including but certainly not limited to artificial intelligence (AI), have the potential to both include and exclude populations. For example, AI can serve to include populations by reducing language barriers (using translation software, for example), enabling access to a knowledge bank (through chatbot facilities, for example) and addressing issues experienced by diverse learners (such as providing speech to text facility). Counter to this, AI is already excluding certain population sectors as a result of the algorithms and the content base from which it draws (for example, not providing access to specific language banks or specific subject topic banks).

The COVID-19 pandemic put the spotlight on pre-existing inequities on an international scale, as identified by UNESCO (2020), for example. Countries that were assumed to have well-prepared teachers, robust technological infrastructure and access to devices also found this was inequitably distributed (with some schools and education authorities in highly developed countries providing online access and equipment to numbers of children). For ranges of children and young people across the world, access to teachers, devices, Internet, skills and platforms continued in the COVID -19 pandemic period to be an issue, and consequently, excluded populations have been further impacted (as identified in the United Kingdom, for example (Ofcom, 2022)).

Exclusion is also not supported by the behaviors of some companies. The actions of educational technology companies can continue to exploit populations through monopolistic behavior (see Xiong, 2021) and through questionable practices in relation to data governance (see Cadwalladr & Graham-Harrison, 2018). There continues to be a lack of broad oversight of these behaviors that could serve to protect the more vulnerable as well as schools and users more widely.

Key contributions of TWG3 to the new educational realities

TWG3 has identified some possible ways that can contribute to coping with new educational realities for excluded populations, in order to both bridge the gaps and also to explore new possibilities for a better future for education of excluded populations. These include:

At the level of policy:

- Advocacy for government regulatory mechanisms that ensure development of inclusive and responsible technologies for education of excluded populations with due considerations to ethical collection and use of data while respecting privacy and individual choice.
- Advocacy of policy to provide digitally-excluded learners with infrastructure support and technology enabled resources.
- Development of metrics for assessing educational technologies' provisions for inclusivity and equity of excluded populations.

At the level of the teacher and learner:

- Raising awareness of and critical thinking among teachers and learners regarding the limitations and pedagogically appropriate use of emerging technologies such as AI-based applications and extended reality tools for excluded populations.
- Developing guidelines to assess pedagogical appropriateness of technologies by researching teaching and learning uses in appropriate ways.

At the level of research:

- Development of appropriate technologies to enable effective use in low-resource environments and with under-served excluded populations, preferably co-created with stakeholders.
- Continuing research on implementations of emerging technologies when used with excluded populations regarding *what works, when, for whom and how*.
- Developing vignettes of outcomes of innovative cases that explore uses with excluded populations in diverse contexts.

Key insights from other TWGs

TWG7 has suggested a model for learning based on organization, technology and space; the main issue and the focus is on technology design. As we suggest, a space that adequately considers technology design and access within rural communities, immigrant and refugee camps might be a useful suggestion to look at when building and developing community centers. These community spaces should offer the most appropriate solutions for one-day online space access, for a student to access at regular times, and for all-week learning opportunities in emergency situations. This form of facility is recommended by TWG3 to support preparation for a subsequent disaster and also to help cope with teacher shortage, which is a global phenomenon (UNESCO and International Task Force on Teachers for Education 2030, 2022). Community spaces of this form could provide a place for non-formal and informal learning, as presented by TWG5. TWG5 suggests that non-formal education will, in the future, become more extensive than formal education and this might relate to TWG3's contention that learning in class will become more limited and that future community spaces and non-formal education will take their place at least to some extent. These possibilities of

'new spaces' arise from the new realities, including increasingly high levels of teacher shortage and continued advancements in digital technologies

Strategies and actions

TWG3 offers suggested strategies and actions for three key groups: policy makers; practitioners; and researchers.

Strategies and actions for policy makers

Governments must enable and sustain accessibility to digitalization for marginalized communities and individuals (through appropriate infrastructure, equipment, systems and competence-developing programs) and put in place regulation and accountability of educational technology companies - or potential incentivization through a rating/metrics system. In this context, it is vital that appropriate long-term planning and actions are considered and in place, as short-term projects or plans need to be appropriately sustained over time (Passey et al., 2016). We need to develop and maintain competencies so that students and teachers practice critical thinking and awareness when using and applying digital technology, and we need the same of educational technology platform companies, as their systems and products become more widely adopted, integrating AI and data collection, with the potential for surveillance and privacy harm. The General Data Protection Regulation (GDPR.EU, 2023) may provide a model for this type of policy.

Strategies and actions for practitioners

Teacher training should be directed towards competence development, especially critical thinking, in order to be aware of technology bias and discrimination. In addition, teacher preparation programs should foster a lifelong learning mindset that enables teachers to adapt to changing technologies and new evidence-based practices to support learner variability (Passey & Lee, 2020). Because the existing and increasing teacher shortage will continue to impact all students, but particularly vulnerable populations, teachers should have training and support on how technology can provide aid to workload burdens.

Strategies and actions for researchers

Research needs to be undertaken that will measure competence development, government digital equity, companies' ethical alignment and developing a reputation system that can rate educational technology companies on aspects including inclusiveness, caring for privacy, and transparency, as well as criteria that contribute to protect users and support marginalized communities. Much research in the field of educational technology has taken a techno-centric/techno-solutionist perspective that measures the benefits of using technology, but less has focused on the potential harms. TWG3 calls upon researchers to focus on the potential for technology to create or perpetuate inequities.

Actions from the TWG

TWG3 plans to present its work and about EDUsumMIT in general at:

1. The IAIE 2023 Conference, 7-10 October 2023, in Sarajevo, Bosnia and Herzegovina (<https://iaie.org/>).

2. The ISPC 2023, 3rd International School Principals Conference, 22-25 June 2023 in Istanbul, Turkey (<https://egitimbilimleri.medeniyet.edu.tr/en/all-events/3rd-international-school-principals-conference-networking-and-beyond-for-innovation-in-education>).
3. The IAIE 2024 Conference, 26-28 March 2024, Chemnitz, Germany (<https://iaie.org/conferences>).
4. The SITE Interactive 2023 Online Conference, 7-9 August 2023 (site.aace.org/online/).

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Thematic Working Group 4 - Fostering Self-Regulatory Skills in Learners in Digital Learning Environments

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Background

A notable trend in learning and teaching that has been accentuated by the COVID pandemic is a move towards online, blended or hybrid learning scenarios. This particularly affects higher education but also extends to K-12 education, though the manifestations vary. Learning in diverse technology-supported learning environments poses certain challenges to students. For example, there are higher demands on students' abilities to plan, manage and reflect their learning in such environments - abilities that are part of students' competence to self-regulate their own learning (Azevedo, 2009).

The importance of students' self-regulated learning (SRL) has long been recognized in research and practice. Theories of SRL, i.e., the ways learners monitor, reflect on and regulate their motivation, cognition, metacognition & emotions in order to learn, have been developed and refined over a number of years since they emerged from educational psychology approximately 20 years ago (Panadero, 2017). Research has shown positive correlations between the use of SRL-strategies, learning processes and academic outcomes in face-to-face learning settings (Broadbent & Poon, 2015). Evidence for the importance of SRL-skills specifically in online and blended learning scenarios has also been accumulating (ibid.). Compared to face-to-face settings, SRL might be even more important because students are more often having to work without teacher support and thus need to be able to learn autonomously (Xu et al., 2023).

However, the relationship between SRL-skills, technology-supported learning environments and learning outcomes is complex and multi-directional. In recent years, research into SRL and how it may be supported by technologies has proliferated. At the same time, there is a need for orientation in the field. The aim of Thematic Working Group 4 (TWG4) was therefore to review what research has to say about the challenges of SRL in technology-supported learning environments and how these findings can be applied to the design of learning environments that effectively support SRL. This eBook report presents results of an international discussion of the members of TWG4 over several months in 2022 and 2023. The review of evidence from research publications enabled us to identify a number of challenges related to fostering SRL

in technology-supported learning environments and to propose recommendations for researchers, practitioners and policy makers.

Moving forward to new educational realities in the digital era

New educational realities

The implementation of online, blended or hybrid learning scenarios in all phases of education poses higher demands on students' SRL and raises the question of how to support SRL as well as to develop students' SRL-skills in these environments. Research and technological developments often focus on higher education, where students tend to learn in rather 'closed digital systems'. However, in K-12, we rather see a mix of homework assignments, blended learning, and frequent shifts between digital and physical spaces, enabled by tools such as tablets and mobile devices.

While the need for students to develop their self-regulatory learning skills has long been recognized, these SRL-skills are even more important in online and blended learning scenarios because students are more often having to learn autonomously (Xu et al., 2023). This need becomes even more significant with a stronger emphasis on educational approaches like personalized or self-directed learning, where students have to create their own learning goals and monitor and evaluate their learning progress. In addition, ChatGPT and other generative Artificial intelligence (AI) technologies have intensified discussions about what and how students need to learn in the future. Creating a conducive environment for learning, equipping students with the responsibility for their own learning and providing them with the ability to self-create their learning path are pressing concerns.

Learners face many difficulties while attempting to self-regulate their learning in technology supported as well as in traditional learning environments and need support to develop their SRL-skills (Ázevedo, 2009). Unfortunately, students often lack opportunities to enhance their SRL-capabilities in school. Research showed that teachers often integrate only little SRL support into their classroom practices (Callan et al., 2022). The direct instruction of specific SRL-strategies to students is especially rare (Dignity & Büttner, 2018). In addition, the development of SRL-skills at different school levels appears to be uneven. Notably, there seems to be an emphasis on the cultivation of SRL-skills during primary school education, but this focus diminishes during secondary school. However, we need a deeper understanding of the factors influencing the development of SRL. Despite the presumption that students possess a wide range of SRL-capabilities, there is only limited research on students SRL in technology-supported learning environments. A meta-analysis by Panadero et al. (2017) showed that SRL can vary extensively among students, important factors being age and gender as well as self-efficacy and motivation. However, research evidence with respect to students' SRL in diverse and mixed technology-supported learning environments is rare, especially for K-12 students.

Developments in online learning, specific digital functionalities as well as new applications of artificial intelligence (AI) provide more opportunities to scaffold students' self-regulated learning as well as to assess and promote specific SRL skills (e.g., planning, reflection). A range of instruments have been developed for these purposes (Alvarez et al., 2021). Studies have shown that these tools can be effective in promoting SRL-skills and improve learning outcomes

(e.g., Guo et al., 2022). However, some highly structured digital and AI-enriched learning environments may potentially also restrict opportunities and affordances for SRL and subsequently decrease SRL capabilities in some students. This is a possibility that requires further investigation and strategies for designers and educators on how to avoid this.

A further issue is the potential for increased inequalities among students. SRL-skills have a major impact on learning motivation and effective learning processes especially in digital learning environments (Xu et al., 2023). Therefore, a lack of these skills can be a disadvantage in terms of learning outcomes and subsequently educational or professional career choices. Since a lack of SRL-skills is particularly pronounced among students from lower socio-economic and/or academic backgrounds (Guo et al., 2022), this might reinforce existing inequalities. Fostering SRL skills in a technology supported learning environment in school is therefore also a question of providing equal opportunities to all students.

Contributions of the TWG to the new educational realities

Reviewing evidence from recent research has led us to the identification of five interrelated challenges:

1) Theoretical clarification of SRL concepts to inform development of digital supports

Several theoretical SRL models have been developed in the last 20 years (Panadero, 2017). Related concepts such as metacognition are also used in the literature. Recent theories of SRL also apply not only to individual self-regulated but also to co-regulated learning and socially shared regulation of learning (Hadwin & Oshige, 2011). In higher education the term “self-directed learning” (SDL) has been used to describe the behaviors of students who take responsibility for directing their own learning. Thus, SDL focuses on examining students’ behaviors and has a much more limited theoretical base than SRL. The relationship between SRL and SDL, however, has often been confusing (Saks & Leijen, 2014). “Personalized learning environment” (PLE) is another concept that is strongly related to and influenced by SRL concepts (Dabbagh & Kitsantas, 2012). PLEs are individually tailored (digital) learning environments that provide opportunities for students to learn at their own pace and interest. Research suggests that learners with higher SRL abilities might be better prepared to take advantage of a PLE (Xu et al., 2020). Theories about how students can regulate their learning and become autonomous learners have also been influenced by research on formative assessment and there is in turn strong evidence that formative assessment practices can promote SRL (Greene, 2020). In summary, SRL is a widely used concept in research on technology supported learning environments but has also a) strong overlaps with related theories which are not always clarified and b) no sufficient theoretical integration of the role of technologies in different SRL-processes.

2) Effectiveness of specific types of technological support to foster learners’ SRL

Many different digital tools have been developed to support SRL and to promote its development. This includes the identification of relevant SRL-related behaviors and SRL learning profiles in online-learning and their visualization (e.g. in dashboards), scaffolds for specific SRL sub-processes (e.g. a planning assistant) or for co-regulated learning sequences (e.g. awareness tools for group work).

Technology enhanced instructional designs can emphasize a more direct or indirect approach to the promotion of SRL (see Figure 1). Direct promotion of SRL can be explicit, e.g., using video instructions or context-specific instructional comments. Others are implicit, such as prompting self-regulatory cognitive and metacognitive processes. Another approach is to design the overall learning environment and embed indirect promotion of SRL through, for example by introducing complex problems or formative assessment methods.

<p><u>Direct promotion of SRL (“teaching” SRL):</u></p> <p><u>explicit:</u> e.g. video instructions, instructional comments</p> <p><u>implicit:</u> e.g. prompting of the self-regulatory cognitive, metacognitive and motivational processes</p> <p><u>Indirect promotion of SRL (activating SRL through the design of the learning environment):</u></p> <ul style="list-style-type: none">- e.g. scaffolding of the self-regulatory cognitive and metacognitive processes- e.g. opportunities for elaborated feedback- e.g. opportunities for formative assessment

Figure 1 Different types of SRL promotion (adapted from Fahrni et al., submitted)

Research revealed that both direct and indirect types of SRL support in computer-based learning environments produced positive effects on academic performance (Guo et al., 2022, Xu et al., 2023). Furthermore, SRL is a complex process with a number of phases and sub-processes. Therefore, it also needs to be considered which type of tool better supports specific processes. Based on a systematic review, Álvarez et al. (2022) showed that goal setting, monitoring and self-evaluation are the SRL processes supported the most by current existing tools, whereas help seeking and self-reflection were not sufficiently addressed in research. Zheng’s (2016) meta-analysis suggested that it is necessary to use scaffolds to support SRL during the whole process by integrating SRL tools with multiple functions.

However, there is little research on the effectiveness of particular combinations of technologies, SRL processes and instructional approaches in promoting students SRL. Furthermore, it is also important to monitor the impact of these technology supported learning environments not only on learners academic outcome but also on the social wellbeing of students.

3) Role of learning analytics and AI in supporting SRL in technology supported learning environments

Learning analytics (LA) and AI functionalities currently being embedded in educational software include, for example tracking and clustering of online learning activities, automatic assessment of students’ skills; visualization and personalized feedback and intelligent (pedagogical) human–computer interaction systems. Multimodal multichannel data, e.g. to identify students' emotional regulation, is increasingly being utilized in recent research (Molenaar et al., 2022). Many of these functionalities can be harnessed to assess and support SRL and there is a growing body of evidence on the value of AI-enabled learning environments to support SRL (ibid.). Recent developments in AI functionalities have also suggested ways in which the development of SRL can be supported by a combination of digital tools, AI support and human support (Molenaar, 2022). Challenges lie in the identification of meaningful SRL

profiles from log data, the visualization of information on SRL behaviors and the interpretation and utilization by teachers and students. In addition, there are also a variety of risks to consider, e.g. impact of algorithmic bias in AI applications that might result in unfair outcomes.

