

## *Assessment Horizons: Pre-service Teacher Expectations on Future Education*

Nina Bergdahl, Halmstad University, Sweden  
Jeanette Sjöberg, Halmstad University, Sweden

The European Conference on Education 2023  
Official Conference Proceedings

### **Abstract**

Socio-technical imaginaries of preservice teachers are an important area of inquiry that warrants exploration, partly because teachers need to be prepared for teaching in a digital society and partly because they will enter schools and influence education in their own right. In this paper, we examine the socio-technical imaginations of pre-service teachers in relation to future assessments in education. Socio-technical imaginaries reflect values and priorities and play a significant role in fostering agency and ownership in meeting and managing the development of future practices, thus contributing to a higher quality of education and professional development. Pre-service teachers (n=21) were instructed to write journal reflections and narratives during a speculative future intervention as part of a teacher training programme. In this study, we sought to explore how pre-service teachers perceive the role of technology in shaping future educational assessment practices. The data was analysed using thematic analysis and discussed through the lens of Information Systems Artefact. The findings indicate both teacher scepticism and robust agency as digital innovations emerge in the learning landscape. This paper will be valuable for stakeholders aiming to promote responsible digitalisation, educators, and educational researchers interested in understanding and adapting to the evolving landscape of technology in education.

Keywords: Socio-Technical Imaginaries, Pre-service Teachers, Chat-GPT, Speculative Futures

**iafor**

The International Academic Forum  
[www.iafor.org](http://www.iafor.org)

## Introduction

Socio-technical imaginaries, a concept coined by Jasanoff (2015), refer to the collective visions of a society's future shaped by technology and its potential impact on social life. These imaginaries are crucial in shaping new technologies' development and integration into society. In this context, assessment refers to evaluating the implications of technological advancements on society regarding their ethical, economic, and environmental consequences. Socio-technical imaginaries refer to individual and collective visions of desirable futures shaped by shared cultural, social, and political values (Jasanoff & Kim, 2009). These imaginaries influence not only the design and use of technologies but also the ways in which societies understand and engage with them. As such, they hold considerable sway over developing and implementing assessment practices, which are integral to educational and professional systems. Technology and its potential and risks are central elements in the societal debate (Kerschner et al., 2018) concerning education. The discussion on the digitalisation of education has hardly changed, even though the technologies in focus have (Kerres, 2022). It has been argued that future teachers must ensure their plans are closer to the students' reality and the use of technology (Becuwe et al., 2022). Following Schelly et al. (2021), this article posits that pre-service teachers' socio-technical imaginaries may offer insights into tomorrow's normative practices and plural ontologies and inform teacher education. Rather than conceptualising future education or planning for protection against emergent fears (Facer & Enright, 2016), this article frames and theorises the nature of pre-service teacher articulation of future education and educational practices. Pre-service teacher socio-technical imaginaries are a relatively new concept, and there is still much that needs to be explored and understood about pre-service teacher anticipation. Exploring respondent narratives allows for raising awareness and could support emerging alternative paths. The study empowers pre-service teachers to verbalise the unknown by sharing their views and positioning themselves and future education in context and with each other (Priyadharshini, 2019). Pre-service teachers entering education are expected to teach for at least a few decades. They need to stay relevant and engage in professional development and educational practices. In addition, school development needs to reflect the digitalisation of society at large to prepare learners for an engaged life in an even more digital society. Previous research has noted that the main difference between less and more experienced teachers lies not in the type of learning activities they undertake but in their attitudes toward learning, learning outcomes, and how their context influences them (Kyndt et al. 2016). Thus, exploring pre-service teachers' attitudes and anticipation of educational futures will likely offer other insights into how they anticipate future schooling. Research at the forefront has already described the potential implications of data-driven and automated assessment (Paiva et al., 2022), learning analytics and artificial intelligence (AI) in the K-12 classrooms (Tedre et al., 2021). However, when pre-service teachers engage in socio-technical imaginaries, they may not be updated with "the latest" in the tech industry. Instead, any extreme may be represented in their expression: i.e., they may include technologies that do not yet exist, report using preferring analogue teaching and learning methods, having a very limited understanding of digitalisation in education, or anything in between. However, "pre-service" implies that they are to become teachers; as such, they will need to rely on their knowledge and experience to prepare for scenarios in the classroom. This article explores the anticipation of assessment in future education through pre-service teacher socio-technical imaginaries. It discusses how these can help to improve the quality of teaching and learning, create better learning experiences for students, provide teachers with the necessary skills and knowledge to be better prepared for future challenges and scenarios and inform further development of pre-service teacher education through the lens of Information Systems

