Nputs

edition 2 | October 2024

Supporting students with learning analytics.

Practitioner stories, benefits and challenges, and future outlook.

Dit magazine is ook
beschikbaar in het Nederlands

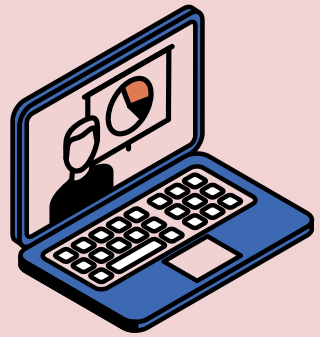
Supporting students with learning analytics.

Practitioner stories, benefits and challenges, and future outlook.

Authors
Alan Berg, Priyanka Pereira, Annie Slotboom, Manuel Valle Torre, Symen van der Pas, Anouschka van Leeuwen

Publication
October, 2024

Contact
info@npuls.nl



In this magazine

Introduction

Background, benefits and challenges of Student-Facing Learning Analytics

Students' perceptions of and expectations from Learning Analytics: What does the literature say?

International success stories of Student-Facing Learning Analytics

Insights from the field: Interviews on Student-Facing Learning Analytics

Learning Analytics with AI - What to expect

Conclusion

The project team (f.l.t.r.): Manuel Valle Torre, Alan Berg, Symen van de Pas, Anouschka van Leeuwen, Annie Slotboom, and Priyanka Pereira

Introduction

In the evolving digital education landscape, Learning Analytics (LA) has emerged as a powerful tool for enhancing student learning experiences and outcomes. By leveraging data collected from digital platforms, LA provides insights that help educators and students understand and optimise learning processes. Particularly, Student-Facing Learning Analytics (SFLA) represents a dynamic shift towards engaging students directly with their own learning data.

Learning Analytics is defined as the "measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (Siemens, 2013). This broad definition underscores the multifaceted role of LA in education, extending from administrative use to direct student engagement. Visit our first magazine for a more comprehensive description, considering barriers and facilitators for adoption, of the current landscape of LA.

Student-Facing Learning Analytics (SFLA) is not only about using students' data, but also about generating insights for them, such as a dashboard where they can monitor their progress in a course. In this magazine, we first cover the fundamental aspects of SFLA, its most common implementations, and the benefits and challenges it can present. We also provide an overview of *students' perceptions and expectations of Learning Analytics* since user engagement was one of the main facilitators identified in our first magazine.