4) Understanding the interaction of students' SRL competencies with other student characteristics and digital SRL supports

To date, it remains unclear, particularly in K-12, how students with different SRL abilities cope with the demands of learning in more open technology supported learning environments. Some students might benefit from more SRL scaffolding to compensate for their lack of SRL skills (Koivuniemi et al., 2021). However, highly structured digital learning environments can also potentially decrease SRL capabilities by providing too little freedom for students to develop their own goals and decisions. This inherent contradiction can only be addressed by adaptive learning approaches considering the different SRL skill-levels of students. For example, SRL support could be differently designed for novice and advanced learners: novice learners might profit from cognitive strategy scaffolds (e.g. a knowledge map), for advanced learners prompts for planning and monitoring activities might be more effective.

Another area of focus pertains to learner characteristics that influence the effective use of specific SRL supports (e.g. SRL attitudes, self-efficacy). Furthermore, students might have certain preferences concerning specific digital tools and it might be helpful if they participate in the design of their personal SRL support. The relationship between learner attributes and the application of individual SRL supports is an important avenue for future research.

5) Understanding teachers' roles in supporting SRL in technology supported learning environments

Teachers face a number of challenges both for utilizing digital technologies and for associated SRL support and development. They need to acquire new competences to design and implement digital learning environments that effectively provide adaptive SRL support. These competencies are typically context-specific and require a solid foundation in technological and pedagogical knowledge, which in turn may also be related to teachers' own SRL capabilities (Huang et al., 2021). Furthermore, teachers are also experiencing a growing tension in balancing and integrating data-driven instructional suggestions (e.g., from dashboards) with their own experience and expertise (van Leeuwen et al., 2023). How teachers handle these tensions is not clear. A recent systematic review revealed that research on how teachers perceive and use opportunities in technology supported learning environments is rare (Fahrni et al., submitted). There is a growing need for both teacher support and technological support to develop students' SRL. This also includes new ways of conceptualizing and implementing opportunities for hybrid teacher-student-AI support (Molenaar, 2022).

Key insights from other TWGs

With reference to TWG1 (Artificial Intelligence and big data), AI applications, their opportunities and risks, are intensively discussed in recent research and we therefore included this as a challenge in our report. Our discussion with TWG5 (Learning beyond formal schooling) brought up the very important fact that informal learning spaces are important opportunities for learning SRL and the question of how we can make sure to transfer these experiences to

formal schooling. With reference to TWG 9 (Social emotional aspects) we discussed the (underrated) role of socio-emotional regulation in SRL research and the fact that students' wellbeing is not given enough attention as a goal of SRL. The ideas of TWG7 (Post pandemic online learning) sharpened our thinking about shifts between digital and physical spaces and what challenges that poses to the promotion of SRL for example by teachers.

Strategies and actions

Strategies and actions for researchers

- Based on the existing research on SRL and technology-supported SRL, theoretically clarify the SRL-concept, specify similarities and differences with related concepts such as PLE and specify the role of digital technologies including hybrid forms of human-AI co-regulation.
- Conduct empirical studies on ...
 - students' capacity for SRL in technology supported learning environments, and the enabling and hindering factors for the development of SRL skills. Analyze also possible negative effects for instance on learners' autonomy.
 - how specific digital technologies promote SRL skills of students considering various learner characteristics. Explore the role of teachers and learners and ways in which they can act synergistically with digital technologies (including AI)
 - how to use LA and AI for supporting students and teachers. Carefully document and evaluate the use of indicators and models for SRL assessment and support, including teachers' understanding and reasoning as well as unintended side effects for students' learning, wellbeing and new inequalities.

Strategies and actions for practitioners

- As a teacher, recognize the importance of SRL in digital learning environments and know the opportunities and limitations to support SRL by technology, to be able to design a learning environment with learning activities for students that support their SRL.
- As an educator, teach SRL to teachers not only as an ability to teach SRL to students, but also as a personal skill to empower teachers' own teaching and learning.
- As a developer, include researchers and teachers in the development of new digital tools or functionalities for the assessment and the promotion of SRL.
- Raise awareness about issues of equity for students from different backgrounds and document and analyze possible factors related to aspects of equity.

Strategies and actions for policy makers

- Based on the existing competencies frameworks for teachers: make sure that these frameworks include SRL and ways to support this by technology. Also include SRL competencies in current curricula, but do not add (again) things "in the yard of teachers" but highlight connections with existing concepts.
- Strengthen SRL as part of teacher education and provide resources to enable professional development in relation to (technology-supported) SRL.
- Ensure educationally relevant data literacy levels and teachers' capacity to use data for decision-making and instructional design, including a better understanding of the pedagogical contributions and risks of AI applications.

- Develop policies, guidelines and best practices examples for stakeholders surrounding the use (and risks) of LA and AI applications for SRL support.

Actions from the TWG

We plan to take the following actions:

- Proceed with an umbrella review and write an academic journal article.
- Present themes and challenges identified by TWG4 at key conferences and meetings.
- Translation and publication of brief companion pieces in national educational channels & networks.

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Thematic Working Group 5 - Learning Beyond Formal Schooling: Human-Computer-Human Interactions in a Digital Inter-connected Era

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Introduction

The overarching goal of Thematic Working Group 5 (TWG 5) is to define the importance of informal and non-formal learning practices that rely on human-computer-human interactions outside formal educational institutions (such as schools). TWG 5 explored how these informal and non-formal learning practices can co-exist and interact synergistically with formal education.

Moving forward to new educational realities in the digital era

The educational landscape in the 21st Century is influenced by several disruptive changes and trends. For example, the rise of the knowledge economy places a demand on schools to develop students with knowledge-building capacity enhanced by the power of IT technologies (Tan et al., 2021). Alongside these rapid changes, declining funding in many countries has left schools and postsecondary institutions with pressures and expectations to do more with less (Pelletier, et al., 2023). On the positive side, rapid technological advancement makes Internet connection, mobile learning devices and powerful tools (such as ChatGPT) accessible to learners, and at the same time blurs the boundaries between learning modalities (Pelletier, et al., 2023). The highly connected digital era with powerful digital devices and software affords “a fluid and hybrid digital rhizomatic non-hierarchical and multiplicitous network that allows students to connect, think, act, interact, access ideas and resources in ways that may assist educators in closing the gap between formal learning and informal learning whilst living in a rich technology world” (Bogiannidis et al., 2023, p. 1). Consequently, school leaders and teachers need to be adaptive in complex, ambiguous and rapidly evolving environments within an increasingly technology-literate society (Cox & Quinn, 2021).

New educational realities

To make sense of the new educational realities, we need to clarify firstly the concepts of formal, informal, and non-formal learning. From a review of the literature, including existing definitions from the Council of Europe (2022), Johnson and Majewska (2022) held that formal learning tends to be aligned with organized and temporally defined periods of institutional learning, while informal learning is used to describe everyday learning across contexts throughout one's life. There is greater consensus on definitions of formal and informal learning while the distinction between non-formal and informal is more fluid and thus less clear. "Non-formal learning is a hybrid of the other forms of learning, meaning that it is in the interaction of formal and informal elements that non-formality attains its special character" (Johnson & Majewska, 2022, p. 4). The range of characteristics ascribed to the three types of learning (Johnson & Majewska, 2022) demonstrates fluidity and how these characteristics are often attributed to more than one type of learning.

Key contributions of the TWG to the new educational realities

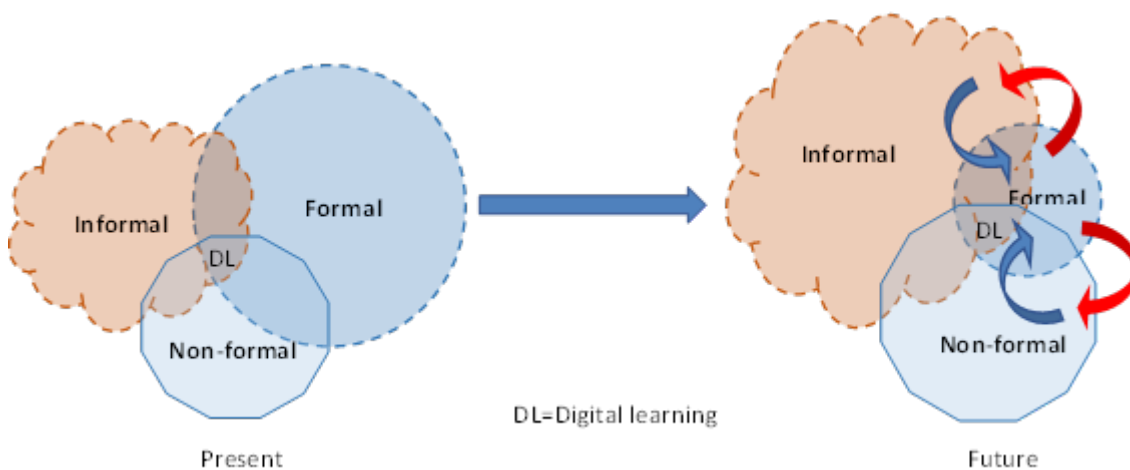


Figure 2 A shift towards greater synergy between formal, informal, and non-formal spaces

This working group proposes an exploration of the shift towards greater recognition of informal and non-formal learning spaces, which interact with and synergistically enhance formal learning spaces (see Figure 2). There is a premium placed on national, local, and institutional regulation, including curricular content, modes and methods of delivery, and accrediting and certification of students' attainment and competency. Non-formal and informal learning, though complex but powerful concepts, fit less well into restricted curriculum models, and rely more on self- or community co-regulation.

The rapid advancement in digital networked technologies affords new tools to augment human cognition (Prensky, 2009) and bridge the boundaries between learning modalities (Pelletier, et al., 2023), thus enabling the shift towards greater synergy between formal, informal, and non-formal spaces. The highly connected digital spaces, coupled with powerful digital devices and software, allow users greater access to data, to conduct deeper analyses, and gain insights into others' perspectives (Prensky, 2009). Informal learning takes place in a variety of practices that are particularly enabled by current human-computer-human interaction technologies, as well as technology-mediated human-human communication. Often without explicit learning goals and not guided by an explicit curriculum, these practices

are rich sources of knowledge building and learning. This modality of learning is reflected by Dewey's notion of "collateral learning" (Dewey, 1938). That is, learning involves holistic experience, not just the intended, but also the unintended and accidental, including the attitudes and non-verbalized insights generated through how we learn. For example, Bogiannidis et al. (2023)'s report shows that besides using digital technologies for formal learning, Australian students in middle years also engaged in social interactions, and entertainment: a model of rhizomatic learning that not only blurs the boundary of formal and informal learning but also has no obvious beginning and end. Other examples of such practices are productive online communities such as Wikipedia authoring or open-source software development, participation in online Citizen Science projects and platforms such as SciStarter or EUCitSci, as well as civic actions in social media spaces.

One example of an intentional effort bridging formal and informal learning is School-42 (<https://42.fr/en/what-is-42/42-program-explained/>), which provides university students with the opportunity to work on authentic tasks in an inclusive tuition-free environment. The University campus affords a wide-open space with the necessary infrastructure to support interested and motivated students to come together to solve authentic problems through coding and programming, coaching one another, and learning through doing. A model of how mobile technologies can be used to bridge students' formal and informal learning spaces has also been proposed (Lai et al., 2013). The rapid advancement of networked technologies and artificial intelligence brings new promises and related issues in our efforts to achieve greater synergy between formal, informal, and non-formal spaces.

Bridging formal, informal, and non-formal learning is not a trivial task. Our learners may interact in digitally connected spaces to gain knowledge in the cyber world and engage in informal learning in addition to the traditional formal school environment. However, "(t)he different types of human computer interactions required of the learner also require an understanding of the new literacies associated with these representations. The way in which new technologies has changed the representation and codifying of knowledge, and how this relates to learners' mental models has shown that learners develop new ways of reasoning and hypothesizing their own and new knowledge. How different these ways are is influenced by the nature of the representation system and the ability of the learner to interpret new images and new literacies." (Cox, 2013, p. 9). Changes in beliefs and practices of school leaders and teachers are also needed for new relationships, and roles and responsibilities in supporting new modes of learning in an increasingly technology-literate society (Cox & Quinn, 2021).

More questions remain to be explored:

- How can experience from and research on these practices be used to innovate or enrich learning in schools?
- How can participation in informal or non-formal learning activities be certified in such a way as to add on to an individual's learning achievements? What are some accreditation challenges? It might involve consideration of e-portfolios and micro-credentials for these purposes.
- Whereas these practices are highly innovative and stimulate knowledge building, we see the absence of a curriculum as a potential deficit with respect to systematizing and interconnecting the specific knowledge with the general body of knowledge. In which

aspects are elements of formal education to be taken as references? How should teachers assume personalized pedagogical responsibility?

Key insights from other TWGs

Connections between TWG 5 and all nine TWGs can be identified, with a particular emphasis on explicit resonance with these TWGs.

TWG1: The advent of generative AI (e.g., ChatGPT) can play critical roles in supporting learning in formal, informal, and non-formal learning spaces. The use of generative AI, for example, could facilitate students' self-directed learning in non-formal or informal learning spaces. There are, however, ethical and pedagogical issues related to the use of generative AI. TWG 1 suggested identifying and supporting new roles of educational stakeholders, along with pedagogical practices and policies for AI and data literacies across educational contexts and modalities.

TWG7: Online and digital teaching and learning could mediate and bridge formal and informal learning spaces, an experience that many teachers and students shared during the pandemic. TWG 7 suggested promoting organizational flexibility and funding for the design and development of innovative teaching and learning environments using technologies; constructing communities of practice consisting of various stakeholders in order to co-design innovative teaching and learning environments, and also initiating new multidisciplinary research methods that are design-based and embedded in practice to inform infusion and sustainability of technology in innovative teaching and learning environments.

TWG8: Teachers' professional development is critical in the new learning spaces where informal and non-formal learning spaces interact with and synergistically enhance formal learning spaces. TWG 8 suggested there is a need to develop new theories of teachers' professional learning, pedagogical reasoning, and effective practice that consider new global educational realities involving new data, new practices and considering new roles and identities of teachers.

Strategies and actions

Strategies and actions for policy makers

Policy makers could

- provide teachers with time and financial support to do reflective activities such as focused inquiry projects that build collaborative networks within and beyond the school through broader online networks.
- Provide policies for the expansion of formal curricula and syllabuses to account for access to informal and non-formal resources and consequent assessment procedures.
- create spaces and mechanisms where practitioners and researchers can collaborate online to leverage the co-creation of ideas to promote sustainable innovations.
- create mechanisms to credit non-formal and informal learning practices in the formal education systems.

Strategies and actions for practitioners

Practitioners could

- extend the boundaries of classroom-formal education to include teaching and learning approaches that leverage technologies for communication beyond the classroom; for example, hybrid teaching using a virtual world.
- promote new ways for teachers' understanding of how to learn using social media and in professional learning networks so they learn in social communities where they are self-directed. This professional learning needs to be classroom-based and reflective, driven by what needs are associated with the learners and driven by problem inquiry.
- build socially connected online communities as part of core curriculum teaching so that students learn to learn within expanded communities. These spaces need to be valued learning spaces that are fundamentally part of teaching and learning, not add-ons.

Strategies and actions for researchers

Researchers could

- explore alternative approaches to studying teaching and learning in schools, universities and non-formal settings to develop an innovative spirit.
- explore how to shift the roles of teachers to be co-learners, co-designer, knowledge-managers, and engineers of interactions.
- understand learning behaviors that occur through formal, informal, and nonformal learning for the purpose of converging fragmented learning.

Actions from the TWG

The strategies and actions that TWG 5 recommended above are reflected in research and practices that some members have been working on:

- Researchers and teachers focus on enhancing learner experience and making iterative changes towards new approaches, which can be challenging and disruptive for both teachers and students (Cox, 2013):
- Researchers develop mobile technologies for the seamless blending of formal and informal learning (Khadage et al., 2016; Milrad et al., 2013).
- Researchers develop web analytics and methods to track and study informal learning at the micro, meso and macro levels (De-Groot et al., 2022).
- Teachers develop new practices and be adaptive, for example, the ability to break the "fourth wall" to have a presence in online teaching (Prestridge et al., 2023):
- Teachers form knowledge building community to work on authentic classroom problems and share strategies to leverage technologies to support students' learning (Teo et al., 2021):
- Develop new approaches to teachers' professional development, for example, through e-TPCK (Maria Mama, Andri, & Charoula, 2017).
- Researchers co-design and participate in the development of new technologies and teaching and learning practices using participatory research methodologies and design-based research approaches (Jacobsen & McKenney, 2023; Jacobsen, 2014).
- Expanding research approaches, such as design-based research, that strive toward the dual goals of advancing scientific understanding through the development of

interventions to enrich and expand learning and educational practices (Jacobsen & McKenney, 2023; Jacobsen, 2014).