Artefact (ISA) (Lee et al., 2015). In the context of teacher education, Tondeur et al. (2013) addressed how student teachers are being prepared to use and integrate technology into their programs. The aim of this study is to contribute insights into pre-service teachers' socio-technical imaginaries on future assessment in education. Against this background, we raise the following research question: How do pre-service teachers perceive the role of technology in shaping future educational assessment practices?

## **Background**

### **Assessment in Teacher Education**

Assessment in higher education is crucial within all fields of knowledge, not least with regard to future educators. The general idea of assessments in teacher education is that they evaluate knowledge, skills, and competencies across domains like didactics, pedagogy and classroom management - while also modelling assessment practices for pre-service teachers. It is a critical component in preparing teachers for their future professional roles. Both formative assessments (such as classroom observations, lesson planning exercises, and reflective journals) and summative assessments (such as project outcomes and performance-based evaluations) have a place in teacher education as they provide ongoing feedback and support to the students, helping them monitor their progress and identify areas for improvement as well as serving as comprehensive measures of their own overall competence and readiness for the teaching profession (e.g. Kibble, 2017; Pellegrino, 2014; Schildcamp et al., 2020). However, assessment in higher education, particularly in the context of teacher education, is not without challenges and limitations. One issue is the potential mismatch between assessment methods and the complex nature of teaching and learning. There is a debate about assessment in relation to the measurement of learning goals and if the assessment is measuring what it is intended to (Boud, 2018). Traditional assessment practices often prioritise standardised tests and written exams, which may not adequately capture the multifaceted skills required for effective teaching. Nor do such methods prepare teachers to improve their own assessment skills in analogue or digital settings. Assessments focusing solely on knowledge recall may fail to assess candidates' ability to engage students, foster critical thinking, and adapt teaching strategies to diverse learning needs - and in effect - fail to model how they can use assessment effectively as teachers.

### **Assessment in the Digital School**

Preparing future teachers to teach learners using technology suggests a context where infrastructure is sufficiently integrated for widespread access to digital technologies (Starkey, 2020). Teaching others requires introducing digital technologies, integrating existing systems and practices and the infusion across the teacher's work (ibid). There are challenges in observing and assessing students' progress while working at a distance, but advances in networked technologies, particularly when embedded in working practices, offer new solutions (Kukulka-Hulme et al., 2022). They suggest that it is important to continuously consider how the innovations may impact aspects of teaching, learning and assessment and, in this line, if there are any implications for teachers' professional development. Indeed, Pongsakdi et al. (2021) found that even though teachers with low digital confidence showed increased confidence, the staff with high confidence benefited most from the professional development. Yet, with the future in mind, researchers have since long proposed that technology may enhance cognitive processing to improve their intellect and enrich the minds

of humans (Salomon et al., 1991). Such a position also encourages a re-examination of prevailing conceptions of intelligence and ability, what is and what could be.

### **Socio-Technical Imaginaries**

Pre-service teacher socio-technical imaginaries refer to the potential outcomes of students considering a career in teaching. Jasanoff defines socio-technical imaginaries as: “collectively held, institutionally stabilised, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology” (Jasanoff, 2015: 4). Building on Jasanoff, the position here is that we move beyond the language of imagination with socio-technical imaginaries and recognise the diverse pluralistic ontologies of cultures to develop inclusive frameworks for socio-technical system transitions. The introduction of standards-based instruction, the use of technology in the classroom, and the increased emphasis on teacher accountability have significantly impacted the teaching profession. All changes require teachers to be reflective and critical of their practice, necessitating a more in-depth exploration of the different elements that shape the teaching experience. At the same time, the rapidly changing landscape of education has created an increased need for prospective teachers to consider their future as educators. “How a person understands his or her relationship to the world, how that relationship is structured across time and space, and how the person understands possibilities for the future” (Norton, 2000: 45). Teachers will shape the future of learning. Their practices will be relevant for decades. Verbalising how and what pre-teachers believe, hope for, fear, and visualise the future is therefore of interest. Teachers' rights to verbalise priorities, learning studies, and practice development remain relevant to professional development. Visualising the expanded ideas can contribute to better preparation. Previous studies exploring an audience's imaginaries of artificial intelligence (AI) and of the future roles of teachers lifted aspects like “AI taking over” and questions of who would be right: the teacher or the AI system? Hrastinski et al. (2019). Here, we explore the understandings and worldviews of pre-teachers. Acknowledging that individuals often harbour diverse and incommensurable ontologies is essential. We need to accept the reality of pre-service teachers to achieve insights into their anticipation. Their stories can offer valuable insights into teachers' current positions on the role of educational technologies in the future.

