Data use for personalised learning: how can it benefit students and teachers?

Today, students can do mathematics exercises on a digital app that can analyse their progress and suggest new ones to help advance their competence level. Students can then move on to a digital reading exercise that tracks eye movements and notifies their teacher when they experience reading difficulties. Parents can access an online platform to check how much time their children spend on assignments and whether they are falling behind schedule. Self-regulated learning technology can inform teachers if students improve in monitoring their own answers while doing exercises.

Despite the availability of these technologies, research indicates that they may threaten equity and inclusion, and evidence is inconsistent regarding their benefits. To what extent therefore do these tools support learning, and do they address equity issues?

At individual level, adaptive learning technologies or digital personalised learning (DPL) can personalise content according to student or teacher needs. At group or system level, student data collected through these tools can be aggregated and analysed by researchers, policy makers and digital tool developers to make evidence-based decisions. However, international reports and the research literature highlight a range of challenges to making the use of data beneficial for students.

The Value Compass for digital transformation of education

Kennisnet, the Dutch public organisation for ICT, is leading initiatives to promote the ethical and safe use of education data in the Netherlands. One such initiative is a privacy covenant for digital tool suppliers in the Netherlands. By signing up for this covenant, the suppliers agree that they will safeguard the privacy of students and teachers using their products. There are currently dozens of suppliers on the list. Another initiative is the Value Compass for the digital transformation of education, jointly developed with SURF, proposing a set of values based on justice, humanity and autonomy. The compass establishes a common language and aims to facilitate discussions between stakeholders about digital education and the processing of student data.
The unclear impact of digital personalised learning

A DPL tool is any application that uses student data to respond or adapt to the student by, for example, customizing its content or adjusting instructions or the level of difficulty of exercises. DPL has the potential to support students in their learning, but its impact is not yet well established. Although DPL have a positive impact on learning according to research studies, study designs differ a lot and are mostly based on trials with small, possibly unrepresentative samples or with no control group. Furthermore, the recent Education Data Reality report, based on interviews with stakeholders in the United Kingdom, indicates that teachers and schools are not always sure about the benefits of the technologies they use, and not all of them are backed up by sound research. The report also highlights the fact that digital tool developers do not always use student data in a way that benefits students, sometimes owing only to a lack of knowing what can improve learning.

Facebook and other technology giants who have adopted DPL as the solution to unequal opportunities in education base their argument on Bloom’s (1984) study and argue that one-to-one human tutoring is the most effective teaching method. However, this study has been taken out of context according to systematic reviews. Current Artificial Intelligence (AI) technology is nowhere near to fully automatising tutoring and in the OECD Digital Education Outlook 2021 report it is argued that it will never reach the point at which it can fully replace a teacher for teaching content, let alone for learning social and emotional skills.

Effective use of student data for teaching and learning

Considering the issues above, it is important to be aware of how using student data may be ineffective and to consider alternatives worth exploring further.

First, DPL tools are not suitable for collaborative or group learning; they are designed for self-paced, individual practice. The classroom plays an important role in socialisation and emotional development, and this cannot be fully replaced by such tools. During the COVID-19 pandemic, many students were more positive about learning in their classroom than remotely (e.g., Croatia) although they enjoyed the flexibility offered by digital tools for tasks at home (e.g., Netherlands). This suggests that DPL can be used for practice at home, while teachers organise collaborative learning tasks in the classroom, possibly using classroom management tools and classroom analytics.

Second, according to an expert roundtable, personalised learning tools offer “no serendipity or diversity in what children access” (p. 12). Algorithms that personalise learning are in a way, working similarly to the social media algorithms that create echo chambers. In this scenario, students become passive receivers unlikely to be encouraged to reflect on the type of mistakes they make or to make decisions on what kind of content to look for next.

Third, a degree of self-regulated learning is necessary for the effective use of digital tools and AI, because students often use them for self-study. However, there are interesting examples of digital tools that aim to support self-regulation of students by encouraging them to track their own progress.

Schools can further encourage the use of digital tools with teacher-facing dashboards that provide them with insights about their students and help with planning activities. Assessment for learning is a cost-effective way of improving teaching and learning because it empowers the teacher to adapt their teaching in the light of insights provided by such dashboards to assess the impact of their activities and make improvements that would suit their context.

Pointers for policy action

- Encourage cooperation between teachers, education technologists and developers in designing digital education technologies.
- Include data literacy in the curriculum, both for teachers and students to learn to interpret digital dashboards better and to make better decisions based on learning data.
- The use of student data to adapt and improve teaching and learning is key for student-centred teaching but such pedagogical aims can be neglected when the focus is on learning to use digital technologies. Integrate in Continuing Professional Development (CPD) and teacher education topics such as data literacy and practical guidance on how to make decisions based on student data.

### Inclusion and equity in using student data

Recent national and international surveys reveal a digital divide between students from different socio-economic backgrounds. However, inclusion is not only a matter of access.