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Thematic Working Group 6 - Aligning Educational Policies with the New Realities of Schooling

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Introduction

This report presents the main outcomes of discussions at EDUsumMIT2023 by Thematic Working Group 6 (TWG6). The focus of TWG6 was to examine policy and policy implementation in respect of the use of digital technologies in schools in the new realities of schooling. This report begins by outlining the new educational realities identified by the group and is followed by the unique connection of the theme to the new educational realities in this digital era, key contributions of TWG6 to the new educational realities and the key insights from other TWGs. It concludes by listing the actions to be taken by TWG6 to further develop the discussions going forward.

The work of TWG6 builds on that of previous EDUsumMIT TWGs that focused on policy and the implementation of policy pertaining to the use of digital technologies for learning, teaching and assessment in schools. For example, at EDUsumMIT 2017, TWG1 focused on the need for alignment across education systems; indicating that if change is to occur and digital technologies successfully used to support learning, there is a need to consider the implications for all aspects of the education system, all of which work together and reinforce each other as part of an interrelated and interdependent learning ecosystem (Butler et al., 2018). At EDUsumMIT 2019, TWG12 subsequently explored and articulated what a quality curriculum should look like in a digital era (Twining et al., 2021).

Since the last EDUsumMIT, the COVID-19 pandemic caused unprecedented disruptions and massive changes to almost every education system in the world (UNESCO, 2020). Between 2020 and 2021, schools closed, and many schools and education systems offered education remotely. The unexpected and sudden switch to emergency remote education saw extraordinary efforts by teachers and education systems to adapt and innovate (UN 2020). However, while laudable in the short term, the changes to education that occurred during this time were made very quickly to address the immediate and urgent need of continuing schooling. Undoubtedly, remote education brought the enormous potential for innovation to the fore, but it also revealed and amplified the weaknesses of current systems; highlighting existing and growing equity gaps (OECD, 2020). Emerging from the COVID-19 pandemic, society and education systems are faced with a new set of realities and the work of TWG6

examines policy and policy implementation in respect of the use of digital technologies in schools in the new realities of schooling.

Ten members of TWG6 representing eight different nationalities attended EDUsummIT2023. These included Australia, Bulgaria, Canada, India, Ireland, Italy, Japan and Sri-Lanka (See Figure 3).



Figure 3 TWG6 comprised 10 members representing 8 different nationalities.

Moving forward to new educational realities in the digital era

Before COVID (BC), many countries had engaged in a process of policy development and curriculum design with some evidence of a shift towards the alignment of policy and curriculum implementation. However, enabling real change “requires policies and actions on several fronts, including infrastructure, strategy and leadership, teacher skills, learner skills, content, curricula, assessment and national legal frameworks” (EC, 2020, p.2).

During COVID (DC), many countries published policies or guidelines on remote/online learning. Despite this, there is little available information on the current status of these policies. While there has been rhetoric that the COVID-19 crisis was a ‘turning point’ for education, it is also reported that it brought inequalities into sharper focus (OECD, 2020; Robinson et al., 2020).

As the effects of the COVID-19 pandemic still emerge, there is a need to be mindful of what is influencing the development of educational policy and strategy. Digital technologies are just one part of a complex network of actors (Butler et al., 2017; Selwyn, 2023) and long-term change in education will require a “combination of actions and policies to be effective” (EC, 2020, p.4). Post COVID-19 requires a clear vision and strategy on how all phases and stages of education can purposefully and strategically embed digital technologies into educational practices. Unless there is alignment between policy and action, schooling will not meet the

needs of society and prepare young people to empower them to take an active role in shaping their lives and the societies they live in.

New educational realities in a digital era

Although the experiences of schooling that occurred during the periods of school closures are well documented, initial discussion in TWG6 revealed that much less has been documented about the realities of schooling in the aftermath of the COVID-19 pandemic. As a starting point and to garner this information, group members constructed case studies of their respective countries in which they addressed questions relating to policy and policy implementation on the use of digital technologies in learning, teaching and assessment at three different time intervals:

- Pre 2020 - Before COVID-19 pandemic (BC)
- During the emergency response period of the COVID-19 pandemic (DC)
- Since the full-time return to schools after the COVID-19 pandemic (AC) (See Figure 4)

Before COVID (BC)	During COVID (DC)	After (AC)
<p>Were there policies developed in your country in relation to the use of digital technologies in learning, teaching and assessment within your school’s system pre2020 (pre COVID-19)? If so, provide a brief account of these policies e.g., the focus of these policies regarding the use of digital technologies in schools? What was the impact of these policies? i.e., is there evidence to indicate how digital technologies were being used in schools?</p>	<p>What policies were initiated / actions implemented during the Emergency Response period of COVID-19 (2020 -2022)? Is there evidence to indicate the impact of these policies in schools? How were digital technologies used during this period?</p>	<p>Post COVID what has happened in your schools? Were the policies developed during COVID-19 maintained? Were new policies developed? Is there evidence how digital technologies are now being used in schools? Is there any difference to pre 2020?</p>

Figure 4 Prior to meeting at EDUsummIT2023, TWG6 members constructed case studies

The case studies formed the basis for discussion at EDUsummIT 2023. Based on this discussion, TWG6 identified a number of emerging trends and varying shifts which illustrated that while some new realities had emerged (e.g., teacher shortages, greater acceptance and use of digital technologies in teaching, focus on well-being), the “new realities” were for the most part an exacerbation of existing realities and inequities that were evident prior to the outbreak of the Covid-19 pandemic. These included access to devices and connectivity, but also digital competence and literacy of teachers, learners, and the wider community. While these realities varied across regions and contexts, common themes to emerge are outlined in Figure 5 and discussed below.

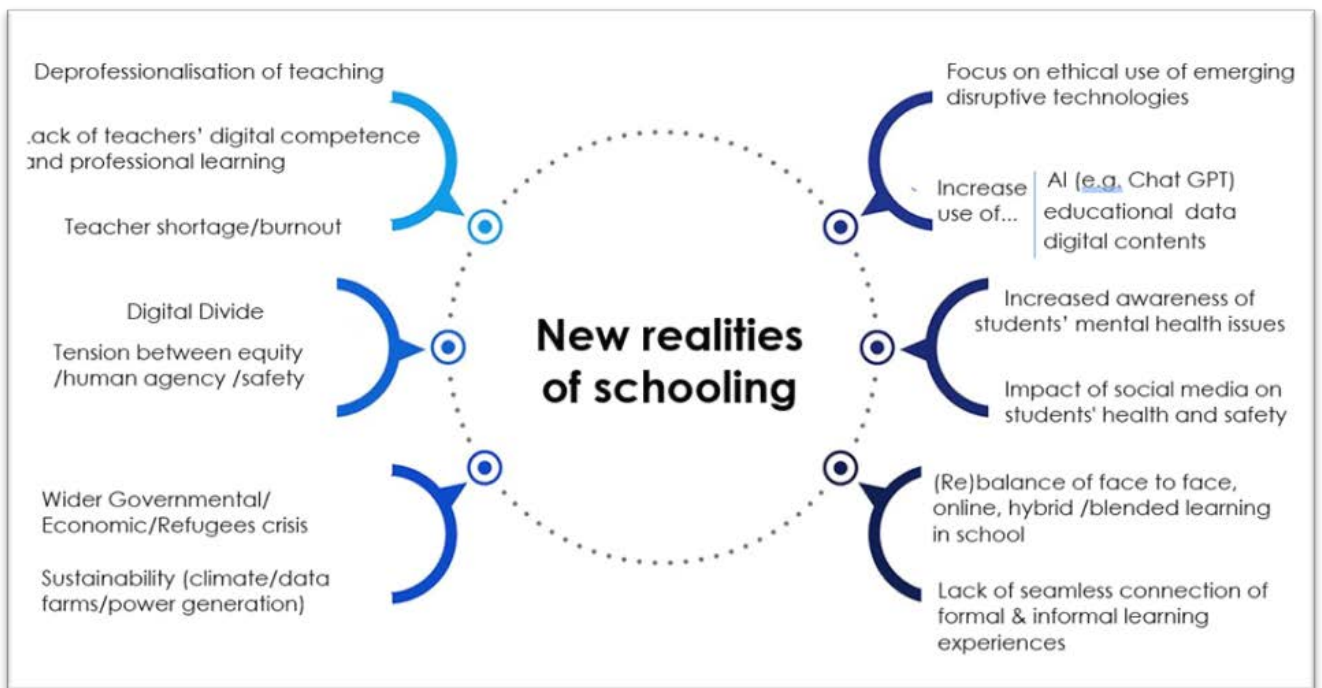


Figure 5 'New realities' of schooling as identified by TWG6

1. **Hybrid / blended / online / formal / informal learning.** The period(s) of remote/online learning led to increased attention on and acceptance of using digital technologies as part of teaching, learning and assessment. The use of online platforms and resources to supplement traditional classroom instruction in some cases allowed for access to a wider range of educational materials, greater flexibility and personalized learning experiences. In contrast, some platforms reinforced traditional classroom instruction and did not allow for significantly different learning outcomes (Sawyer, 2022). However, what is certain is that schooling during the COVID-19 pandemic did not level the playing field in terms of access to hardware, software, resources and competence. Those countries that already had infrastructure, curriculum, professional development and policies in place were better at navigating this space. In general, countries and schools with existing and comprehensive digital education plans and visions fared better; schools / teachers who had previous experience in using technology and had equipment were more confident in online provision. Moving forward, challenges to be met include:
 - a. How digital technologies are used in classrooms as part of teaching, learning and assessment?
 - b. How hybrid/ blended / online learning is/can be used in schooling?
 - c. How informal learning spaces can be included in formal learning?

2. **Social & emotional well-being of young people.** There is a heightened awareness of the importance of student well-being and mental health (e.g. Valance & Millar, 2023). This is evident in the range of policies that have been introduced in many countries which prioritize students' emotional, social, and physical well-being alongside academic development. Greater emphasis is placed on social-emotional learning, mindfulness practices, and creating supportive environments in schools to promote positive mental

health. The impact of social media on the mental health of young people is also garnering attention. In 2023, the American Surgeon General released the health authority's strongest advisory yet about the risk of harm to the mental health and well-being of young people by social media. He called for "urgent action", stating that we need to "gain a better understanding of the full impact of social media use" to "minimize the harms of social media platforms, and create safer, healthier online environments to protect children" (The U.S. Surgeon General's Advisory, 2023).

3. **Increasing use of emerging, potentially powerful and disruptive technologies.** Technologies such as generative AI has given rise to a myriad of questions i.e. How can they be used effectively and ethically in teaching, learning & assessment? Will they add value and enable us to think in different ways (be more critical/creative)? What are the implications for the role of the teacher? How can teachers and students be empowered to use these technologies meaningfully? In addition, fundamental questions of what data should be collected and how it will be used must be addressed alongside issues of data and identity security.
4. **Changing face of the teaching profession.** Many jurisdictions have witnessed evidence of teacher burnout and shortages in tandem with the changing approaches to initial teacher education:
 - a. reductionist (shorter) programs of Initial Teacher Education (ITE)
 - b. professionalization of profession (teacher as technician).

In addition, the experiences during the emergency remote education period challenged even the most competent educators to rethink their pedagogy. However, they did not have the luxury to do this through evidence informed research. Significantly, for many less digitally competent teachers this has led to a skewed understanding of digital learning (i.e., online learning v's use of digital technologies as an integral part of teaching, learning and assessment) with many "late adopters" associating digital learning exclusively with online learning. This continues to be exacerbated by the lack of teacher professional learning opportunities to develop digital competence across the teacher continuum.

5. **Wider societal economic and political developments.** In the aftermath of the COVID-19 pandemic, societal, economic, climate and political developments across the world have impacted and displaced many people. The impact of climate change has caused devastating fires, floods and droughts across the globe. Political instability is a feature in many jurisdictions e.g., Sri Lanka. In Europe, the war in Ukraine has led to a refugee emergency and significant disruption in supplies and costs of energy, food, and other materials to Europe, Middle Eastern and African countries. The effects are profound and ultimately disruptive to schooling.
6. **Tensions between emerging technologies and the pace of policy making.** Post COVID-19, the education landscape faces a myriad of challenges; the impact of school closures has given rise to calls for a "let's get back to basics" attitude i.e., "students have missed so much time at school, they need to make up for lost ground". This has led some

education authorities to fund and implement additional targeted programs to help children catch-up on the learning lost during the pandemic (e.g., Ireland, Quebec). In tandem, criticisms of the effects of digital technologies on student learning have begun to emerge and there are calls for a return to more traditional methods (Sweden¹², Spain) while rhetoric around causal relationships between increased access to technologies such as mobile phones and social media and mental health issues is widely published across media outlets. To muddy the waters even further, the emergence of ChatGPT in late 2022 has generated much controversy, disrupting the educational system globally particularly in relation to how learning is to be assessed. While it has the potential to be the catalyst to radically change how schooling is understood, the challenge for educators is how best to design learning environments and learning experiences for students that leverage the use of these new AI tools.

This maelstrom of divergent agendas and the disruption of emerging technologies is compounded by the rapid pace of change and the speed of policy development that brings into sharp focus the urgent need for more agile policy development to meet these challenges and to effectively prepare teachers to meet these new realities of schooling.

What is the unique connection of your theme to the new educational realities in this era?

Engaging in developing and analyzing the case studies from the various perspectives of the TWG6 members enabled us to have a “snapshot” of education systems and policies across a number of countries leading to the identification of commonalities/differences. Most importantly and as previously stated, we realized that for the most part, these “new realities” were often exacerbations of existing inequities while also reflecting contextual emergencies that have emerged post pandemic, namely economic and governmental crisis (Sri Lanka), refugees’ crisis (Ireland), the persistence of the digital divide and the lack of teachers’ competence (Sri Lanka, India). Moreover, it appears that as educational ecosystems are readjusting, there was and is increased uptake of digital teaching practices in some countries (India, Italy, Australia) whereas others are reverting to pre-pandemic practices or have adopted “back to basics” practices (e.g., Canada, Ireland). Tensions between the use of active pedagogies and didactic teaching as a ‘quick fix’ for learning loss have also emerged. Finally, the very real tensions between the rate of development of emerging technologies in contrast to the slower pace of policy making in education were acknowledged.

Key contributions of TWG6 to the new educational realities

The work of TW6 highlights a need for agile policy in order to align educational policies with the “new realities of education”. This is vital to enable high quality education to ensure equity and inclusivity for all. However, to do this the following challenges need to be addressed:

¹<https://www.smh.com.au/world/europe/sweden-brings-handwriting-practice-books-back-to-tech-heavy-schools-20230910-p5e3j7.html>

²<https://abcnews.go.com/International/wireStory/sweden-brings-books-handwriting-practice-back-tech-heavy-103063039>

1. Alignment of policies: needs common goals, standards, participation and engagement of practitioners, ownership.
2. Agile policy making framed with shared values and vision of education.
3. Policy has to be robust enough to adapt to new and emerging challenges (e.g. new ways of working, emerging technologies etc.) while offering agency to all stakeholders.

Therefore, TWG6 believes that a focus on policy alignment to the new realities of schooling requires:

- Policy to be agile, (mainly in the context of immediate response), flexible and complex enough to interpret in ever-changing realities.
- Policy should respect diversity and lead to equality of opportunity and equity.
- Policy should give agency and build competence to practice this agency.
- Policy is used to drive implementation / building practice which requires that policy is supported and resourced with a clear implementation plan designed to ensure the policy is enacted. This in turn has implications for the development of strong leadership who have the capacity to translate the vision into reality.
- Collaboration beyond education – developing smart partnerships (Leahy et al., 2016).