### **Theoretical Lens**

Considering the Information Technologies and socio-technical systems for categorising artefacts, Lee et al. (2015) propose a way to conceptualise systems (IS) that they refer to as the Information Systems Artefact (ISA). ISA consists of three sub-artefacts to be understood as interrelated parts of a compound: The technology artefacts with the human-created tools (digital or non-digital; physical or non-physical objects) used to solve a problem, achieve a goal or serve a purpose. The Information artefacts, which include instances of information that occur through human acts, can be used to process data, reduce uncertainty, and establish meaning. Finally, Social artefacts consist of relationships and interactions between individuals that help individuals meet their goals. Stressing that ISA does not necessitate IT (the tools may include digital and non-digital objects) but instead may be adopted as a lens to any societal system, Lee et al. emphasise that ISA “brings the socially excluded segment of the society [...] (thereby resulting in a whole that is greater than the sum of its parts)” (Lee et al. 2015: 18). The technology, social, and information artefacts all support each other's functioning, and it is only, together that they form ISA.

## Method

The study was conducted within the teacher program at a Swedish university during November and December 2022. Pre-service teachers (n=21) participated in a synchronous online course on Assessment in digital learning environments, during which times were designated to the socio-technical imaginaries. The students were encouraged to reflect in a logbook and asked to co-author a narrative following intervention scaffolding that supports teacher imaginaries (Ross, 2022). While lesson time was limited, the pre-service teachers were encouraged to continue writing in their logbooks throughout the course. The data comprises 35 text entities: logbook entries (n=30) and narratives (n=5). The log-book entries, recounting individual, and group level reflections are coded with numbers reflecting student(s), log entry, and accumulated entry, for example, "Excerpt 1.2.4". In exploring narratives of the future and education or educational practices, the actions (interactions and communication) become essential in understanding the critique of the current and the expectations ahead. The discovery becomes central because discovery means learning about one's surroundings, exploring potential goals, and directing intention towards specific affordances (Ross, 2022). As such, these processes reflect how pre-service teachers think about future education and educational practices via the buildings, materials, objects, and characters interacting with them and each other.

The course was designed to introduce digital technologies in education, stimulate creative thinking and exploration, and highlight the risks and potential of AI following the A-C sequence. A) Lecture 1: a three-hour lecture on how the written word has evolved from analogue to digital, including the changed role of the consumer. Lecture 2: looking into "Future education" providing a brief orientation of (non-exclusive) augmented and virtual reality, immersive learning, stations for 3D printing and modelling, telepresence robots in education, green screen and holograms. Adjacent to these lectures, the instruction for reflections 1-2 was communicated. B) Lecture 1-2 was followed by a seminar in which students would present a situation with AI, augmented reality, virtual reality, green screen, telepresence robots, or other digital technologies which they could see themselves using and describe how they engaged learners and executed their summative and formative teaching practices. C) Then, students participated in Lectures 3-4, which included assessment theories, digital examination, diagnostics, technologies to assess live practices, data-driven school development, AI in education and trying Chat-GPT and automated assessment. Then, the students started writing their narratives in groups. The narratives were handed in the following week. The data was analysed using thematic analysis (Braun & Clark, 2012). Notes were gathered in the familiarisation stage. Each logbook entry, representing both individual and group-level reflections, was coded using a system that designated the student(s), log entry number, and cumulative entry identifier (e.g., "Excerpt 1.2.4"). Tentative themes and sub-themes were formulated and grouped. The potential themes were refined by checking them against the coded data and the entire dataset. This step ensured themes were coherent, consistent, and distinctive. Upon discerning a clear and consistent pattern among the themes, each was defined and named, marking the final stage of the analysis process.