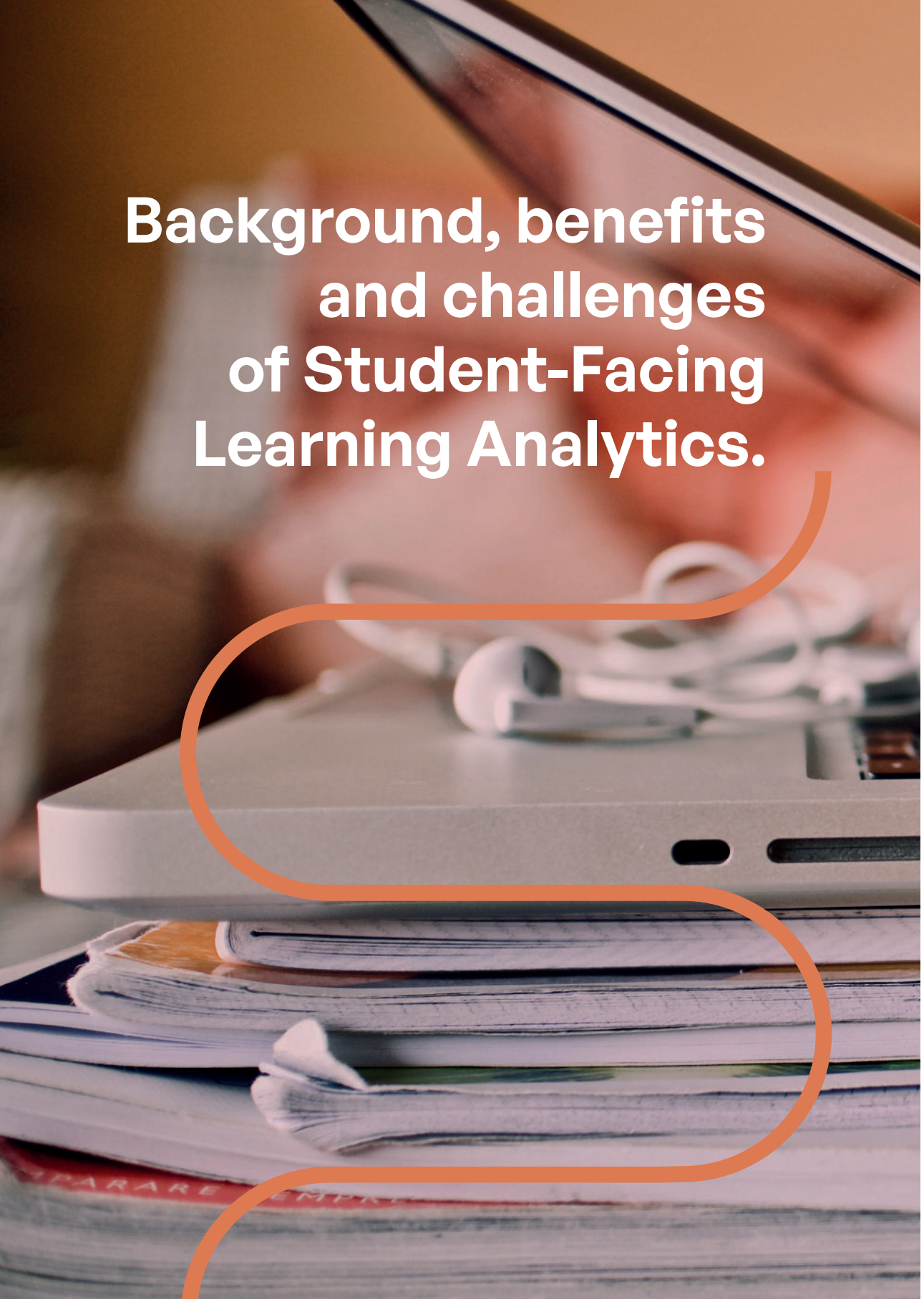
We continue by diving into 'success cases' of SFLA implementations. First with examples from the literature and then through insights from *interviews with researchers and practitioners* describing various SFLA projects and systems from Dutch institutions, where success sometimes means that valuable lessons were learned, even if the project itself did not achieve all its objectives.

Finally, we discuss the future of SFLA and the integration with Generative AI, also known as Large Language Models, popularised by ChatGPT. We consider whether we are helping students to understand their data or taking away the agency that we are trying to provide.

The aim of this magazine is to provide a comprehensive overview of Student-Facing Learning Analytics that not only informs but also inspires educational practitioners to adopt and implement these transformative tools effectively.

If you have any questions or comments,
we would be very happy to hear from you.

For our **contact details** and more information, visit the project website.



Background, benefits and challenges of Student-Facing Learning Analytics.

As a first step, we focus on the foundational aspects of Student-Facing Learning Analytics (SFLA). This section examines the scope and theoretical basis of SFLA, outlining different forms of SFLA and addressing the benefits and challenges they present in contemporary educational settings.

To establish the foundational aspects of SFLA, we explored academic databases such as Google Scholar and Web of Science. Our search showed that, while students have been participants in Learning Analytics (LA) research since the early 2010s, the term “Student-Facing Learning Analytics” did not appear in academic literature until 2017. We utilised these initial articles dedicated to SFLA to define its background and theoretical basis. We then examined articles citing these first works to uncover more information on specific use cases, benefits and challenges associated with SFLA in contemporary educational settings.