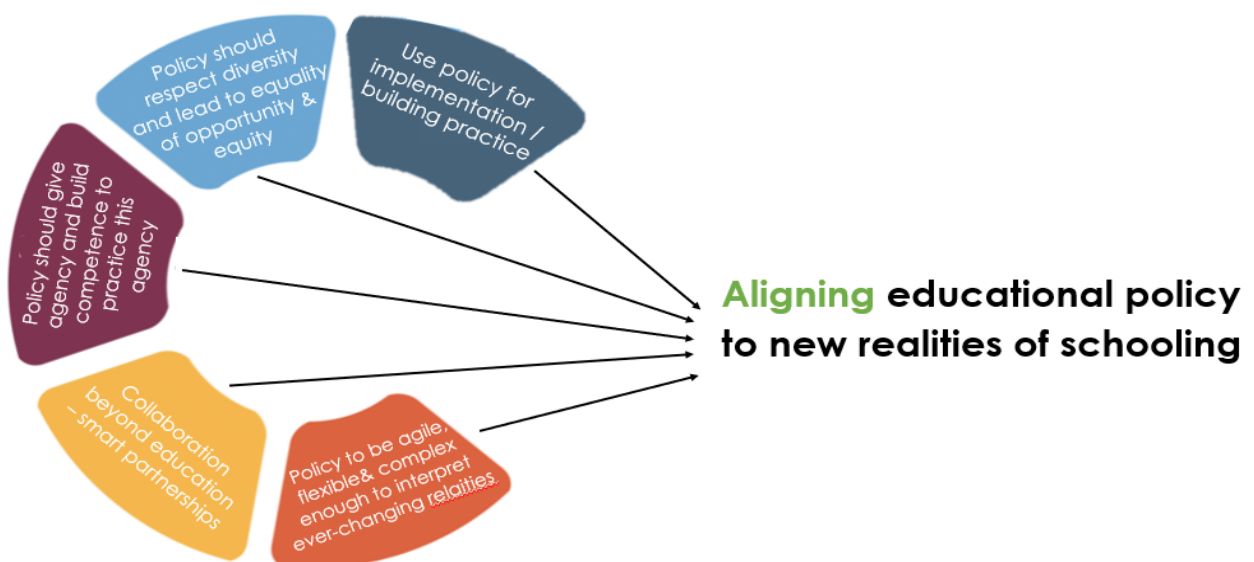


Figure 6 Aligning educational policy to new realities of schooling

Key insights from other TWGs

Pertinent insights to the deliberations of TWG6 were offered by four other working groups in considering the new realities of schooling:

TWG1: The use of AI and big data for learning, teaching and assessment has major implications for education. There are concerns that developments in the field of AI and data will lead to a deprofessionalization of teaching; that it will reduce complexity of learning, minimize the need for explicit teaching and enable increased control by the authorities (e.g. school district and government). There are also concerns that developments in this field will lead to the reduction of requirements for teacher preparation and will narrow the learners' experience in the

classroom as everything can be reduced to “technical behaviors.” The fear is that teachers will protect themselves against failure by adopting or remaining within the scope of conservative practices.

TWG2: As TWG6 highlighted that policy should respect diversity and lead to equality of opportunity and equity, the work of this TWG is particularly pertinent.

TWG5: When considering the new realities of schooling, there is a need, as part of policymaking, to consider how to move the discourse of learning beyond formal schooling and to bridge formal and informal learning. Realities to be further explored include how formal education systems can recognize and utilize self-directed media activities and how such activities can be accredited.

TWG7: The deliberations of TWG7 on multiple spaces for learning aligns well with the discussions of TWG6 in coping with emerging realities. Specifically, TWG7 draws attention to the importance of ensuring organizational flexibility and funding for development of innovative pedagogy and learning design for new teaching and learning environments. Three of TWG7’s key conclusions in relation to policy, practice and research are particularly relevant:

- Policy – focus on organizational flexibility and funding for development of innovative pedagogy / learning design of new teaching and learning environments.
- Practice – focus on communities of practice to design and support innovative teaching and learning environments.
- Research – focus on new multidisciplinary research methods that are design based and embedded in practice to inform infusion and sustainability of technology in innovative teaching and learning environments.

These conclusions draw attention to the need to develop (i) teacher confidence and competence if they are to design and use flexible learning environments (expert and adaptive teachers), and (ii) teacher and learner agency.

Strategies and actions

Based on our deliberations at EDUsummIT, TWG6 makes the following recommendations for future educational realities in this era:

Strategies and actions for policy makers

Need for agile policy making framed within values and vision of education, respecting teacher agency and diversity, leading to inclusion and equality of opportunity and equity. Policy should give agency and build competence to practice this agency.

Strategies and actions for practitioners

Holistic (cognitive, social & emotional) well-being of young people and teachers in the digital era should be prioritized, to empower them to leverage emerging digital technologies in ethical and meaningful ways as part of teaching, learning and assessment practices.

Strategies and actions for researchers

Conduct research to understand the interplay between policy alignment, implementation and impact at scale for the new realities of schooling.

Actions from the TWG

Following the meeting in Kyoto, the group agreed to the following actions:

- Final EDUsumMIT 2023 report to be submitted by August 31 2023.
- Journal article to be developed for the Special Issue. Proposal to be submitted by August 31 and completed draft to be submitted for review by 15th Dec. All group members to contribute as authors.
- Possibly contribute to following symposia:
 - IFIP/OCCE Bournemouth, England, Feb 24 (ML, DB, TK)
 - SITE, Las Vegas, March 24
 - ECER, Nicosia, August 2024

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Thematic Working Group 7 - Future Learning Environment: Integrating Digital and Physical Learning Spaces

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Introduction

In Thematic Working Group 7 (TWG7), we explored the future of learning environments through theories, empirical evidence, good practices, and experiences during the great online transition (GOT) (Howard et al., 2022), to inform this evolving space. From this exploration, the aim of the group was to generate design principles for the field and implementation of integrated digital and physical spaces. This was a new thematic working group added to EDUsummIT in 2022 proposed by the group leaders, Jo Tondeur and Sarah Howard. The first step of this TWG was to gain some understanding of how we think about learning spaces. To capture our collective thinking, each of the group members completed a short questionnaire, including four open questions: 1) What do you consider a learning space?, 2) What's in the learning space?, 3) What are we doing in the learning space?, 4) How does space matter? These questions helped us to start thinking about learning spaces: what they are, what they do and why they are important. This was an important step in finding out what we thought as a group. Moreover, this guided us toward a stronger focus of our TWG. More specifically, in TWG7, we focused on the integration of the digital and physical learning environment in schools.

Next, we explored the 'state-of-the-art' in our specific research field. Each TWG member was invited to explore relevant literature, interesting empirical studies, great projects, good practices, etc. related to physical and digital learning spaces. This was an important foundation for our hybrid August 2022 [meeting at the University of Wollongong](#). Figure 7 presents a word cloud from the keywords we discussed about good practices.



Figure 7 TWG7 20220825, Online Whiteboard for Visual Collaboration (miro.com)

TWG7 has worked face-to-face, online, hybrid/synchronous or asynchronous, based on the principles of our TWG, integrating digital and physical learning environments. We began prior to the hybrid meeting in Wollongong and continue to do so. Figure 8 presents those TWG7 members who were able to make it in person to the hybrid meeting in Wollongong.



Figure 8 TWG7’s participants in the hybrid meeting in Wollongong

This two-day hybrid meeting gave us the opportunity to work across physical and digital spaces, as we evaluated the research and identified good practices. Between the Wollongong meeting and EDUsummIT in Kyoto, we held monthly catch-up meetings and asynchronous work in our online environment. We used Miro boards to capture individual and collective

thinking at each phase of the work. This data indicated the depth and breadth of the challenge we were undertaking. One of the final tasks for TWG7 was for each individual to bring one case study related to learning spaces to the EDUsummit meeting in Japan. Figure 2 presents TWG7's face-to-face participants in Japan.



Figure 9 TWG7's participants in Japan - EDUsummit2023

Moving forward to new educational realities in the digital era

New educational realities due to the GOT (Howard et al., 2022) - the global shift to online remote teaching because of the global COVID-19 pandemic - catalyzed a significant shift to the (digital) learning environment in all educational levels. The COVID-19 lockdowns have ended but significant questions remain about how to carry on with opportunities afforded through online learning spaces and associated digital tools, in ways that support student autonomy and flexibility in learning. In this respect, the pandemic has brought a great opportunity to not only consider the online space but to also reconsider physical learning spaces and to better understand the impact of learning environments. Given these changes, our TWG argued that it is time to revise the interplay between physical learning environments and the potential of digital learning environments adopted during the GOT (cf. Nortvig et al., 2020).

New educational realities

As stated above, education has undergone a rapid shift from face-to-face teaching to fully online remote teaching. When looking towards a post-pandemic future, educators are considering how new remote practices may evolve into a blended space, integrating the opportunities of both physical and online learning environments. However, this is not an easy process. Teachers have to decide what is being taught face-to-face and what can be learned in and/or through a digital space, and how these spaces intersect. They would be expected to redesign their online and physical space to support new learning experiences, but what are these and are they 'blended' or are they something else?

Key contributions of the TWG to the new educational realities

We argued that it is necessary to study the interplay between physical learning environments and the potential of digital learning environments. To do this, we propose employing a connected ecology approach to explore the learning environment (cf. Herman et al., 2021). This approach is informed by place, pedagogy, and design, exploring the richness of learning environments in the light of merging the potential of digital and physical learning spaces. This supports a holistic view of the learning environment and one that can include a range of contexts, actors and activities. Specifically, the TWG7 highlighted the necessity of aligning action at multiple levels in order to develop a knowledge base for the integration of physical and digital learning environments based on 1) a scoping review, 2) a set of cases that have highlighted the lessons learned and 3) design principles included in a conceptual model for integrating the physical and digital space.

The design of the space is central to effective learning and teaching. At the conclusion of the face-to-face session in Japan TWG7 created the Designing Teaching And Learning environments model (DTALE) see Figure 10. Outside the circle of the DTALE-model is the school culture and context. Inside the circle, teachers have the capacity to influence those elements. We present this model to guide K-12 educators on the use of space. The next section begins to unpack the key elements of the model.

DESIGNING TEACHING AND LEARNING ENVIRONMENTs MODEL (DTALE)

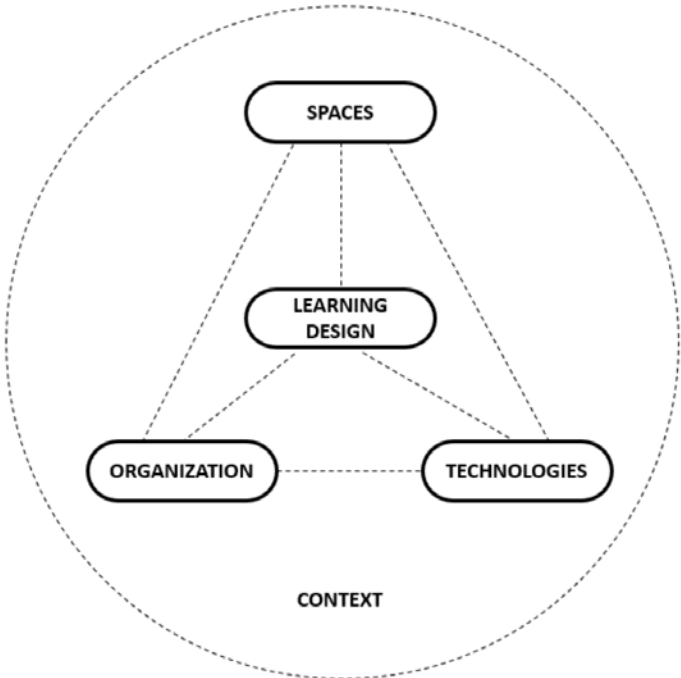


Figure 10 The DTALE-model for designing teaching and learning environments

Spaces

Initial notions of space were narrow, based on physical and built spaces like school buildings and tangible infrastructure (Tondeur et al., 2017). But these notions were widened to encompass increasingly open and digital spaces. In a broader view, spaces provide dimensions, points of reference and boundaries (Herman et al., 2021). From an applied perspective, spaces are essential to position and relate objects and processes. In education, learning spaces - either physical or digital - provide teachers and students with an environment where they can interact with learning objects, learning-related tools and with each other. Going beyond traditional school buildings opens notions of open spaces, shared spaces, third spaces, or the non-space. Spaces are increasingly conceived as flexible and hybrid. There are also mixed spaces, incorporating virtual and augmented reality. Broadening our concept of what learning spaces can comprise enables us to make learning more inclusive and accessible to students.

Technologies

Technologies are constantly changing. There are trends from static to more interactive, from 2D to more immersive, from desktop to mobile. More than 30 years of research indicates that technology can improve learning and teaching, but it is highly dependent on context and how it is used (Lai & Bower, 2019). Although there are numerous different affordances of different technologies, teachers need to be able to understand affordance requirements of tasks and technologies available to select and use appropriately. Effective use of technology might differ in different subjects, pedagogical approaches and for different students (cf. TPACK).

Organization

Organization has been defined as the way humans work together to achieve specific goals. Four aspects of organizational theory are key in educational contexts: Goals, structures, culture and context (Bush, 2015). The introduction and use of digital technology in the schooling context is altering these aspects such as how the school and teachers interface with parents, expectations of the use of learning management systems, organizational structures such as timetables or how students are grouped and the loosening of the boundary between the school and the wider community.

Learning design

Learning design concentrates on how to support students achieve learning goals through the way teaching and learning processes are organized and deployed. Designing a powerful learning environment requires the intervention and the mutual understanding of all components in the DTALE-model.

Context

In this TWG we focus on design of individual classes (micro) in the context of school environments (meso) in a larger education system (macro). The latter relates to elements such as state or national policies, funding, curriculum, laws, teacher education, professional development, or cultural aspects. Context also relates to microelements such as the nature of individual students, class compositions, prior knowledge, interests, motivational dispositions,

and so on. Evidence continually suggests that consideration of context is essential in the design of a learning environment (cf. Brianza et al., 2023).

Key insights from other TWGs

For teachers, the design of learning in new, hybrid, connected, digital and physical learning spaces places new demands on their competences, with clear consequences for teacher's professional development. TWG8 is focusing on teacher's professional development for technology enhanced and online education. Their insights about how to stimulate and support teachers to develop their agency and self-efficacy in this area, are directly connected. New forms of professional learning, in communities, with border crossing elements, experimentation and reflection (pedagogical reasoning) are needed. Next, there is also a clear link with TWG5: Learning beyond formal schooling: human-computer-human interactions in a digital inter-connected era. They point to the need to develop integrated and extended hybrid learning ecosystems that meld formal, informal and non-formal learning spaces through multiway digital connections.

Strategies and actions

TWG7 believes that policy, practice and research should necessarily inform each other and should work together this following section provides an overview of recommendations.

Strategies and actions for policy makers

Focus on organizational flexibility and funding for development of innovative learning design of new teaching and learning environments.

Policy-makers have the opportunity to formally recognize the contribution of innovative learning environments and spaces to the quality of learning outcomes by a) specifying an entitlement for all school children within their jurisdiction for access to digital and physical spaces in which to learn, b) providing requisite funding to schools to redesign spaces for effective hybrid/blended/digital teaching, and c) supporting professional learning to help equip teachers with the skills to effectively teach in blended physical-digital learning environments.

Strategies and actions for practitioners

Focus on communities of practice to design and support innovative teaching and learning environments.

Practitioners need to assess their capacity to teach in new hybrid/blended/digital ways and undertake a range of professional learning in order to provide themselves with the capabilities they need. Professional learning could be through formal training, but also through engagement in professional communities of practice, independent investigation, online courses such as MOOCs, and so on.

Strategies and actions for researchers

Focus on new multidisciplinary research methods that are design-based and embedded in practice to inform infusion and sustainability of technology, innovative teaching and learning environments.