## Results

We identified three themes: 1. Assessment Design, 2. Implementing assessment, and 3. Critical perspectives on future assessment are presented below:

Theme 1: Assessment Design

Socio-technical imaginaries play a critical role in shaping the design of assessment practices by informing the underlying principles and values upon which they are based. The pre-service teacher narratives suggest a shift in the conception of assessment and learning due to the influences of globalisation, digitisation, and AI.

*Validating the [internet] source and type of source can be an important element [in assessment]. [As well as] accounting for the process: how to reach a result and not just accept 'a result' in itself can be another point that becomes increasingly important. Assessment is or should be related to the view of knowledge -which today has moved from "knowledge of facts" to "knowledge of using tools to find information and produce facts". Assessment could include how to use tools but not just that; whether it is done in an efficient and/or innovative way; if it adds a new perspective, etc. (Excerpt 4.2.8)*

*Globalisation and digitisation will create a new view of knowledge, [...]. The teachers will have updated and shared criteria for assessing the students. Digital tools will help the teacher in assessment. (Excerpt 5.1.10)*

*The choice of working method is affected – [one] may take into account cheating and [...] to what shows a fair assessment. (Excerpt 15.2.28)*

*It's obvious that AI will create new teaching materials that relieve this burden [from teachers]. The student is connected to a kind of learning station, perhaps a screen, a helmet with a visor or some type of glasses and headphones. Learning takes place subconsciously. The subconsciousness is opened via soft music, and a voice provides learning as a narrative. Images constantly flow in association with the story, and the brain processes all this at its own pace. A night's sleep may be required until the knowledge can be tested via practical assessment, where the student is tested by performing a specific task. (Excerpt 8.1.16)*

In the above excerpts, the pre-service teachers describe that with future technologies, it is important to assess the validity of the online information and adopt some kind of competency-based assessment that focuses on evaluating an individual's ability to perform tasks and meet predefined standards and that this, due to technology, can only be done in the process, and not by accepting the final product. In this future, with AI, the pre-service teachers convey a bond between their view of learning and assessment, in which assessment is designed to assess particular content in a particular context. Thus, what it targets, reflects the values and views of what is important. As is shown in excerpt 4.2.8, there is still a traditional way to view knowledge, which reflects our society's battle with fake news (to validate and identify internet sources). However, some pre-service teachers also moved beyond currently debated issues and highlighted that we are likely to start talking about *what knowledge is*. Finally, with yet unrealised technologies, such as biological implants, one pre-service teacher suggested that learning will be passively transmitted during sleep (see excerpt 8.1.16), and that AI assistants are supporting assessment, impacting the role and essence of what a teacher is. This final example signals that the learning activity and assessment practices are interconnected, where the assessment design is directly linked to the learning activity and what the pre-service teachers expect digital tools to do (i.e., function as assistant teachers, material creators or tutors). While pre-service teachers describe the importance of assessing the validity of online information and adopting competency-based assessments, they also express devoted agency to master the emerging learning environment by actively

redefining knowledge, utilising innovative technologies, and integrating AI in both learning and assessment processes.

## Theme 2: Implementing Assessment

In theme 1, pre-service teachers believe that the learning activity and digital technologies will influence the design of the assessment. These, in turn, are results of socio-technical imaginaries which reflect an understanding of the implementation and use phases. The ways in which educators imagine assessments may thus reflect their technological orientation, experiences and understanding.