Initially, the focus of LA was primarily on tools for educators, used to enhance instructional practices and course management. These early applications, such as dashboards, were aimed at identifying at-risk students and optimising educational content to support both face-to-face and online learning environments. However, the evolution of LA has shifted towards a more inclusive approach, prominently working on the design and implementation of SFLA. This shift places students at the centre of their learning processes, empowering them with direct access to their own educational data to foster autonomy and informed decision-making.

A crucial aspect of SFLA is its role in facilitating effective feedback loops. Feedback in educational settings has been extensively studied, with recent trends emphasising the importance of interaction data-based feedback that is directly accessible to students. The effectiveness of such feedback hinges on how well the information is visualised and presented to the learners. A feedback loop is only considered closed if the learners take appropriate actions based on the feedback to bridge the gap in their understanding or performance. If no action is taken, the feedback loop remains open, and its potential benefits are unrealised.

Beyond just providing data, SFLA tools are designed to enhance student engagement, motivation and self-reflection by making the learning process more interactive and responsive. By integrating comprehensive feedback mechanisms, these tools encourage students to regularly monitor their progress and reflect on their learning strategies. The personalised nature of the feedback provided by SFLA tools means that students are not only informed about what areas need improvement, but also guided on how to make those improvements. This tailored advice helps students to remain motivated, particularly through challenging portions of their coursework, fostering a deeper understanding of the material.

Tools and Methods

SFLA encompasses a variety of tools, from dashboards to messages, that aggregate diverse data points about learners, learning processes and contexts into cohesive and understandable information. These tools aim not just to present data, but to transform it into actionable insights that students can use to guide their learning paths.

Empowerment Through Data

The overarching goal of SFLA is to empower students by making them the primary users of their own educational data. This shift not only promotes transparency, but also encourages a more engaged and reflective learning process. By providing data directly to students, SFLA supports self-regulated learning and enables students to take charge of their educational journey.

Implementing Student-Facing Learning Analytics

Student-Facing Learning Analytics (SFLA) can be implemented in various forms, each designed to interact directly with students and enhance their learning. By using one, and often a mix, of these forms, SFLA can then provide a multifaceted approach to learning that encourages autonomy, reflection and tailored educational experiences. Below, we explore some of the distinct forms that SFLA can take, illustrating how each contributes to student empowerment and academic success.

Descriptive Feedback and Recommendations in SFLA enhance the learning experience by providing students with targeted guidance tailored to their unique learning behaviours and outcomes. This form of SFLA enhances the educational experience by facilitating an interactive learning environment where feedback is not only reactive but also proactive, offering recommendations that are predictive (what might happen, based on the current data) and prescriptive (what to do about it).

In these systems, *feedback* often manifests as direct responses to student activities, assessments or interactions within the learning platform. For example, after submitting an assignment, a student might receive automated feedback highlighting strengths and areas for improvement, integrating information such as the rubric for the assignment or the average progress of peers with similar goals. This immediate and personalised response helps students adjust their learning strategies in the moment, promoting a more adaptive learning process.

Recommendations extend this concept by analysing patterns in a student's performance over time to suggest future actions. These might include suggesting more challenging materials for a high-performing student or proposing certain peer study groups if the analytics indicate that collaborative learning could be beneficial. Recommendations are designed to be anticipatory, guiding students towards activities or educational resources that will likely enhance their understanding and retention of the subject matter.

Both feedback and recommendations aim to activate students' metacognitive skills, encouraging them *to think about their own thinking* and to continually assess their learning strategies. Students are guided to ask themselves questions such as "Am I on the right path?", "Do the strategies I adopt work?", and "What can be done differently?". These questions not only foster deeper engagement, but also encourage students to take ownership of their learning, thereby enhancing their capacity to learn independently and effectively.