Research is needed to understand the major issues and impediments to effective teaching in hybrid/blended/digital spaces, and effective strategies to overcome them. Research by Tawfik, et. al (2021) has provided a starting point for these investigations with respect to challenges for online teaching, but investigations of blended teaching involving both physical and digital spaces is underexplored. Research could also focus on the sorts of pedagogical design patterns (Laurillard, 2013) that are effective in hybrid digital and physical spaces, with particular emphasis on the role of the teacher.

Future Actions from the TWG

The members of TWG7 will continue their collaborative work. Firstly, we will elaborate on the preliminary model by analyzing the existing knowledge about the components of the DTALE-model based on a literature review. Secondly, we will test and refine the model by applying it on existing cases from different contexts. This will lead to a joint scientific publication of the model in 2024. Thirdly, we will validate and refine the model by means of Design Based Research in K12, with a specific focus on the creation of design principles and scenarios. Our goal is also to explore the cross-cultural relevance of the model and to explore the value for other educational contexts such as higher education, vocational education, and workplace learning. Clearly, this is a crucial point in time for significant change related to learning environments.

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Thematic Working Group 8 - Pedagogical Reasoning and Reflective Practice: Teacher's Professional Learning and Development (TLPD) in New Digital Realities

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Background

Since the last EDUsummIT in 2019, digital education has become a global priority and has shifted the attention of educators to the importance of teacher professional learning and development (TPLD) in and through affordances made possible through new digital realizations. The focus of our TWG was the exploration of pedagogical reasoning, reflective practice and their connections with professional learning and development.

In particular, three key concepts have underpinned our conversations and deliberations:

1. online education and the opportunities TPLD presents for considerations of pedagogical reasoning and reflective practice;
2. professional learning and development for educators (initial and continuing) in online environments (using affordances provided by new digital realities); and
3. professional learning and development for educators in hybrid environments.

Our work began online developing our ideas asynchronously and identified literature which revealed contemporary challenges and opportunities for TPLD that scaffolded our face-to-face work in Kyoto, Japan.

Moving forward to new educational realities in the digital era

As we continue to experience educational shifts with socio-cultural, political and technological contexts shaping and reshaping our conceptualizations of teaching and learning, members of Thematic Working Group 8 (TWG8) considered TPLD and identified 6 key drivers of such changes: Data; Digital transformation; Equity; AI; and Policy responsiveness and stakeholders.

These drivers have resulted in numerous changes but, in relation to TLPD, the following 10 key changes are most relevant: Ethics; New content areas; Context (social status / value); Pedagogy in new areas; Identity; New social-emotional challenges (e.g. Twitter); Process models; Workload; Autonomy / agency; and Accountability

We argue that these ten factors shape 6 key adaptations: New topics in teacher education; Reflective practices; Reflective tools; New forms of reasoning; New forms of professional learning; and Accountability.

As illustrated in Figure 11, members of TWG 8 argue that these drivers, changes and adaptations can collectively be considered when considering new models of teaching and learning.

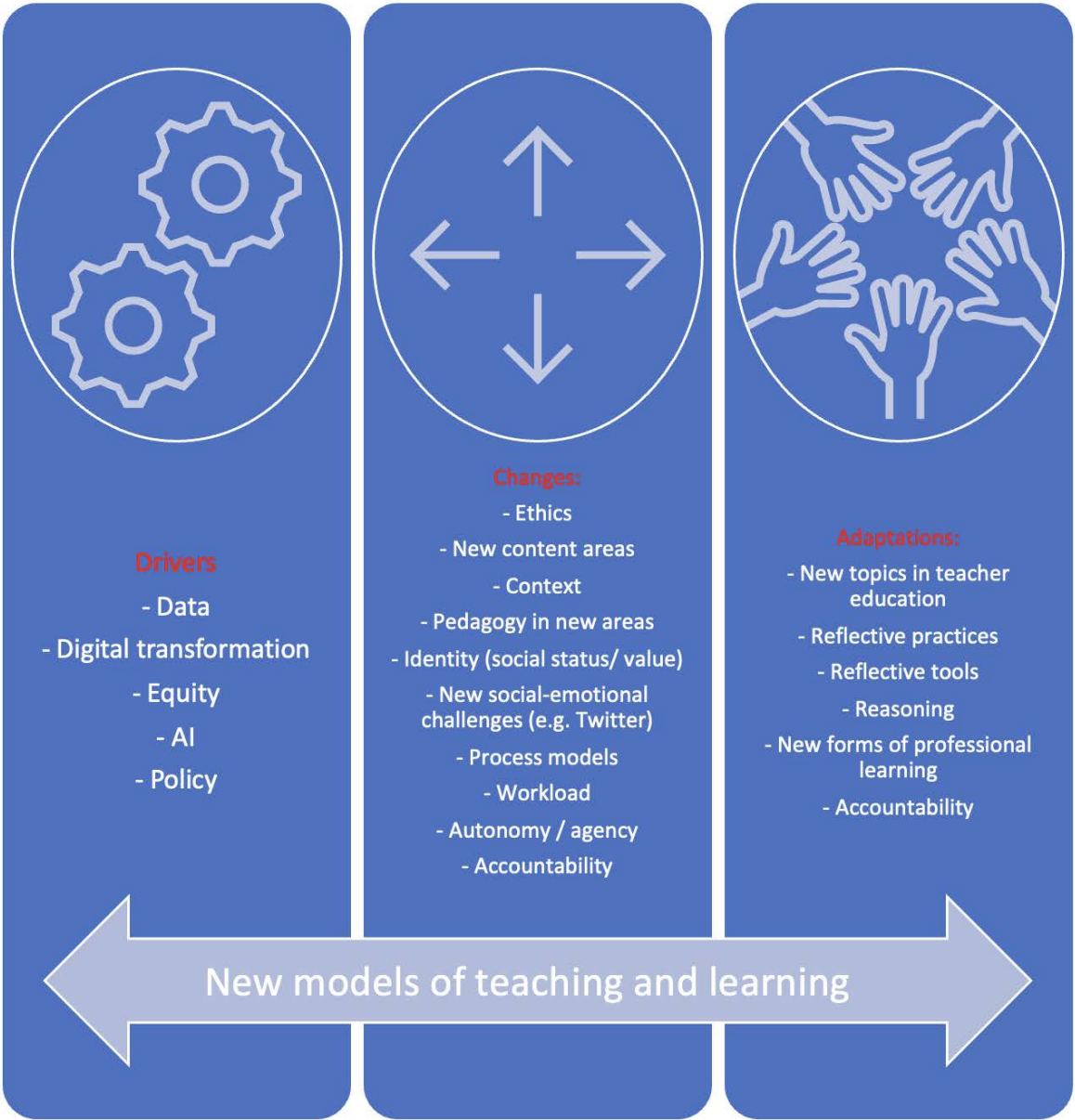


Figure 11 Drivers, changes and adaptations shaping new models of teaching and learning

New educational realities

COVID has impacted education in a range of ways including teachers’ identities, teaching and assessment practices along with their epistemological understanding of the content they teach. These realities have also been experienced by many as a result of conflict and geopolitical tensions in many parts of the world. These new realities have impacted teachers’ pedagogical reasoning and actions.

The (often pre-existing) challenges of effective educational technology integration have been made more visible at scale and have resulted in tensions around the use of educational technology - there are some jurisdictions that are moving away from educational technology use by teachers and students in K-12 and higher education contexts despite the fact that many students now have digital devices as a result of the pandemic. On the other hand, some jurisdictions are embracing various forms of digitization, such as AI, cloud computing, and learning analytics to enhance and extend teaching and learning processes. One of these jurisdictions is Japan under direction by their Ministry of Education (MEXT). The Chief Director of Education Planning with MEXT provided the conference delegates with an overview of this educational initiative which was in place in schools in Japan. The computer based testing (CBT) is designed with the goal to “improve teaching and learning processes through insights from the data collected in ubiquitous (both physical and virtual) learning environments” (Ogata, 2021, p. 6). The amplification of hybrid synchronous learning opportunities post-pandemic provides considerations for not only practice (teacher as pedagogue in contrast to the notion of teacher as data analyst) but also ways in which teachers develop their knowledge, skills and capacities to deliver effective learning opportunities in blended contexts but also impacts on the ways in which they can reason and reflect on their classroom practices. Similarly, AI also provides new opportunities for both teachers and students to participate in new ways of engaging with and developing content. However, these new opportunities also complicate conceptualizations of teacher identity, teacher decision making and what knowledge educators should or could be provided to enhance their reasoning and reflection. These new realities are often manifested in issues that include equity, privacy and challenges with reactive policy contexts that struggle to keep pace with technologies.

The role of educators has fundamentally shifted dramatically over a very short time period and teacher professional learning, which has often moved online, does not typically reflect the ways in which teachers may need to reason and reflect in these new contexts. Moreover, the evidence of the impact of instructional decisions in online and hybrid settings is difficult to quantify and the flow-on effect to professional learning to support the work of teachers in these contexts is a current global challenge.

We know from research (Howard & Tondeur, 2023, Pella, 2015) and our own experiences that this new reality can and often is countered by the thoughtful use of technologies underpinned by pedagogical reasoning, reflection and effective professional learning. However, contemporary theories of pedagogical reasoning and conceptualizations of professional learning are not always attuned to these new educational realities.

Key contributions of the TWG to the new educational realities

In the context of these new realities, TWG8 offers the following ideas as key contributions to the new educational realities identified above labeled with whether they are short or long term ambitions

1. The inundation of data means teachers need to be more data literate; however, the data needs to be more ‘literate’ about teachers and teaching. It is important to focus on ways to create better models that resonate with teachers (and their decision making and reflective practices) and with students and their learning. MEDIUM TERM AMBITION.
2. Pedagogical reasoning, the way educators think about their teaching strategies, is not an innate ability and exists on a continuum from less to more effective. The implication is

that teachers need to be educated about ‘what works and why’ and then tools for pedagogical reasoning need to be adaptive / flexible for different levels of pedagogical reasoning. MEDIUM TERM AMBITION

3. Create an “expert system” by teacher educator experts that guides teachers toward pedagogical reasoning through questioning (reflecting on their practices); examples might include reflection on practices related to teacher or learner centered practices. MEDIUM TERM AMBITION
4. Smarter AI has to be able to be trained on a model of pedagogical reasoning to make AI work better for educators. Additionally, educators need to be explicitly taught about AI to avoid potential bias and misconceptions around the use of AI for TPLD. LONG TERM AMBITION
5. Changing understandings of teacher identities by educators as well as the society at large. Historically, teachers have been required to have deep knowledge and competencies in a range of content areas. Technologies which allow new forms of collaboration (for example hybridity), networking, and data generation (for example AI) may provide opportunities for teachers to develop more specialist knowledge and capacities - and therefore their identities. LONG TERM AMBITION
6. Equity issues. Matters of equity and inclusion are at the top of many educational agendas. Matters such as gender, socio-economic background, immigrant status, and ethnicity continue to impact efforts in many jurisdictions despite considerable policy action. A concentrated, global effort is required to examine the measures that have worked to create a more equitable and inclusive educational system in different economic, cultural, and societal contexts. While this is not only a technology issue, we have seen the lack of access to digital resources create greater inequities. LONG TERM AMBITION

Boundary objects (Akkerman & Bakker, 2011) are one way that we consider addressing the challenges of TPLD in light of these new realities. Discussions have led us to the belief that such boundary objects should consider a range of characteristics which can be understood as a Champaca Tree metaphor in that it is said to have been the type of tree known to be used toto gain enlightenment. The following acronyms have characteristics used to demonstrate how boundary objects can be used in bridging TPLD and the new digital realities:

Community

Holistic

Multivocality

Privacy

Accessibility

Collaborative

Adaptability

Trustworthiness

Responsive

Equitable

Easy to use

To illustrate these characteristics and the ways in which boundary objects could be conceptualized, we developed four case studies and associated implications for researchers, policy makers and practitioners which are provided in full in the appendix. The first case study

includes the challenge of how to use the abundance of data in a meaningful way by teachers to improve learning. The second case study focuses on the need to provide ways in which preservice teachers are guided to use pedagogical reasoning and reflective practices in their use of technology for teaching. The third case study relates to the issues involved in technology driven personalized learning for students and the need to help provide professional development for their teachers. The fourth case study introduces tools that create a map of the pedagogical space that teachers use in a domain of practice with the idea of reflection on multiple areas of pedagogical reasoning. Each of the case studies includes suggestions for researchers, practitioners and policymakers to support the implementation of solutions to the challenges faced.

Key insights from other TWGs

The richness of multiple working groups sharing their insights with the other groups is the cross fertilization of ideas that offer awareness of ways to support the challenges discussed during EDUsummIT group dialog. The insights from three of the other groups that contributed to TWG8 include:

TWG 1: The AI issues that this TWG are exploring are closely connected to many issues associated with our theme including data privacy, ethics and trustworthiness.

TWG 2: The work undertaken by this TWG appears to be a particular case study of pedagogical reasoning and action with technologies. The discussions in TWG 2 mirror many of our own in which the affordances and limitations of technologies need to be carefully considered as part of effective learning designs.

TWG 6: Policies need to be responsive and adaptive to the development of new technologies. In contrast to slower, reactive policy making, there is a need for new conceptualizations of policies that allow for more immediate responses. Considering this in light of the insights from TWG 1 and the close connection with our TWG, this responsive approach is aligned with our discussions.

Strategies and actions

1. Develop participatory research and implementation of adaptable, context-based systems for making informed decisions, to foster a culture for professional learning and development, rather than evaluation.
2. Ensure that practitioners participate in the development and evaluation of data-based approaches to modeling teaching and learning that they can entrust, thereby promoting teacher agency.
3. Develop theories of teacher professional learning, pedagogical reasoning, and effective practice that consider new global educational realities involving new data, new practices and considering new roles and identities of teachers.

Strategies and actions for policy makers

- To better connect professional learning opportunities to contemporary theories of pedagogical reasoning that consider new educational realities;
- Actively support and recognize early intervention participatory research and implementation of adaptable, context-based systems for making informed decisions,

that will be used for teacher professional learning and development rather than evaluation.

Strategies and actions for practitioners

- Our new educational realities have developed new ethical challenges that require additional forms of decision making for contemporary practitioners;
- Participate in the development and evaluation of data-based approaches to modeling teaching and learning that they can entrust, thereby promoting teacher agency
- These data-based approaches need to become as useful and trusted as practitioners' current qualitative and grounded approaches.

Strategies and actions for researchers

- Develop contemporary theories of teacher professional learning, pedagogical reasoning, and effective practice that consider new global educational realities involving new data, new practices and considering new roles of teachers
- Create tools based on these theories that model teacher practice represented to enhance teacher reflection; and develop ways to code and model teacher practice (enacted and intended) quickly and accurately.

Actions from the TWG

To further extend the discussion that began in the working group even prior to the EDUsummIT in person meeting, members of the group will submit a symposium to international conferences such as the Society for Information Technology in Teacher Education (SITE) to continue seeking input from other researchers, practitioners and policymakers as well as disseminate the outcomes from the working group. In addition, members will contribute to a special edition of an international journal providing more in depth information on the topic of pedagogical reasoning and reflective practices for the new digital realities with the goal of providing implications for practice in teacher education.

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Appendix

Case Study 1

A secondary school teacher has been reading about the proliferation of data and wants to begin to use data about her students to help her make informed decisions about her educational designs and teaching practices. The problem is that she doesn't know what data is available for her and how to access it. Moreover, if she was able to access data, how would she interpret the data and then use it to inform her designs and pedagogy?

In response, comprehensive data sets curated by policy makers would need to be made available [**trustworthiness**] to other stakeholders including practitioners and researchers. In addition to this (typically) historic data, additional data from the teacher could be combined with the data from policy makers in a digital system that utilizes AI to present a comprehensive picture of a student (or group of students) [**privacy**]. The teacher is able to filter different data sets that contribute to the picture of the student [**responsive**] so that she is able to best determine what pedagogical moves to then make.

The system prompts the teacher to enter some data about her intentions and follows up with a prompt to input a brief evaluation of the effectiveness of the pedagogical decision. The AI can then be trained to provide suggestions about future planned pedagogical moves together with data about the future students in a teacher's class [**adaptability**] that she can then use as part of her pedagogical decision making. Ultimately, the tool could then make pedagogical suggestions for individual students [**equitable**].