First, there is also a data divide in that disadvantaged groups’ data can be less secure and not be used to its full potential to help learners.

Second, the digital transformation of education can also disadvantage students with special educational needs (SEN). There are digital tools for SEN: for instance, digital tools can analyse handwriting to detect dysgraphia or track eye movements while reading on a computer screen to detect dyslexia. However, digital tools tend to be designed with the average student in mind, and not for students with disabilities or gifted students. Moreover, DPL is not used enough for SEN in low- and middle-income countries according to a UNICEF report.

Third, the adaptability of digital tools to minorities, different ethnicities and low-income regions is debated. UNICEF and a case study refer to efforts by digital tool developers to make the content of digital resources more suited to minorities. A systematic review also indicates that DPL can be effective in low- and middle-income countries. Nevertheless, the UNICEF data governance manifesto emphasizes that these technologies can potentially maintain biases against different demographic groups.

Fourth, data use should also address students’ personal needs and social and emotional learning. Studies indicate that children with emotional problems and high digital skills are the most vulnerable to negative outcomes from intense use of digital technology. Furthermore, a teacher recently explained that not all students cope well with the scoring scheme of DPL tools that display their errors as feedback.

Finally, digital tools might require a strong ability to self-regulate learning and make use of various digital skills. Consequently, some students and teachers will be less skilled than others to fully benefit from digital technologies.

### Privacy questions concerning student data

Evidence suggests that it is possible to design digital tools that personalise learning while keeping student data completely anonymous, not sharing data with third parties and leaving full ownership of data to the school. However, building in such ethical measures is expensive in terms of labour; legislation and regulation are needed to encourage and support digital tool developers to take these steps.

There is also the issue of how to regulate the use of student data for research. Digital products gather data that could be used for research, but their use by researchers may not always be clear to students and parents, and anonymity may not be assured.

The type of digital tools promoted in education systems can impact significantly on the design and privacy considerations of digital tools. More exchange is needed at all levels in education systems to understand this impact.

### Self-regulated learning

Self-regulated learning (SRL) is a process in which learners set goals for what to learn, decide what to do to reach those goals, monitor their progress, identify gaps in knowledge and regulate their actions, thoughts and motivation. SRL is therefore considered an essential skill for autonomous, lifelong learning and acquiring new skills. DPL’s impact on SRL is still not well established, but it is recognised that these and similar self-paced learning tools (MOOCs for example) demand a high ability to self-regulate learning.

### Digital education marketplace in Norway

Norway aims to develop a digital ecosystem of schools, municipalities, the state and the industry to promote transparency and interoperability of digital products and services, to encourage cooperation between suppliers and to enable data to be aggregated at system level in order to facilitate evidence-based decisions about education. A single sign-on system called Feide enables students and school staff to access digital services as well as assessment and administrative data with a single username and password. It also ensures safe and easy data sharing. In 2021, 280 digital learning services in Norway were using Feide. As suppliers need to use Feide to sell their services, schools and administrative institutions can better regulate data processing. Thanks to the ecosystem Norway also aims to replace school surveys with unobtrusive data collection through digital services.
Digitisation is rapidly transforming work and daily life, increasing the need for young people who are skilled in digital technologies and able to adapt and re-skill themselves, according to the Digital Education Action Plan by the European Commission. The COVID-19 pandemic has accelerated teachers’ adoption of digital tools. They should not however be solely responsible for selecting digital tools and ensuring their safe use but should be supported by regulations and practices put in place by education authorities. Although digital personalised learning tools have the potential to support learning and higher-order cognitive abilities, the algorithms behind them have a powerful yet invisible influence. The assumptions built into them should be open to debate, testing and change. The voice of educators should be heard in the development of digital tools and how learning data will be used by developers and academia to improve these solutions. Specifically, more studies with robust research methods are needed (randomised-controlled trials, for example), and studies comparing students who use DPL vs. students using the same technology without the personalising element, to isolate the effect of the “active component”. More research is also needed on how digital tools can be improved to better measure students’ self-regulation skills. These being said, the UNESCO Broadband Commission Working Group warns against heavy reliance on quantitative data collected by digital tools: they cannot capture all the contextual knowledge and understanding that a teacher constantly gathers about students while working with them and observing them.

Clearly there are unresolved issues related to inclusion and equity; problems that need time and multifaceted solutions. Developers can potentially use data they gather to understand how their technology can better respond to personal needs of students and teachers. There is a need to establish guidelines and procedures to evaluate digital tools and resources and promote closer collaboration between teachers, schools, digital tool developers, researchers and education systems concerning the use of student data to improve digital tools pedagogically. European Schoolnet will support this ongoing debate through Agile Edu, an Erasmus+ funded three-year project to foster dialogues between stakeholders and to develop case studies to address the issues raised in this Perspective.

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