Instead of suggesting short-term activities or changes, as done by feedback and recommendations, **Personalised Learning Paths** adjust the educational content and pace to fit the unique needs of each student. By adapting to individual learning goals and progress, this form of SFLA allows students to explore subjects at their own speed, dive deeper into areas of interest, or spend additional time on complex topics. This approach contrasts sharply with the traditional "one-size-fits-all", as paths are often adjusted dynamically based on the student's performance and engagement levels, ensuring that each learner receives a truly tailored educational experience.

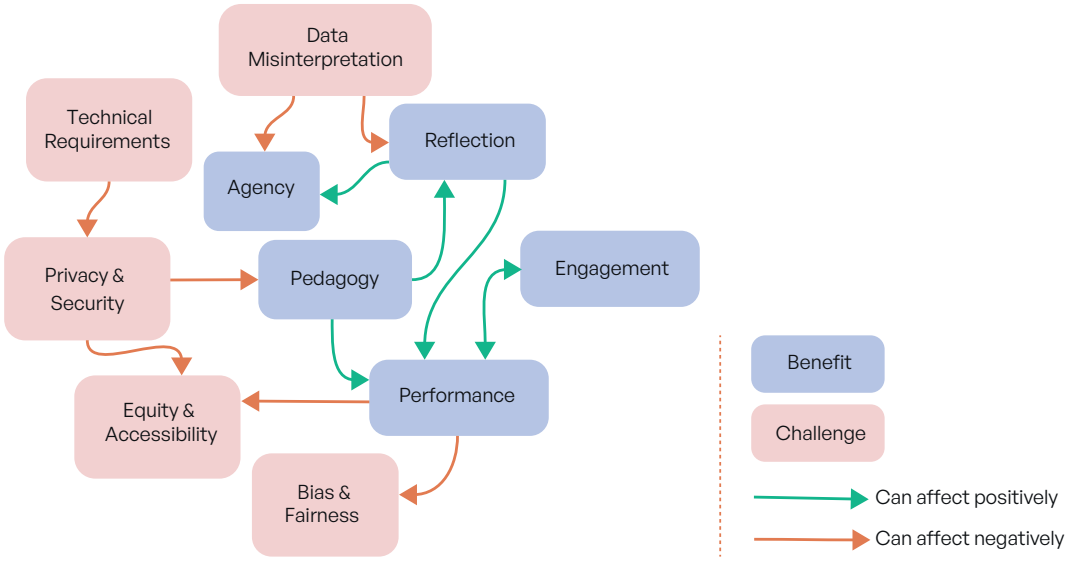
The essence of *personalisation* within SFLA lies in its ability to dynamically adjust learning materials and objectives based on analysis of learner interactions and performance. By incorporating both static (such as the learner's previous knowledge and the course design) and dynamic parameters (such as real-time performance metrics and changes in learning goals), SFLA systems can offer highly customised learning paths, ranging from a single module to a full-length programme, capable of evolving with the learner. Such mechanisms not only enhance the learning experience, but also boost learner engagement and motivation by showing visible progress and providing clear guidance on where additional focus is needed.

Finally, **Dashboards** serve as a fundamental form of SFLA, providing a visual synthesis of data that enables students to interact directly with information about their learning activities, progress and outcomes. As defined by Schwendimann et al., an LA dashboard is "a single display that aggregates different indicators about learner(s), learning process(es), and/or learning context(s) into one or multiple visualisations". This integration allows students to perceive and understand their learning patterns and progress without needing specialised knowledge to interpret the data.

The impact of dashboards extends beyond data representation; they are instrumental in fostering a proactive approach to education. Students are not only recipients of knowledge, but also active participants who can steer their learning experiences based on the feedback provided by dashboards. These tools offer a practical application of the theory that students benefit significantly from access to their own learning data, supporting the argument that they have both the *right and the responsibility* to engage with this information. By enabling self-assessment and self-regulated learning, dashboards provide a platform for students to monitor their own progress and engagement whenever they want. This capability is crucial for adjusting study habits, identifying areas for improvement, and setting realistic academic goals. The visibility of such data helps demystify the learning process, making it more tangible and manageable for students.