The system would have to be dynamic: a) learn the students and the teachers; b) allow teachers to insert their own input; c) allow teachers to collaborate in viewing decisions of colleagues and sharing their decision-making [**collaborative**].

Researchers, practitioners and policymakers would need to be involved at various stages of the process including the design, construction and evaluation of the tool. Policy makers would also be involved in the curation and storage of student data and promotion of use of the tool.

Case Study 2

One challenge for preservice teachers is the inability to elicit their reasoning for the practices they use in the new digital realities. Often their pedagogical identity may be based on what they have seen from their schooling experiences or those of their instructors. However, they are typically not required to reflect on these modeled practices. This in turn may lead to the realization of teaching pedagogies that are less than optimal for student learning. What are strategies and tools that can be created to enable preservice teachers to reflect on their practices that lead to developing their own pedagogical identity?

In the past few years, technology has advanced at a rapid pace. Many of the current preservice teachers' experiences in schooling did not include the current digital realities [**accuracy**]. It is more critical than ever to elicit pedagogical reasoning and reflection on how educators are selecting and implementing technology tools for learning.

Boundary objects have been shown to provide potential learning through elements such as coordination, reflection and transformation (Akkerman & Baker, 2011). A boundary object that could assist pedagogical reasoning “improvement’ is the creation of a digitally assisted space that provides structure for eliciting reasoning and reflection [**holistic**]. The digital space may be based on an expert system or it may evolve into AI assisted feedback. Ideally, it would include teacher educators as participants along with preservice teachers, providing different perspectives and levels of expertise on the issue [**multivocality**]. In any case, it should be an iterative process to foster continuous professional improvement of anyone involved. Some possible ideas for the digitally assisted space may be the use of videos depicting different types of teaching or an educator simulation designed to provide immediate feedback.

Implementation strategies

An important element for implementing this boundary object is to set clear and negotiated expectations that guide the consideration of teacher pedagogical strategies [**responsible**]. Providing the opportunity for ongoing journaling on what preservice teachers are learning through their initial teacher education (ITE) will allow them to see how their practices changed over time [**easy to use**]. Preservice teachers should work in collaborative groups [**community**] to share the feedback and compare pedagogical reasoning strategies thus creating a **communicative** channel between people and with technologies. In such contexts, the clear aim would be to elicit and improve their pedagogical reasoning in digital realities, without any judgment component on participants’ pedagogical identities [**trustworthiness, privacy**].

The feedback provided by the digital system would provide prompts for inquiry [**adaptable**]. They would be tailored to the material at stake and to the discussion in place with peers, educators and the system itself [**equitable**]. Examples of prompts include questions such as: what did you see in the instructional activity regarding pedagogical practices? Was the goal achieved? Why is what you see relevant? How does this connect to your idea of learning? How could it be improved?

If this evolved from an expert system into an AI system, the system would need to become more personalized for each preservice teacher [**responsive**].

Next steps

Researchers – How might this object look in practice? What impact does the boundary object have on pedagogical reasoning and reflection?

Policymakers – College level – Administrators/leaders need to recognize the value and need for pedagogical reasoning and reflection to improve teaching and learning; create shared vision in the college

Practitioners – Teacher educators model practices; enter learning community with preservice teachers to provide example of transparent pedagogical reasoning [**transparency**]; elicit feedback from preservice students on how your teaching pedagogy impacts their learning

Case Study 3

Scenario

In Japan, MEXT has introduced one device for one student. Students are provided with AI to provide them with real-time feedback on their learning. The dashboard consists of students' engagement, which is determined by how long the student spent in learning, and outcome scores. The feedback also provides the student with information regarding errors they have made and monitors where students get stuck. They can also provide a reflection on their learning. This information is available to students so they can monitor their progress in learning and is also available to teachers to inform their practice so they can take remedial action. AI is built into the system to recommend to the student quizzes and subsequent questions based on where the student's learning is at. Students stated that the quizzes are always changing based on the student's responses. They reported that they felt like their learning was being monitored; however, they did not express this as a negative emotion.

A similar environment was proposed for teachers to strengthen and improve their teaching practice, i.e., using their practice as the site of continuing professional learning. It would allow them to engage in critical reflective practice. Some teachers embraced this opportunity to adopt this new reflection and learning environment which includes engaging in pedagogical reasoning and critical reflection with colleagues, while some teachers were hesitant as classroom teaching has been a fairly private profession.

Issue/challenge

The challenge is to encourage more teachers to try the new environment as a way to engage in continuing professional learning through pedagogical reasoning and reflecting on practice with colleagues to improve and strengthen their teaching practice.

The issue is that teachers have expressed hesitancy and some fear about being monitored. Some teachers hesitate sharing their practice with their colleagues as they are afraid to expose their teaching as they feel it might lead to criticizing and evaluating them as teachers.

Tool/Processes (boundary object (Champaca Tree))

In response, the environment itself would have to allow teachers to select their own communities of colleagues [**community**] through processes of invitation which are within the teachers' control. It would need to be created so that all teachers, regardless of their teaching practices [**multivocality**], grades or subjects taught could participate [**holistic**]. It would also need to adapt to encompass a range of expertise and experience from a beginning teacher to a master teacher [**holistic**].

Policy makers would need to ensure the environment was used exclusively for the purposes of professional learning and not for teacher evaluation [**trustworthiness**]. Additional data from the students' learning taught by the teacher could be combined with the teacher data to support the teacher basing their pedagogical reasoning on evidence from the students' learning as well as their teaching [**privacy**]. Teachers and students would also need to be able to have the ability to opt out of the sharing of data [**privacy**]. Students would need the option of anonymizing themselves so they are not identifiable to the teacher; however, their learning

would be available so the teacher can engage in pedagogical reasoning and critical reflection to guide their own learning [**privacy**]. The teacher should be able to filter different data sets that contribute to the picture of the student [**responsive**] so that they are able to strengthen and improve their pedagogy.

As the teacher engages in pedagogical reasoning, the system would prompt the teacher with questions based on discussions with colleagues [**collaboration, community**] and their personal reflection [**responsive**]. The AI can then be trained to provide suggestions about future pedagogical moves [**equitable**], informed by the research literature [**accuracy**], which they could use to learn, develop, and inform their next pedagogical moves [**adaptability, responsive**].

Researchers, practitioners and policymakers would need to be involved at various stages of the process including the design, construction, and evaluation of the tool.

Policy makers would be involved in the curation and storage of teacher data, promotion of use of the tool, and assurance that tool would not be used for teacher evaluation.

Researchers would need to study how teachers experience boundary objects, how engaging with colleagues in pedagogical reasoning in the presence of student learning and research literature improves and strengthens their pedagogical reasoning and pedagogical practice.

Practitioners would need to encourage themselves to be open to share their practice, to trust themselves, and trust the tool to engage in the process of ongoing professional learning, pedagogical reasoning, and critical reflection in the company of their colleagues.

Case study 4

The PIE (Policy<->Intention<->Enactment) Reflection Tool

This scenario is in the following parts:

1. A description of the PIE Tool

The PIE approach leverages addresses the new digital reality of teaching in the context of large amounts of fine-grained data on teaching practices, particularly (though not exclusively) in online contexts.

The driving vision of PIE is the concept of *alignment*:

1. That teachers should be able to understand the ways in which their teaching plans (intentions) do (and do not) align with policy documents that define the pedagogical expectations of their teaching context;
2. That teachers should be able to understand the ways in which their enacted teaching aligns with those plans;
3. That teachers should be able to investigate whether and how their enacted teaching varies for specific students or groups of students in their classes; and
4. That teachers should be able to understand the ways in which enacted teaching aligns with students learning outcomes.

The mechanism is PIE is a tool (or set of tools) that can create a map of the pedagogical space (including socioemotional, content, and methods) that teachers use in some domain of practice (for example, one subject in one grade level). The PIE tool would allow teachers to create such a map for:

1. The policy documents and standards of their local context;
2. Their own lesson plans and other planning documents;
3. Their own teaching practice based on recordings (in whatever format) of their classroom practice (e.g. transcriptions of Zoom lessons);
4. Student system-level outcome data.

The PIE tool could show the ways in which any two of these maps are similar or differ, both for the teacher’s practice as a whole, the teacher’s practice as it relates to some specific student or group of students, and comparing to aggregate anonymized maps that other teachers choose to share.

The result would be a tool that gives teachers a visual and mathematical representation of their teaching practice in the context of their own pedagogical intentions, the broader expectations for their teaching context, and the teaching intentions and enactment of their peers – and to do so in ways that can highlight gaps, inequities, or issues overall or in respect to specific groups.

Teachers could anonymously share these maps with other teachers, as well as post non-anonymized maps with reflective commentary and other materials.

The PIE tool could thus serve as a boundary object that lets teachers see how their practice evolves over time and relates to changes in expectations over time. For example, a teacher could see how their lesson plans align with an existing set of curricular standards and then see how that alignment differs from some new set of standards. (Not to mention, compare the two sets of standards!)

Example maps for two different subject-level standards:

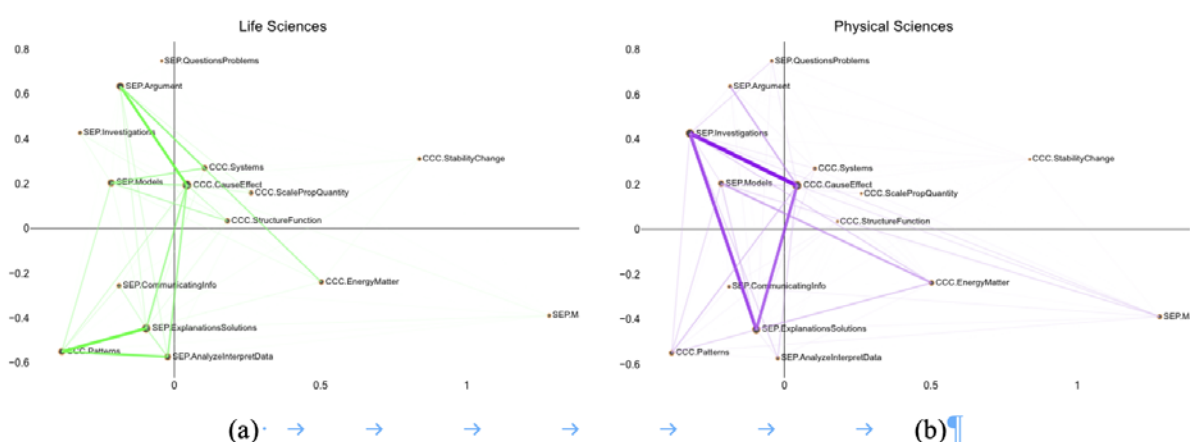


Figure 4.8. Network representations of life sciences (a, green) and physical sciences (b, purple). Thicker lines represent more frequent connections.

2. A description of the framework for teachers to use PIE as a reflection tool

MOOC with the following components:

1. Video tutorial explaining the functionality of the PIE tool
2. Video tutorial explaining the practical use of the data
3. Tool for using the data (visualization included)
4. Examples of data to practically apply the competencies acquired in component 2, if needed (own data can also be used directly)
5. Political documents that define the pedagogical expectations of their teaching context to understand the ways in which their teaching plans (intentions) do (and do not) align
6. Examples for lesson plans and other planning documents (own documents can also be used directly)
7. Reflection cards (questions along the framework that encourage reflection on one's own actions)
8. Board where teachers can share their experiences with each other. On the one hand, practical challenges regarding the use of data can be discussed here. On the other hand, teachers can share how they have practically used the data to further develop their teaching.
9. Maps from the teachers with reflective commentary and other materials.

Thematic Working Group 9 - Social and Emotional Aspects in New Modes of Learning with Digital Technologies

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Introduction

On a global level, there is a growing concern about the social and emotional well-being of children and youth growing up with digital media as an integrated part of their everyday lives, and how these digital transformations influence young persons' learning and development. Especially during the last five years, the topic of social and emotional aspects in new modes of human learning has become an important issue of research, policy and educational practices. Social and emotional aspects of learning are of course not new within educational research. However, the developments of digital technologies have raised awareness of the importance of what is often referred to as well-being (or mental health) in addition to more cognitive aspects of learning. At the same time these developments of social and emotional well-being with recent technological developments, especially concerning social media, point towards new modes of learning and conceptions of future developments of education.

Children and adolescents need a balanced set of cognitive, social and emotional skills in order to succeed in modern life. *Cognitive skills*, including those that are measured by achievement tests and academic grades, have been shown to influence the likelihood of individuals' educational and labor market success. They also predict broader outcomes such as perceived health, social and political participation, as well as trust. In turn, *social and emotional skills*, such as perseverance, sociability, self-esteem, responsible decision-making, and self-awareness have been shown to influence numerous measures of social outcomes, including better health, improved subjective well-being and reduced odds of engaging in conduct problems. Cognitive and socio-emotional skills interact, cross-fertilize, and empower children to succeed both in and out of schools. For example, social and emotional skills may help children translate intentions into actions, and thereby improve their likelihood of graduating from universities, as well as follow through with healthy lifestyles and also prevent engagement in aggressive behaviors.

In this chapter we will introduce some key points and issues as reflected in recent literature in this field. Next, we will address key discussion points from the social and emotional learning (SEL) thematic working group that met in Kyoto for EDUsummIT 2023. The last section will highlight some strategies, actions and outcomes from this work.

2. Social and emotional aspects in changing societies

2.1 What is the nature of childhood today?

Compared to former generations, children growing up today are experiencing fundamentally different ecosystems and conditions for learning and development. *“Modern children’s lives have changed on a number of measures, often for the better. They have an array of digital tools to creatively express themselves. There is increased awareness of mental health issues, and support from loved ones is often only the touch of a button away. But children are also facing new challenges. They are reporting less sleep and more stress. Many children have a digital footprint before they can consent to it – sometimes even before they are born. Old threats take on new complexions in the digital world, like cyberbullying”* (Burns & Gottschalk, 2019, p.3). Dis-information and fake news are also emerging challenges. According to J.M. Twenge (2017, cited in Bono et al., 2020), high schoolers struggle with loneliness, depression, and anxiety, “their sleep and social skills are compromised, and the road to adulthood is longer, more competitive, and more uncertain than ever.”

According to the OECD report published in 2021, at the core of many of these facts are digital technologies and **environments that impact all aspects of young persons’ everyday lives** including ineffective and dysfunctional parenting, family pressures on the child to be successful in school, and trying to stand out in front of friends (e.g., on social networks). All of this and much more has an impact on what defines childhood and youth in contemporary societies. In this respect, social and emotional aspects of using digital technologies are of utmost importance in understanding the nature of childhood and youth today, and how young people are engaged in processes of learning and society development. We all live, learn and work simultaneously in a real and digital world. This opens up **new opportunities and modes of learning** for which the social and emotional aspects of learning are an integral part. Also, the interrelationship between formal, non-formal and in-formal ways of learning are closely related to social and emotional aspects of learning.

2.2 An analytical framework

From an overall perspective - everything around us changes, and sometimes very **quickly** and quite **unexpectedly**. Political and economic instability in some countries multiplied by global environmental problems in the world may give the impression that the future is **uncertain**. All of this is projected in the ways people conceive of themselves and their own social and emotional well-being. The term well-being could be operationalized in a variety of ways. In this study well-being is referred to psychological flourishing, life satisfaction, happiness, or finding meaning in life (Howell et al., 2016 cited in Chaves, 2021, p. 275). As part of such change processes, we also see indications that family models are changing, as well as the ways in which one communicates with other people, and how one establishes partnerships and friendships. We are experiencing cultural transformations that have an impact on social and emotional aspects in new modes of learning with digital technologies. Learning is here understood in a broad sense as humans involved in socio-cultural transformations. We perceive that existing education systems are not sufficient to respond to the changes taking place in society. However, not only knowledge is important for human life, but also people’s approach to life and their ability to adapt to changes.

