

Digital Education for Equity in Primary Schools (DEEP) - Flagship Challenges

The digital transformation implies profound changes for both learning and teaching. There is a growing awareness that these changes go far beyond the need to learn new skills or to employ one or the other novel technology. Rather, they profoundly affect what, how, where, and when children learn, the understanding of classroom teaching and the teachers' role, the design of equitable and effective learning environments, issues of school organization, and the question of how to involve different groups of actors for organizing the digital transformation of learning in line with pedagogical and political objectives.

We know little about how exactly these changes play out in Swiss primary school contexts and what challenges they pose for the design and implementation of learning environments that support young children's learning processes in all their variability. In particular, there is a lack of empirically grounded insight into dynamics regarding educational equity, i.e. for how schools and teachers can design digital learning environments and employ digital technologies in ways that support pupils in their individual potentials and needs and thus enhance the life chances of children – especially but not only for those from disadvantaged backgrounds.

Against this background, the DEEP consortium aims to maximize the positive effects of the digital transformation on **all learners in primary schools** while accounting for potential risks. By highlighting “all learners”, we emphasize the necessary adaptation of instruction to individual **variability** in terms of learners' biographical and socio-economical backgrounds, skills, interests, motivations, etc.

The overarching objective is to identify **the ways in which teaching and learning in Swiss primary schools need to develop** in order to achieve this goal. For this reason, DEEP projects start from pedagogical and educational concerns. While projects will often use state-of-the-art tools and technologies as examples and showcases, the analytical focus is on establishing a deep understanding of the transformation we need to work towards in classrooms, schools, and universities (of teacher education). Pedagogical and educational questions are the starting and target points of DEEP research projects.

Next to the consideration of learners' variability and the priority of pedagogical concerns, **translational evidence** is also a common element that all projects within the framework of this consortium share and need to address. Translational evidence takes many forms and can span all phases of research from defining practice-relevant research questions, through co-designing interventions with practitioners, developing context-aware research studies, and investigating the conditions of successful uptake and appropriation after initial results.

In sum, DEEP follows three objectives: (1) to identify both the affordances and challenges that follow from the digital transformation for Swiss primary schools; (2) to test ways for creating and implementing equitable and effective digital learning environments; (3) to highlight feasible and sustainable strategies for professionalizing teachers and developing schools.

Our consortium works towards this transformative impact by conducting research within a space defined by two flagship challenges.

Flagship challenge 1: Capturing a moving target.

DEEP aims to have a transformative effect on the current state of Swiss primary schools. The first challenge comes from the fact that this state is actually not stable but is constantly evolving due to various societal developments, including the digital transformation. Acknowledging the speed of technological innovation and the social transformations surrounding it, we need to consider the profound changes that are already reshaping school practices and the key challenges that follow for (digital) teaching and learning in Swiss primary schools. Proposals may address this challenge by relating to ongoing international debates and research endeavours that focus on the digital transformation of learning environments¹. Some of these dynamics are already well understood. For instance, there is a broad awareness that the nature of “knowledge” changes in the digital era, as well as the kind of skills considered necessary for fully participating in society and in the labour market. For school education, this means that new content and skills need to be taught, with cross-curricular competencies presumably gaining more and more relevance. Other deep trends are less clear.

This first flagship challenge emphasizes that in order to design and implement digitally-enhanced interventions that transform primary schools towards effectiveness, equity, and inclusiveness, we need to ground these interventions in a deep understanding of how schools, teaching, and learning are already being rapidly transformed.

Flagship challenge 2: Producing context-aware and translational evidence.

DEEP aims to establish context-aware evidence for equitable and effective digitalization in diverse school and classrooms settings. Our premise is that often empirically-measured effects of technology-enhanced activities fail to generalize because they neglect contextual factors and processes. This problem is deeply interlinked with the **challenge of translation** because evidence needs to be relevant for teachers and other actors who need to act, react, and interact in very concrete contexts. DEEP aims to address this challenge by encouraging methodological innovation. Teachers and other relevant actors should be involved in different roles, e.g. following a “design-based research” paradigm. Teachers involved in the co-design of some lesson plans to be “tested” acquire ownership of digital tools etc., help identify challenges they face, interpret the empirical results of, and connect insights from empirical research to the classroom context. We expect proposals that produce rigorous and translatable (or “teacher-trusty”) evidence that truly speaks to teachers. DEEP thereby aims to increase its **translational power**.