*During the day, six lessons will be held, a rather stressful day, but with the help of robot assistants and recordings (for later assessment), it will still be possible to get it done. [...]When the students have gone home for the day, the teacher's second part begins, which focuses on assessment. The teacher listens to the recordings from the robot assistant while at the same time looking at the assessment matrices of the classmates. The assessments are collected digitally to form a judgement. The students do not receive grades, but their various assessments are collected as a digital portfolio to form their merit values for future education. Assessment can take place afterwards. The students peer-assess each other, and the robot listens. (Excerpt: 1.1.29)*

*Everyone interacts via mobile phone or sees digital screens in the air. We don't have to be in the same [physical] space, but everyone is where they feel like being and through thought, they are transported to 'the immersive' classroom. The teacher's function is a control function; the teaching occurs via a voice and VR [virtual reality] reality where all the usual moments occur via a pretend reality in the student's head. You hand in written tasks, where you don't even have to write, but what you think as a student is created in the form of text that is then shown to the teacher or the robot. AI corrects, provides feedback, and makes judgments, and the teacher just ensures everything flows as it should. (Excerpt: 14.1.26)*

*Knowledge and performance assessment will certainly change in the future, as it does over time. Today, beautiful handwriting is not judged as was done in the past, just to name a few, but other things will be given a different weight in the future. It can be advantageous to have robots conduct assessments or parts of. More automated assessments can be fairer. I think passing on grades is still left to the teacher to do, but that is unnecessary. (Excerpt: 4.2.8)*

In the above excerpts, the implementation of assessment is focused on how pre-service teachers imagine they will actually be working with assessments in an unknown future. As is shown in excerpt: 1.1.29, there is a strong belief in using robots and AI technology. This means that the teacher's role becomes more of a facilitator. Interestingly, pre-service teachers express that future assessment is implemented in ways where assessment development has developed in parallel but separately from digitalisation. For example, it was described as abandoning grades (see excerpt: 1.1.29) and abandoning the demand for physical presence during assessment (see excerpt: 14.1.26). Pre-service teachers express ideas that align with micro-credentials (e.g., Ahmat et al., 2021), where the know-how is valued rather than knowledge being reduced to grades. While pre-service teachers recognised the evolving nature of assessment and *what will be assessed*, they still thought assessment could be

conducted collaboratively, with peers, AI and teachers having defined and complementing roles, where AI could be a guarantor for fairness. The socio-technical imaginaries can either facilitate or hinder the integration of innovative assessment technologies, such as adaptive testing or e-assessments, into established practices. By recognising the role of sociotechnical imaginaries in shaping assessments, stakeholders can better adapt their practices to accommodate diverse learners and contexts.

### Theme 3: Critical Perspectives on Future Assessment

Socio-technical imaginaries were also seen to play a crucial role in interpreting and evaluating conclusions. As seen in themes 1 and 2, they influence the design and implementation. In theme 3, we found that critical voices and interpretations of assessments contribute to the richness of the interpretation, as acknowledging their role can foster more inclusive, diverse, and ethical approaches to assessment.

*When discussing emerging technologies, it is easy to overlook the purpose of introducing new technology. If the purpose is for students to become good at using technology, it is important to use the technology [at hand]. But, if the aim is for the students to become good in a subject area, it is important to look at whether the technology contributes to increased goal achievement or steals focus and resources from what is really important. (Excerpt 3.1.5)*

*The teacher's role will change. For me, it boils down to: what was my desire to become a teacher? Do I want to be a teacher if interaction with students decreases? Or is it the case that if I get the help of digital technology to do certain things, the time for interaction will be greater? (Excerpt: 4.2.8)*

*Assessment in the future is likely to be even more multifaceted because the more we become dependent on the digital world and its tools, the more those parameters must be considered in the assessment. A teacher must also be careful about what is to be assessed so that it is not digital use, such as the ability to find facts that are assessed. (Excerpt 10.3.22)*

*[It will be] more difficult with assessment and written assignments: "Who has done what?", "How much can the student actually know?"... It is harder to find out what the student can do. (Excerpt: 15.2.28)*

What hinders teachers' technology acceptance may be brought up in themes reflecting critical thinking. In this vein, we can identify scepticisms with regards to the EdTech industry and the real purpose behind the absorption of digital technologies for education and what is perceived as negative changes to the teacher role, with covert statements of quitting their position as a teacher if the role changes not to meet the expectations one had when becoming a teacher (see excerpt: 4.2.8). While scepticism is important, other critical ideas move beyond scepticism and toward what is assessed, where some point out that the sphere focuses on assessment needs to establish that lack of digital skills must not impact how students are assessed (see excerpt 10.3.22), as assessment becomes increasingly digitalised, and others enforce the challenges with discerning individual student contributions and knowledge progression. Thus, respondents present values in which all teachers do not see technology as trustworthy; they recognise their enormous impact and while they expect assistance, new

materials, time-saving assessment, too little control of the learning process, and being reduced to having a control-function trigger different reactions with the pre-service teachers.