The main attention of politicians, policy makers, economists, and businessmen is devoted to issues of ensuring economic growth. Nevertheless, “emerging research suggests that an emphasis on economic growth as a key measure of human well-being, at the expense of subjective and other forms of objective well-being, is a primary contributor to the increasing prevalence of unhappiness, insecurity and poor interpersonal relationships.” (Duraiappah et al., 2022, p.54) Other authors come to similar conclusions, such as C. Chaves (2021). All over the world, educational systems generally focus mainly on the development of cognitive skills. Until now, they have not paid enough attention to mental, social and emotional well-being. "Moreover, the conceptualization of childhood mental health has traditionally been focused on treating the symptoms once they have already appeared." (Chaves, 2021, p. 274) One might therefore ask the question; “Should the goal of education be to develop human flourishing, or should it be to meet the demands of ‘homo economicus’?” (Duraiappah et al., 2022, p.5)

The TWG9 has developed a model (Fig. 1) adapted from Burns & Gottschalk (2019). Using this model could help to elaborate on some key areas in understanding the importance of social and emotional aspects to learning and development using diverse digital resources and environments.

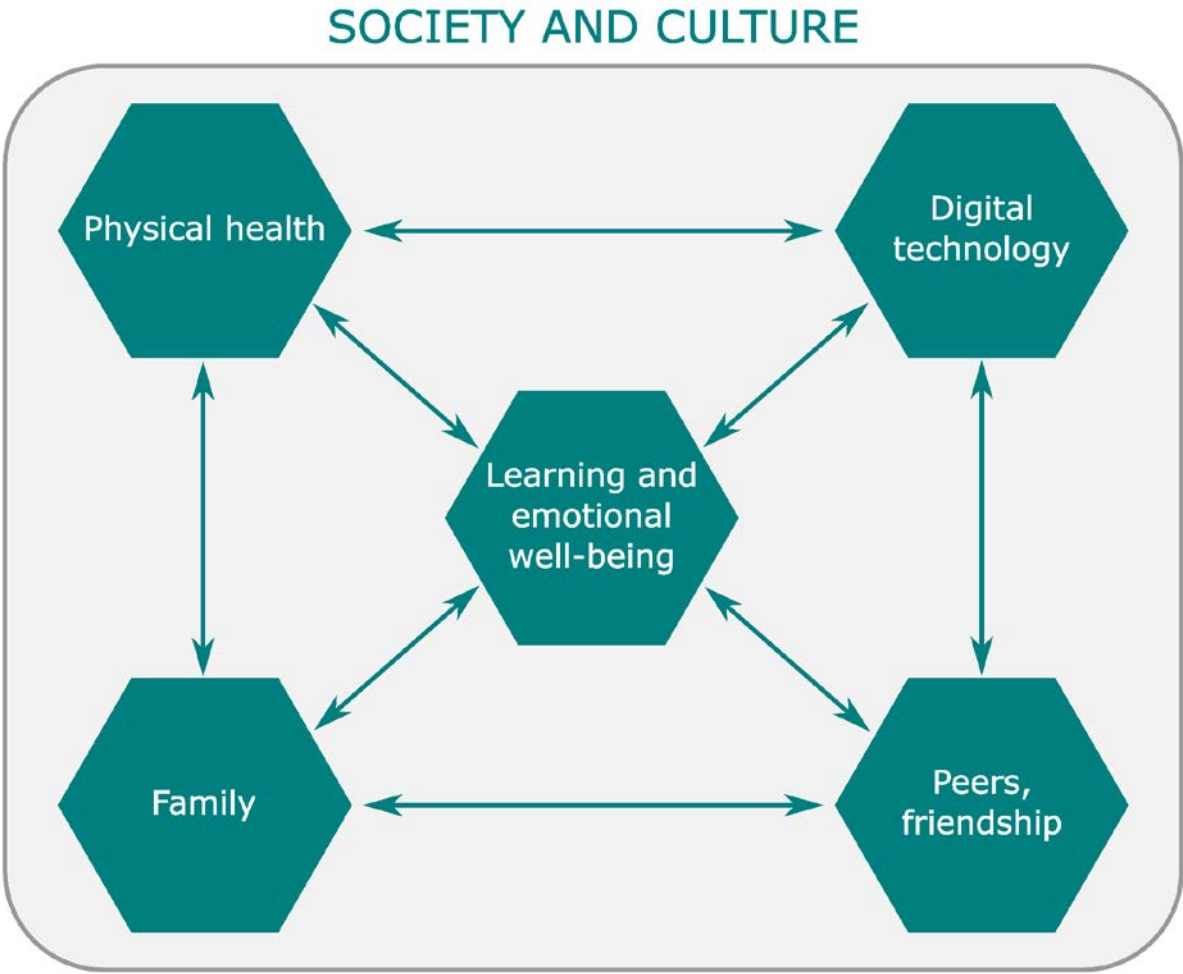


Figure 12: Key areas of consideration for enabling children to flourish in the 21st century (adapted from Figure 1.1 in Burns & Gottschalk, 2019, p.20)

A human's education, his/her emotional development, concepts and ideas about happiness and flourishing take place in a particular social environment (usually in the family, in the environment of an educational institution, in communities of people, etc.) that is part of a particular historically given cultural environment, a social system. These social systems have been instrumental in shaping the framework of educational institutions based on different cultural and religious approaches. Thus, alongside each other, there are dominant Western concepts of upbringing, approaches by African natives to the upbringing of their offspring, upbringing in accordance with religious ideas of Islam, etc. Key factors influencing social and emotional aspects in new modes of learning for 21st century children using digital technologies are society and culture, digital technology, family, peers, friendship, and physical health (see Figure 12).

- **Society and culture:**

Framing questions of social and emotional skills and competences are social and cultural indicators. As described above, societies around the world are transforming in fundamental ways, and these changes impact young peoples' learning and development. As such, social and cultural developments are influencing each of the other indicators in Figure 12.

As previously mentioned, a large number of people live in oscillating uncertainty. Insecurity has settled into our personal lives, work, surroundings, and futures. Political sentiment is changing rapidly, climate change is becoming apparent, the economies of a number of countries "are in motion" and labor market demands are changing. "Current young generation is 'fragile', taking setbacks and failures catastrophically. This generation seems to be more anxious than their parents were. Socially and globally, it is a response to uncertain futures and uncertain boundaries in who I am, what lies ahead and who I will be." (Farná, 2023).

The culture in which we live and which shapes and influences our emotions and social relationships is a combination of the real world and the digital world. We can walk through real museums, admire art artifacts, but at the same time we can view them and study them thoroughly in virtual galleries. We can live artistic experiences in concert halls, but we can also listen to music created by AI. We can read multimedia interactive materials, but also experience stories and learn by reading printed publications. It turns out that a sensible balance needs to be found in developing skills in digital and real world environments. It will be necessary to design new teaching guidelines on how to teach young children to read and lead them to read from an early age so that they are able to read and to develop their cognitive and emotional skills (e.g., recommendations of M. Wolf).

- **Digital technology:**

Nowadays, digital technology is the main indicator influencing social and emotional skills of contemporary children and young people who spend a relatively large amount of time using technology and interacting in the digital environment. Increasingly, at an early age young children are becoming accustomed to technologies as part of their upbringing, in play and learning. This level of familiarity has implications for development and trajectories of learning, and for children consequently becoming active, involved citizens of the world. (Baruch & Erstad, 2018, p. 377). On the other hand, technology allows children to learn new things that the school cannot and even is not able to teach them.

We have become accustomed that technology, media and social networks make it possible for us to follow events almost immediately in any part of the world (wars, conflicts between nations, natural disasters, successes and failures in different branches, life-stories of people, etc.). Quick access to such information can influence our social-emotional relations to other people, our **approach to life**, what we will do or not do, or how we will think about our future, and so forth. On the other hand, as already mentioned, “digital technology is creating new worlds, where the lines between the real and the imaginary are harder to discern.” (UNESCO, 2023, p.23)

Children and young generation adults learn and experience a number of things not only at school but especially outside of school through digital technology. They often find that the school is unable to assess their actual knowledge and skills adequately, and they are very sensitive to how their learning outcomes are evaluated in schools. School assessment evokes many emotions among schoolchildren and in their families. It has a great impact on pupils’ relationship with school and **motivation to learn**. A majority of schoolchildren spend a lot of time with digital technology **playing games** or in activities that are very similar to games. In such cases, they learn a number of skills with a pleasant experience and in a good mood. However, learning through play using digital technologies, is quite often missing in a school education. As Jack Buckley et al. show, “recent advancements in digital technology could lead to a new generation of game-based standardized assessments and provide education systems with feedback on students’ higher-order or socio-emotional skills that are difficult to assess via traditional standardized tests, be they computerized or not.” (OECD, 2021, p. 23) Certain types of games can be used also to identify stress, psychological tension, and aggressive behavior in a person. For example, using a catch-ball game task, the relationship between anxiety and aggressive behaviors such as bullying is being revealed, as well as its neural basis (Takami & Haruno, 2023).

Given the contemporary significance attributed to the **social-emotional dimensions of learning**, the adoption of group learning designs has become increasingly pervasive nowadays. An illustrative example of how digital technology can significantly help teachers in school contexts is the implementation of an intelligent group formation system. This system encompasses a parameter configuration module that incorporates learning data from multiple data sources, alongside a visualization panel displaying the outcomes of the formulated groups, which are further accessible for assessment by users (Liang et al., 2021, p.1). The application of such a system was presented in Kyoto in TWG9 by C. Liang, who also served as a co-author for the empirical study aiming, among other things, to explore the influence of computer-formed groups on the emotional states of students engaged in group activities within a fifth-grade mathematics class in a primary school setting in Japan. Computer-created groups considering intimacy and imbalance of knowledge proved to have more positive affections during the group learning process.

Digital technology can play a key role in social and emotional aspects within education, including special needs education. “Technology enables students with special needs to participate in education and to make inclusive education a reality. With applications such as speech-to-text, text-to-speech, and auto-captioning, etc., AI allows blind, visually impaired, deaf and hard-of-hearing students to participate in traditional educational settings and practices. Some smart technologies facilitate the diagnosis and remediation of some special

needs (e.g., dysgraphia) and support the socio-emotional learning of students with autism so they can more easily participate in mainstream education.” (OECD, 2021, p. 14)

Fundamentally new possibilities for education and training are presented by AI-based technologies. For example, at one public primary school in Shanghai that is integrating AI in its school resource management as well as its teaching and learning, “socio-emotional aspects such as learning engagement and affective states are measured by voice and face-recognition technology. A “digital teaching” system provides teachers with support on five aspects of teaching: lesson preparation, classroom orchestration, homework, tutoring and evaluation – with functionalities such as “classroom orchestration”, “intelligent assessment” and “intelligent homework review”. (OECD, 2021, p. 24)

In the years 2020-2022, the Covid-19 pandemic affected practically the entire world, and school education at all levels was organized in an online environment. During the Covid-19 pandemic there were many serious downsides as side effects, from screen fatigue and adaptation stress to the falling behind of those ill-equipped for digital learning or unprepared to learn on their own. During the pandemic, **the experience with using technology for on-line education has catapulted education systems**, traditionally laggards when it comes to innovation, years ahead in what would have been a slow improvement towards smart schooling.

- **Physical health:**

All over the world, researchers, medical doctors, and parents are watching with concern whether and to what extent the young generation's interest in activities with digital technologies has an impact on their physical health. “There is an urgent need to better understand the relationship between physical well-being and digital technologies.” (Burns & Gottschalk, 2020, p.17)

Statistics show that children's sleep time is not long enough and is getting shorter. At the same time, it is children and young people who need enough sleep for their healthy development. **Sleepless** children are irritable, inattentive, and long-term sleep deprivation often manifests in the form of low intellectual performance, depressive states, and conflicts with peers. Teenage studies point to more frequent suicidal thoughts in those who sleep less than appropriate.” (Slussareff, 2022, p. 218) Some research highlights a link between sleep shortening and the use of digital technologies. Lack of exercise, sleep and inappropriate eating habits translate into another risk phenomenon – that of children being obese.

- **Family**

During the last two decades family structures and relationships have changed. At the same time we know that “stable and positive relationships with parents and teachers are essential for improving children's well-being and social and emotional skills.” (Burns & Gottschalk, 2019, p.22) “Socialisation and relationships have a significant impact on one's life and well-being. Families play a huge role in children's cognitive, developmental, educational, labour and health outcomes, particularly at the youngest ages.” (Burns & Gottschalk, 2019, p.23) Unfortunately, many children do not grow up in harmonious family backgrounds.

In developed countries, children are increasingly born to elderly parents. “Older, better educated parents are increasingly advocating for their children and playing an active role in their education.” (Burns & Gottschalk, 2019, p.18). In connection with digital technologies and the care of parents for their children, a new term appears in helicopter parents “who hover over their children to protect them from potential harm.” (Burns & Gottschalk, 2019, p.18). There are signs of new stresses in children. There is also a lot of **pressure from the side of their families on kids to get ahead in life**, to succeed, to manage everything. And also, “parental anxiety over “screen time” has grown as even young children are engaged with smartphones and tablets. One 2018 survey indicates that it is the number one parenting concern in the United States.” (Ito et al., 2020, p. 23)

- **Peers, friendship**

Children spend a lot of free time with technology. If earlier it was common to play with friends outside, on the playground, on the street, now they communicate with their friends via mobile phones and social networks. “There are worries that children are spending less time on old-fashioned activities like running around outside in favour of time in front of a computer screen.” (Burns & Gottschalk, 2019, p.18) “Previously, so-called street socialization took place. The children in those batches were entering a natural hierarchy where they had to earn a position while respecting the position of others. They learned the strategy of social behavior in a tougher but natural way. They've learned to understand that creating a relationship is hard work. We now make them into little demigods, taking them from circle to circle, expecting them to excel in all of them. We take care of them so they don't happen to bump into each other, we don't give them an opportunity to figure things out for themselves. And so we don't give them the opportunity to develop a natural respect for authority.” (Eva Opravilová interviewed in Smejkalová, 2015) Nowadays, most young people make friends through digital technologies. For example, even before the Covid-19 pandemic in the USA in 2015, “for today’s teens, friendships can start digitally: 57% of teens have met a new friend online. Social media and online gameplay are the most common digital venues for meeting friends.” (Lenhart, 2015)

- **Emotional well-being**

Well-being is a multidimensional construct covering anything from cognitive appreciation of one’s satisfaction with life up to subjective, highly affective experiences of happiness. It can be seen as an umbrella term of the two central concepts happiness and flourishing. (Duraiappah et al., 2022, p. 339) All the indicators mentioned above also relate to issues of emotional well-being that is according to Burns and Gottschalk (2019, p.22) “crucial for our daily lives and overall well-being. Childhood and adolescence are critical neurological developmental periods and nearly one in two mental health problems among adults begin by age 14.”

The World Health Organization’s (WHO, 2004) World Mental Health Survey revealed “a huge variation in the prevalence of mental illness with disorders worldwide affecting from 6% to 27% of individuals in the countries surveyed.