Taking this second flagship challenge seriously implies to develop a DEEP methodological signature in which the focus is shifted from the effect of a digital tool to the way it is used in varying classroom or school contexts. It defies the myth that technologies have intrinsic effects on education.

Priority research areas and topics

In order to address the two flagship challenges, DEEP inquires into selected key topics and problem areas of digital teaching and learning in Swiss primary schools. Possible priority topics and research areas include, but are not restricted to the following:

1. **Shifting “boundaries of learning” and understanding moving targets:** Digitalization allows for new and varying arrangements of learning. Learning today means that children can link different contexts in ways that seemed inconceivable only a few years ago: online and offline, formal and

¹ The term learning environment is here understood in a wide sense and signifies the organized contexts in which children acquire skills and knowledges and develop their self-understandings.

informal, in-school and out-of-school. Thus, the variability of learning experiences and trajectories potentially increases, with unclear consequences regarding educational equity. Little is known about how teachers as well as children themselves perceive and handle these novel opportunities and challenges, and how they vary in doing so.

2. **Educational equity in times of AI & Co.** : After decades of disappointing promises, AI has suddenly delivered unprecedented achievements. Linked to these promises of enhancing learning is the hope of increasing effectiveness in administrative and repetitive tasks, including lesson preparation and assessment, allowing the human actors to focus on important, creative or pedagogical tasks. However, recent research has also demonstrated the risks regarding educational equity, i.e. of “algorithmic fairness and discrimination” (the reproduction of disadvantages such as disadvantaged family backgrounds through biases in data and algorithms). Although this risk is clearly understood, we know next to nothing about the form it takes in Swiss primary school contexts. As the primary school aims to provide the fundamentals of later school cycles, legitimate questions arise about the transformation of these fundamentals.
3. **Learning sequences including digital tools in varying classroom contexts:** Technology-enhanced activities are typically integrated with other, non-digital learning activities, into a sequence. Research is needed to study sequencing principles that enable teachers to build effective lessons with digital tools. Ideally, these principles shall prove generalizable, making it easy for teachers to apply to various classroom contexts. Most teachers have experienced that a sequence that occurred to be effective in a classroom may fail to produce the same effects in another classroom for several reasons: the learners’ level of variability, the physical layout of the classroom, the style of the teacher, the digital equipment or the support offered to teachers are not the same, etc. The design of learning technologies rarely considers practical aspects of classroom practices, for instance the possibility for latecomers to join activities that started 15 minutes before. These events belong to genuine classroom practices but have been neglected both by education research and by designers of digital tools for education. Therefore, translational evidence must also take into account the classroom context, i.e. the variables that explain what makes one classroom or class of pupils different from another: the spatial properties of the classroom, the available equipment, the individual characteristics of the teacher, the variability of pupils and many other variables. Explorative methods, in combination with intervention studies, are particularly suitable for this purpose. Thus, both qualitative case study and (quasi-)experimental designs potentially across different cantons should be employed to further understanding of these intricacies in a relevant, rigorous, and translational manner.
4. **The crucial and changing role of teachers and schools:** Another methodological criticism of research in digital education is that it often aims to establish the effect of a technology-based activity independently from the way the teacher is using the tool in her or his classroom. While it can be understood that decision-makers would prefer to acquire technologies whose effects are guaranteed for any teacher, there is something philosophically awkward to consider the influence of teacher as a bias for assessing EdTech solutions. One might argue that the teacher is one of the contextual variables highlighted on the previous section. However, any consideration of the role of teachers needs to take into account that digitalization holds the potential to change our very understanding of what it means to teach. The roles and responsibilities of teachers shift, with far-reaching, but so far hardly understood consequences for professional self- understandings, for the competencies needed for successful teaching, and for the resulting changes required in teacher education and training. To deal with these dynamics in an effective and equitable manner, teachers need to acquire skills and competencies that were of far less relevance only a few years ago. The digital transformation also changes the role of the school as an organisation. Across its research activities, DEEP will thus identify changes that are called for in teacher education and training, concerning curricula, didactics and school development.

In summary, DEEP encourages proposals that consider both the expected positive effects of digital activities and their potential undesirable co-lateral effects. We thus aim to pave the road for a **responsible** digital transformation of primary schools.