## **Discussion**

By acknowledging the influence of socio-technical imaginaries on assessment design, stakeholders can work to create more inclusive and diverse assessment practices that better align with societal goals and values. By understanding the role of sociotechnical imaginaries in interpreting assessment outcomes, stakeholders can work towards more nuanced, equitable, and context-sensitive evaluations. Results reveal that pre-service teachers are contemplating the interplay between the evolving learning environment, the transformation of the teacher's role, and the factors that may hinder technology acceptance. The themes emphasise adapting to the changing educational landscape while remaining grounded in recent and relevant assessment research.

**The technology artefact** (Lee et al. 2015) focuses on technology's perceived capabilities and constraints. Our findings suggest that pre-service teachers may perceive technology as offering new affordances for assessment practices, such as automated grading, immediate feedback, and adaptive assessment algorithms. They may also consider the limitations and challenges associated with technology, such as concerns about reliability, validity, and equity. The affordances of technology may be shaped by factors such as the availability of resources, the usability of technological tools, and the compatibility between technology and existing assessment practices. In Theme 3 (*Critical perspectives on future assessment*), we explore critical perspectives and identify tech-scepticism. concerns about potential underlying motifs behind integrating digital technologies in education, and apprehension about teacher role change (Ertmer et al., 2012). Beyond scepticism, concerns focus on assessment aspects, emphasising the need to ensure that students' digital skills do not negatively impact their assessment and addressing the challenges in discerning individual student contributions and knowledge progression (Pellegrino et al., 2014).

**The information artefact** (Lee et al. 2015) focuses on how individuals perceive, and process information technology provides. In this context, pre-service teachers may consider the available information through technological tools such as online assessments, digital learning platforms, and data analytics. They may perceive technology as a means to access a wider range of data about student performance, including real-time feedback, personalised learning recommendations, and progress tracking. Pre-service teachers' perceptions in this regard may be influenced by their understanding of assessment theory and their beliefs about the role of technology in enhancing assessment practices. In Theme 1 (*Assessment design*), pre-service teachers highlight the importance of assessing the validity of online information and adopting competency-based assessments in the context of future technologies (Pellegrino, 2014). They emphasise the connection between their views on learning and assessment, addressing the challenge of fake news and exploring innovative technologies such as AI assistants (Bennett, 2015; Ifenthaler & Yau, 2020). This theme underscores the significance of actively redefining knowledge and integrating AI into learning and assessment processes (Holmes et al., 2019).

**The social artefact** (Lee et al. 2015) emphasises the influence of social interactions on individuals' perceptions and behaviours regarding technology. Pre-service teachers' perceptions of technology's role in educational assessment may be influenced by their interactions with peers, instructors, and other stakeholders in the education system.

Collaborative learning environments, online communities, and professional development opportunities related to technology use may shape their beliefs about the potential benefits and challenges of incorporating technology into assessment practices. Social norms, cultural factors, and institutional policies can also influence their perceptions of technology's role. Theme 2 (*Implementing assessment*) delves into the transformation of the teacher's role, with pre-service teachers envisioning a future where robots and AI technology influence assessment and transform teaching from a controlling to a more facilitating function (Holmes et al., 2019). This theme aligns with micro-credentials, emphasising the value of actual know-how over grades and fostering collaborative assessment involving peers, AI, and teachers in complementary roles (Ahmat et al., 2021). The role of socio-technical imaginaries in shaping assessment practices highlights the need for stakeholders to adapt to diverse learners and contexts (Jasanoff & Kim, 2009).