Before Covid-19, on average across OECD countries the following trends in emotional well-being have been identified:

- The rates of suicide among 15-19-year-olds declined from 1990 to 2015, though there were significant exceptions in countries like Korea, Mexico, and New Zealand.
- Instances of bullying and physical complaints such as headaches, stomach aches, and dizziness did not show a notable change.
- There has been an increase in reported cases of depression and anxiety, alongside a decrease in overall life satisfaction. (Burns & Gottschalk, 2019, p.22)

A more recent survey (WHO, 2017) on the mental health status of South Asian adolescents aged between 13 and 17 years found that 10% to 20% of adolescents had mental health issues including anxiety, depression, self-harm and suicide. (Duraiappah et al., 2022, p.54)

The Covid-19 pandemic has changed the situation with emotional well-being. “In the first year of the COVID-19 pandemic, global prevalence of anxiety and depression increased by a massive 25%” (WHO, 2022a) Children and young people have missed out on learning and socializing. (WHO, 2022b) “Depression, anxiety, isolation, and decreased social support associated with the coronavirus disease 2019 (COVID-19) pandemic and related lockdowns have likely contributed to increased suicide risk in youth.” (Bridge et al, 2023)

Idelji-Tehrani et al. (2023) draw attention to research studies that “have demonstrated negative impact of digital technologies on psychological well-being, neuro-cognitive development, depression and anxiety symptoms, and self-harm and suicidal ideation.” “Using general population data, Orben and Przybylski (2019) found a small but negative association between digital technology use and adolescent well-being. A recent update demonstrated that there may be windows of sensitivity to social media in adolescence, where higher social media use predicts lower life satisfaction. These windows occur at the age of 11-13 years for girls, 14-15 years for boys and 19 years for both boys and girls.” (Idelji-Tehrani et al, 2023, p.338) It turns out that young digital users themselves feel some of the negative effects of technology on how they feel: “32% of 17–19-year-olds have reported that the Internet has a negative impact on their mental health, and there is burgeoning research on vulnerable groups and a spectrum of online risk beyond simply the amount of time spent on screens. Children and young people who are particularly vulnerable online include those with family difficulties, disabilities, mental health difficulties, emotional/behavioural difficulties, and neurodevelopmental disorders; as well as marginalised and disadvantaged groups (including children involved in gangs and young carers).” (Idelji-Tehrani et al, 2023, p.339)

3. Moving forward to new educational realities in the digital era

In a majority of countries, much attention has recently been paid to issues of **well-being**, particularly in the context of education. During TWG9 discussions at EDUsumMIT2023 in Kyoto, the focus was on the concept of **flourishing** and of **social emotional learning (SEL)**, as introduced in the keynote address by A.K. Duraiappah, a Director of the UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development, and one of the authors of the UNESCO publication (see Duraiappah et al., 2022). Director Duraiappah was also a member of TWG9. Human flourishing can be understood “as an effort to achieve self-actualization and fulfilment within the context of a larger community of individuals, each with the right to pursue their own goals.” (Duraiappah et al., 2022, p.47) “Most importantly, we now have the scientific evidence to support and enable the cultivation of flourishing in human beings.” (Duraiappah et al., 2022, p.56) SEL “can be broadly defined as the process of acquiring

the competencies, skills and/or attitudes to recognise and manage emotions, develop caring and concern for others, establish positive relationships, make responsible decisions and handle challenging situations.” (Singh & Duraiappah, 2020, xxvii) Based on some research, it appears that some “digital games, if designed with research-based pedagogical properties, can plant the seeds for SEL that can transform attitudes, knowledge, and skills in a socially and politically complex time”. (Singh & Duraiappah, 2020, xxvii) For the development of SEL, it is important for people to meet in person in a real environment, for schoolchildren this means not only in school, but also outside it, that everyone should discuss face-to-face, reflect on their experiences, evaluate each other in order to participate in the creation of different artefacts to share their views, to live in good relations.

3.1 New educational realities

Several new educational realities related to SEL and information and communication technologies were identified by TWG 9 members during discussions. These are itemized in the sections that follow.

(1) Facts: Depression, anxiety, suicides, stress

- There is an alarming increase in the number of individuals affected by depression and anxiety, with adolescents being the most vulnerable.
- Extreme levels of depression can lead to suicide, affecting close to 800,000 people annually around the world. (Suicides are the second-highest leading form of death of people amongst 15-29 year olds.)
- In the current fast-paced and competitive environment, in which individuals are attempting to ‘succeed’, they are also experiencing undue levels of stress.

(This stress is apparent, particularly amongst children and adolescents as many feel pressured to ‘perform well’ at school or generally in their lives.)

(2) Facts: Humans are complex social and emotional beings

- Humans are complex social and emotion beings whose flourishing depends on learning to communicate their needs to each other effectively and manage their emotions in healthy ways.
- The processing of emotions and its important role in empathy are an important contributor to human flourishing.
- Social and emotional skills are fundamental competencies, if one purpose of education is to cultivate human flourishing.

(3) Facts: Learning and life in mixed reality

- Education in the future will be defined by a new learning space which encompasses the real (physical) and the virtual world; that is, mixed reality. Learners and teachers will have to be comfortable moving across these two “worlds”.
- The increased complexity of living in mixed reality will require high levels of emotional intelligence – in other words a need for social and emotional competencies.

3.2 Key contributions of TWG to the new educational realities

During the Kyoto EDUsummit, TWG9 focused its discussion on concepts related to SEL: empathy, collaboration, group collaboration, mindfulness, compassion, emotional regulation, attention, regulation, self/regulation, and emotions. T. Furuta performed a database search of the Web of Science (WoS) and CrossRef during the early stages of TWG9 discussions at EDUsummit2023 in order to consolidate terms of discussion into clusters (groups) of topics. The database search was focused on journal articles published in English from around 1868 to 2023. For each keyword set, first, T. Furuta used Python to pre-process the downloaded data, such as removal of HTML tags and exclusion of non-English articles. He also excluded articles whose abstracts exceeded 10,000 characters. Later, he combined the title and the abstract of each article to build the dataset for the keyword set, and submitted the dataset to KHcoder to draw graphs, or co-occurrence networks. As a result of this analysis, T. Furuta reached the following conclusions:

- The keyword, “social” forms a group with the concepts “media”, “work”, and “practice”. This means that word chunks such as “social media” and “social work” appeared very frequently throughout the dataset, which is reasonable considering the recent surge of social media on the Internet and the consistent public interests in social work as essential work.
- The keyword “emotional” is on the top center of a group that includes the concepts “emotion”, “positive”, “negative”, “relationship”, “intelligence”, and “effect”. “Emotional” is not only strongly associated with words “positive” and “negative”, but also with “relationship”, “intelligence” and “effect”, suggesting that researchers’ interest in emotions is centered on their practical benefits in human relationships.
- The keyword “learning” forms a group with terms “learn”, “student”, “improve”, “teaching”, “outcome”, “online”, etc., which generally corresponds to students’ learning activities in school environments.

This literature-mining exercise helped the members of TWG9 quickly come to consensus that the key words of social, emotional and learning (embedded in the assigned title of the working group’s topic) did indeed tap into the broader spectrum of topics that arose during group discussions. These literature-based findings served to validate almost all topics that were deemed relevant and important by one or more members of the working group.

One of the key consensus items that emerged from EDUsummit2023 convening in Kyoto in May 2023 was the concept of social and emotional learning as learning that allows all learners to identify and navigate emotions, practice mindful engagement and exhibit prosocial behavior for human flourishing towards a peaceful and sustainable planet. Two major points that emerged from the discussions in TWG9 were:

- Research suggests that SEL is key to building emotional resiliency in individuals; and
- The brain networks that support SEL need to be nurtured and trained to cultivate human flourishing.

For EDUsummit2023 in Kyoto, TWG9 with a focus on social-emotional aspects of learning was newly created, included for the first time on the agenda among seven EDUsummits dating back to 2009. It’s inclusion in EDUsummit2023 in Kyoto turned out to be timely, as evidenced

by the fact that in one of the major resolutions emerging from the G7 Education Ministers' Meeting in Hiroshima, that had occurred approximately two weeks prior to EDUsumMIT in Kyoto, (May 15, 2023) was the following: *“With the goal to recovering the functions of school education that could not be sufficiently attained due to school closures and various restrictions on educational activities during the covid pandemic, we will work to promote cooperation and collaboration between schools and the wider community to expand opportunities for children’s experiences in nature, culture, and art, thus supporting the **development of social-emotional skills.**”* (Toyama-Kanazawa Declaration by G7 Education Ministers’ Meeting)

4. Strategies and actions

Recommendations were formulated by TWG 9 for broad distribution. Among these were:

Strategies and actions for policy makers

- Social and emotional learning can be effective through a digital medium that ensures that digital education is not just transmissive but transformative.
- The need for including social and emotional learning becomes a necessary condition in our education systems.
- The role of digital technology in social emotional learning needs to be clarified.
- The proper role of AI (for research, for teaching and learning practice) in SEL needs to be carefully studied.

“Although technology use can enable access to the curriculum for some students and accelerate some learning outcomes, digitalization of education poses a risk of benefiting already privileged learners and further marginalizing others, thus increasing learning inequality” (UNESCO, 2023, p. 25), therefore “governments should focus on how digital technology can support the most marginalized so that all can benefit from its potential, irrespective of background, identity or ability” (UNESCO, 2023, p.25)

Strategies and actions for practitioners

- “How can teachers and schools work together with parents and communities to protect and guide children while still allowing them to be children, and learn by making mistakes?” (Burns & Gottschalk, 2019, p.18) => “The overall goal is to identify innovative, collaborative models that bring together parents, communities and schools to strengthen children’s resilience, lower their stress levels, enhance well-being and improve learning.” (Burns & Gottschalk, 2019, p.18)
- “What are the impacts on education, from early childhood education and care to high school, and what does this mean for teaching and learning at each stage?” (Burns & Gottschalk, 2019, p.18)

Strategies and actions for researchers

- Expand research on friendships of children and young people, both real and virtual (“Are online relationships replacing offline ones or are they improving friendship networks and empowering disadvantaged groups?” (Burns & Gottschalk, 2019, p.13))

- “Although people tend to be wary of change, digital tools have fundamentally transformed our lives. There is a need to understand what has changed for our children. It is equally important to determine what has not changed, for example the importance of strong and healthy relationships with family and friends.” (Burns & Gottschalk, 2019, p.3)

Strategies for parents, educators

Not only the family, but also the school environment, especially teachers, are important for the formation and development of pupils’ and students’ SEL. "Mounting research points to why and how teachers must develop solid social and emotional competence in order to foster SEL effectively and positively impact the well-being of their students." (Duraiappah et al., 2022, p.302) Therefore, it is necessary to pay great attention to the well-being and flourishing of teachers, both in undergraduate and professional teacher education.

We should strive for children to grow up in happy childhoods, to experience children's stories, to have children's wishes, even though digital technology is relatively uneventful in offering them a gateway to an adult world for which they are not yet mentally ready, and in which the adults themselves, their parents and grandparents, are groping in the dark and often taken aback by it.

5. Conclusions

Whether humanity will be able to take care of social and emotional well-being with the development of digital technologies and use these technologies sensibly for SEL will be decided by the people themselves. In light of the challenges for upbringing and life in the digital world what is important is that humanity's support and interest in flourishing should be of greater importance to humanity as such than just economic and political interests.

Actions from the TWG

TWG9 members agreed to continue to work together to disseminate the consensus recommendations of the group. Among targeted actions were: a) completion of an eBook Chapter (this chapter) summarizing discussions in Kyoto; b) completion of a scholarly journal article featuring new conceptualizations or models of how socio-emotional learning can be enhanced, rather than hindered by information and communication technologies becoming prominent in digital education; and c) possible sub-group presentations to disseminate findings at appropriate conferences worldwide.

TWG9 members will continue to search for an answer to the question what is the role of digital technologies, especially AI, used for human flourishing development and how could be applied for SEL.

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Appendix A – EDUsummit Committees

Advisory Committee

- Joke Voogt, University of Amsterdam, The Netherlands, *Founder*
- Gerald Knezek, University of North Texas, USA, *Founder*

Steering Committee for EDUsummit 2023

- Alona Forkosh Baruch (Levinsky College of Education and Tel-Aviv University, Israel)
- Michael Phillips (Monash University, Australia)
- Petra Fisser (Regional Community College of Twente, the Netherlands)
- Margaret Cox (King’s College London, UK) (*past program chair EDUsummit 2019*)
- Thérèse Laferrière (Université Laval, Canada) (*past program chair EDUsummit 2019*)

Conference Chairs for EDUsummit 2023

- Hiroaki Ogata (Kyoto University, Japan)
- Petra Fisser (Regional Community College of Twente, the Netherlands)
- Alona Forkosh Baruch (Levinsky College of Education and Tel-Aviv University, Israel)

Organizing Committee for EDUsummit 2023

- Chair: Hiroaki Ogata (Kyoto University, Japan)
- Rwitajit Majumdar (Kyoto University, Japan)
- Brendan Flanagan (Kyoto University, Japan)
- Yiling DAI (Kyoto University, Japan)
- Kensuke Takii (Kyoto University, Japan)
- Kyoko Shiga (Kyoto University, Japan)

Program Committee for EDUsummit 2023

- Chair: Hiroaki Ogata (Kyoto University, Japan)
- Jill Downie (Curtin University, Australia)
- Takahisa Furuta (Gunma University, Japan)
- Gerald Knezek (University of North Texas, U.S.A.)
- Akira Sakamoto (Ochanomizu University, Japan)

Appendix B – Program EDUsummit 2023

29/05/2023, Monday

Time		
4:00 pm	Registration Building 1 Atrium entrance	Steering and Program Committee meeting Building 1, 4 th floor, Room A
5:00 pm		TWG leader and Steering Committee meeting Building 1, 4 th floor, Room A
6:00 - 8:00 pm	Welcome reception Prof. Hiroaki Ogata A brief history of EDUsummit Prof. Joke Voogt, Prof. Gerald Knezek Building 1 Atrium	

30/05/2023, Tuesday

08:30	Registration Building 1, 4 th floor, Foyer	
09:00	Opening session Prof. Hiroaki Ogata, Prof. Petra Fisser, Prof. Alona Forkosh Baruch, Prof. Michael Phillips	
09:30	Panel introduction Prof. Hiroaki Ogata. Kyoto University, Japan.	
09:35	The Policy of Educational data usage in Japan Ms. Shiho Fujiwara. MEXT, Japan.	
10:00	Research on learning analytics at Kyoto University Prof. Hiroaki Ogata & Dr. Rwitajit Majumdar. Kyoto University, Japan.	
10:20	Reimagining Education: The International Science and Evidence-based Education Assessment. Dr. Anantha K. Duraiappah, UNESCO MGEIP, India.	
10:40	Practices of Learning Analytics Mr. Guo Miyabe and students. Kyoto Municipal Saikyo Senior High School Attached Junior High School, Japan.	
11:00	Discussion on panel Moderator: Prof. Gerald Knezek	
11:30	Hajimemaste time! Getting to know each other. Moderator: Prof. Michael Phillips	
12:00	Lunch Building 1 Atrium	
13:00	Session 1 Individual TWG rooms [A, B, C, D, E, F, G1, G2, and G3] <i>What new educational realities did you identify so far in your TWG? - updating the key challenges defined since the interim meeting</i>	
15:30	Tea break Building 1, 4 th floor, Foyer	
16:00	Session 2 Individual TWG rooms [A, B, C, D, E, F, G1, G2, and G3] <i>What is the unique connection of your theme to the new educational realities in this era?</i>	
17:30	Leave for Banquet by bus at the entrance of Building 1	

18:00 -18:20	Stop at Kyoto University clocktower for a photoshoot
18:30 -18:45	Stop at Heian Shrine for a photoshoot
19:00 -21:00	Banquet start at Heian Shrine banquet hall
21:00	Bus leave for Kyoto JR Station
21:20	Return to Kyoto JR Station

31/05/2023, Wednesday

08:30	Open Building 1, 4 th floor, Foyer
09:00	Welcome session to Day 2 Building 1, 4 th floor, Science Hall
09:30	Session 3 Individual TWG rooms [A, B, C, D, E, F, G1, G2, and G3] <i>How can your TWG contribute to coping with these educational realities in this era?</i>
12:00	Lunch [4 th Floor Foyer]
13:00	Session 4 <i>In what ways are yours and others' themes connected to your TWG in coping with future educational realities in this era?</i> Speed dating between TWGs [Building 1, 4 th floor, Rooms A, B, C, D, E, F, G1, G2 & G3]
15:30	Tea break Building 1, 4 th floor, Foyer
16:00	TWG leaders + SC + LoC meeting Building 1, 4 th floor, Room A
17:00	Meeting of SC and incoming SC & LoC Building 1, 4 th floor, Room A

1/06/2023, Thursday

08:30	Open	Building 1, 4 th floor, Foyer
09:00	Session 5 Individual TWG rooms [A, B, C, D, E, F, G1, G2, and G3] <i>What are your TWG recommendations for future educational realities in this era? - finalizing the presentation and wrapping up</i>	
10:00	Plenary session	Building 1, 4 th floor, Science Hall
11:30	Closing session	
12:00	Lunch (Lunch box)	Building 1, 4 th floor, Foyer
13:00	Optional Tour of Kyoto	