## **Conclusion**

Assessment practices must keep pace as teaching methodologies and educational technologies evolve. Ensuring assessments align with contemporary teaching practices and prepare teachers for the realities of modern classrooms requires ongoing evaluation and adaptation of assessment strategies. By examining these themes collectively and incorporating recent and relevant assessment research, educators and researchers can gain valuable insights into pre-service teachers' perspectives on the future of education and the potential barriers and facilitators to adopting new technologies and practices. In summary, the implications emphasize the importance of teacher education in preparing future educators to effectively integrate technology into their teaching practices. Ongoing evaluation of assessment strategies and incorporation of research insights are crucial for aligning assessments with contemporary teaching practices. Recognizing the role of socio-technical imaginaries can foster inclusive and ethical approaches to assessment, ultimately contributing to the creation of equitable educational ecosystems. Socio-technical imaginaries are vital to understanding and shaping assessment practices, as they influence the design, implementation, and interpretation of assessments. Acknowledging their role can foster more inclusive, diverse, and ethical approaches to assessment. By incorporating socio-technical imaginaries into developing and evaluating assessment practices, stakeholders can contribute to creating more equitable, sustainable, and transformative educational ecosystems.

## References

- Ahmat, N. H. C., Bashir, M. A. A., Razali, A. R., & Kasolang, S. (2021). Micro-credentials in higher education institutions: Challenges and opportunities. *Asian Journal of University Education*, 17(3), 281-290. doi:10.1080/0305764X.2019.1625867
- Becuwe, H., Roblin, N. P., Tondeur, J., Thys, J., Castelein, E., & Voogt, J. (2017). Conditions for the successful implementation of teacher educator design teams for ICT integration: A Delphi study. *Australasian Journal of Educational Technology*, 33 (2) pp. 159–172. doi:10.14742/AJET.2789
- Bennett, R. E. (2015). The changing nature of educational assessment. *Review of Research in Education*, 39(1), 370–407.
- Boud, D. (2018). Assessment could demonstrate learning gains, but what is required for it to do so? *Higher Education Pedagogies*, 3:1, 54-56, DOI:10.1080/23752696.2017.1413671
- Braun V., & Clarke, V. (2012). Thematic Analysis, in *APA Handbook of Research Methods in Psychology: Volume 2*, 2nd ed., vol. 2, E. Lyons and A. Coyle, Eds. Washington DC: American Psychology Association, pp. 57–71. doi:10.1037/13620-004
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59(2), 423-435. <https://doi.org/10.1016/j.compedu.2012.02.001>
- Facer, K & Enright, B (2016). Creating living knowledge. University of Bristol AHRC; Connected Communities Programme.
- Holmes, W., Bialik, M., and Fadel, C. (2019). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*, Boston, MA: Center for Curriculum Redesign.
- Hrastinski, S., Olofsson, A. D., Arkenback, C., Ekström, S., Ericsson, E., Fransson, G., ... & Utterberg, M. (2019). Critical imaginaries and reflections on artificial intelligence and robots in postdigital K-12 education. *Postdigital Science and Education*, 1, 427-445. doi: 10.1007/s42438-019-00046-x
- Ifenthaler, D., & Yau, J. Y. K. (2020). Utilising learning analytics to support study success in higher education: a systematic review. *Educational Technology Research and Development*, 68, 1961-1990. <https://doi.org/10.1007/s11423-020-09788-z>
- Jasanoff, S., & Kim, S. H. (2009). Containing the atom: Sociotechnical imaginaries and nuclear power in the United States and South Korea. *Minerva*, 47(2), 119-146. <https://doi.org/10.1007/s11024-009-9124-4>

- Jasanoff, S. (2015). Future Imperfect: Science, technology, and the imaginations of modernity. In S. Jasanoff, H. Kim (Eds.), *Dreamscapes of Modernity. Sociotechnical Imaginaries and the Fabrication of Power*, University of Chicago Press, Chicago (2015), pp. 1-33.
- Kerres, M. (2022). Bildung in a Digital World: The social construction of future in education, in *Bildung in the Digital Age: Exploring Bildung through Digital Media in Education*, 1st ed., David Kergel, Michael Paulsen, Jesper Garsdal, and Birte Heidkamp-Kergel, Eds. Routledge, pp. 29–46. doi: <https://doi.org/10.4324/9781003158851>
- Kerschner, C., Wächter, P., Nierling, L., & Ehlers, M. H. (2018). Degrowth and Technology: Towards feasible, viable, appropriate and convivial imaginaries. *Journal of Cleaner Production*, vol. 197. Elsevier Ltd, pp. 1619–1636, Oct. 01. doi:10.1016/j.jclepro.2018.07.147
- Kibble, J. D. (2017). Best practices in summative assessment. *Adv Physiol Educ*, 41: 110–119, 2017. DOI:10.1152/advan.00116.2016.1101043-4046/17
- Kukulska-Hulme, A., Bossu, C., Charitonos, K., Coughlan, T., Ferguson, R., FitzGerald, E., ... & Whitelock, D. (2022). *Innovating pedagogy 2022: exploring new forms of teaching, learning and assessment, to guide educators and policy makers*.
- Kyndt, E., Gijbels, D., Grosemans, I., & Donche, V. (2016). Teachers' Everyday Professional Development: Mapping Informal Learning Activities, Antecedents, and Learning Outcomes, *Review of Education Research*, (86) 4, pp. 1111–1150. doi:10.3102/0034654315627864
- Lee, A. S., Thomas, M., & Baskerville, R. L. (2015). Going back to basics in design science: from the information technology artifact to the information systems artifact. *Information Systems Journal*, 25(1), 5-21. <https://doi.org/10.1111/isj.12054>
- Louise Starkey (2020) A review of research exploring teacher preparation for the digital age, *Cambridge Journal of Education*, 50(1), 37-56. <https://doi.org/10.1080/0305764X.2019.1625867>
- Norton, B. (2000). *Identity, and language learning: Gender, ethnicity and educational change*. Longman Publishing Group.
- Paiva, J. C., Leal, J. P., & Figueira, Á. (2022). Automated Assessment in Computer Science Education: A State-of-the-Art Review," *ACM Transactions on Computing Education*, 22(3) pp. 1–40. doi:10.1145/3513140
- Pellegrino, J. W. (2014). Assessment as a positive influence on 21st century teaching and learning: A systems approach to progress. *Psicología Educativa*, 20(2), 65-77. <https://doi.org/10.1016/j.pse.2014.11.002>
- Pongsakdi, N., Kortelainen, A., & Veermans, M. (2021). The impact of digital pedagogy training on in-service teachers' attitudes towards digital technologies. *Education and Information Technologies*, 1-14.

- Priyadharshini, E. (2019). Anticipating the apocalypse: Monstrous educational futures, *Futures*, 113, doi:10.1016/j.futures.2019.102453
- Ross, J. (2022). *Digital futures for learning: Speculative methods and pedagogies*. Taylor & Francis.
- Salomon, G., Perkins, D. N., & Globerson, T. (1991). Partners in cognition: Extending human intelligence with intelligent technologies. *Educational researcher*, 20(3), 2-9. doi:10.3102/0013189X020003002
- Schelly, C. Gagnon, V. Arola, K. Fiss, A. Schaefer, M., & Halvorsen K. E. (2021). Cultural imaginaries or incommensurable ontologies? Relationality and sovereignty as worldviews in socio-technological system transitions. *Energy Research and Social Science*, 80. doi:10.1016/j.erss.2021.102242
- Schildcamp, K., Van der Kleij, F. M., Heitink, M. C., Kippers, W. B., & Veldkamp, B. P. (2020). Formative assessment: A systematic review of critical teacher prerequisites for classroom practice. *International Journal of Educational Research*, Volume 103, 2020, 101602. <https://doi.org/10.1016/j.ijer.2020.101602>
- Selwyn, N. (2022). Less work for teacher? The ironies of automated decision-making in schools. In *Everyday Automation* (pp. 73-86). Routledge. doi:10.4324/9781003170884-6
- Tedre, M., Toivonen, T., Kahila, J., Vartiainen, H., Valtonen, T., Jormanainen, I., & Pears, A. (2021). Teaching machine learning in K–12 classroom: Pedagogical and technological trajectories for artificial intelligence education. *IEEE Access*, 9, 110558-110572. <https://doi.org/10.1109/ACCESS.2021.3097962>
- Tondeur, J., Roblin, N. P., van Braak, J., Fisser, P., & Voogt, J. (2013). Technological pedagogical content knowledge in teacher education: in search of a new curriculum, *Educational studies*, 39(2), 239-243. doi:10.1080/03055698.2012.713548

**Contact email:** nina.bergdahl@hh.se