In practice, there is no clear distinction between systems using feedback, recommendation, personalisation or visualisations. For example, the most recent successful LAD implementations have moved "from being about analytics to being about learning" by complementing visualisations with theory-based recommendations. Similarly, a personalised path system has shown positive results for learner satisfaction and outcomes by integrating automated difficulty adjustments and learning material recommendations, where the learner is still in control.

Benefits and Challenges of Student-Facing Learning Analytics



Student-Facing Learning Analytics (SFLA) significantly enhances the educational experience by providing students with the tools and insights necessary to take active control of their learning processes. Here are some of the primary **benefits**:

Agency: SFLA empowers students by making them the primary users of their own educational data. For example, dashboards allow students to see real-time updates on their progress and engagement, enabling them to make informed decisions about their study habits and academic strategies. This visibility helps students feel more in control of their learning journey, fostering a sense of responsibility and ownership. (Note: Agency may conflict with pedagogy or course design, as students still need to comply with course requirements.)

Engagement: By offering personalised recommendations and feedback, SFLA systems increase student engagement and motivation. Students receive tailored advice on resources and activities based on their individual performance and preferences, making learning more relevant and engaging. For instance, a recommendation system might suggest specific peer groups or additional resources when it detects a student struggling with a particular concept, keeping the student actively engaged and supported. (Note: Engagement is beneficial and may have an impact on Performance, but it should not be the sole objective of SFLA systems.)

Reflection: SFLA tools facilitate reflection by providing students with detailed feedback on their performance. This ongoing feedback helps students understand their strengths and areas for improvement, guiding them to reflect on their learning strategies and outcomes. Personalised learning paths, for instance, adjust to a student's pace and style, allowing them to reflect on their progress and reassess their goals as they move through different learning modules. (Note: Reflection can complement Engagement and Agency, working as the catalyser to improve Performance.)

Performance: The direct feedback and personalisation capabilities of SFLA have been shown to lead to better academic outcomes. Dashboards that visually display a student's progress in relation to learning goals can motivate students to improve their performance. Additionally, alerts and notifications can prompt students to focus on areas that require urgent attention, preventing minor setbacks from becoming significant obstacles. (Note: Performance can vary for different students depending on their goals and specific context; optimising for a single metric may neglect equity and fairness, or it may introduce unexpected bias.)

Integration with Pedagogy and Learning Design: Incorporating SFLA into the (digital) classroom changes the traditional roles of teachers and students, promoting a more interactive, student-centred learning environment. Teachers become facilitators who guide students in interpreting and acting on the insights provided by learning analytics, rather than the sole providers of feedback. The course design should also allow students to use this feedback

and make decisions about their learning. This shift supports a pedagogical approach that values student agency, self-direction and self-reflection, which are key traits in modern educational practices.

While SFLA offers significant benefits, there are several **challenges** that can impact their effectiveness and adoption in educational settings. Addressing these challenges is crucial for realising the full potential of SFLA:

Data Privacy and Security: One of the foremost challenges in the implementation of SFLA is ensuring the privacy and security of student data. As these systems collect and process detailed personal information, there is a substantial risk of data breaches and unauthorised access. Ensuring compliance with data protection regulations and implementing robust security measures are essential to protect student privacy and maintain trust in these tools. (Note: Integrating more data sources, for instance, to better understand specific student needs, also increases data sensitivity and security requirements.)

Equity and Accessibility: Ensuring that SFLA tools are equitable and accessible to all students is another significant challenge. There is a risk that these technologies could disproportionately benefit students who already have greater access to resources, thereby widening existing educational disparities. Moreover, students with disabilities or those from diverse linguistic backgrounds may face barriers to accessing or benefiting from standard SFLA tools. Developing inclusive design practices and considering diverse student needs in the development of SFLA is crucial. (Note: Understanding students better aims for higher accessibility and equity but can compromise privacy.)

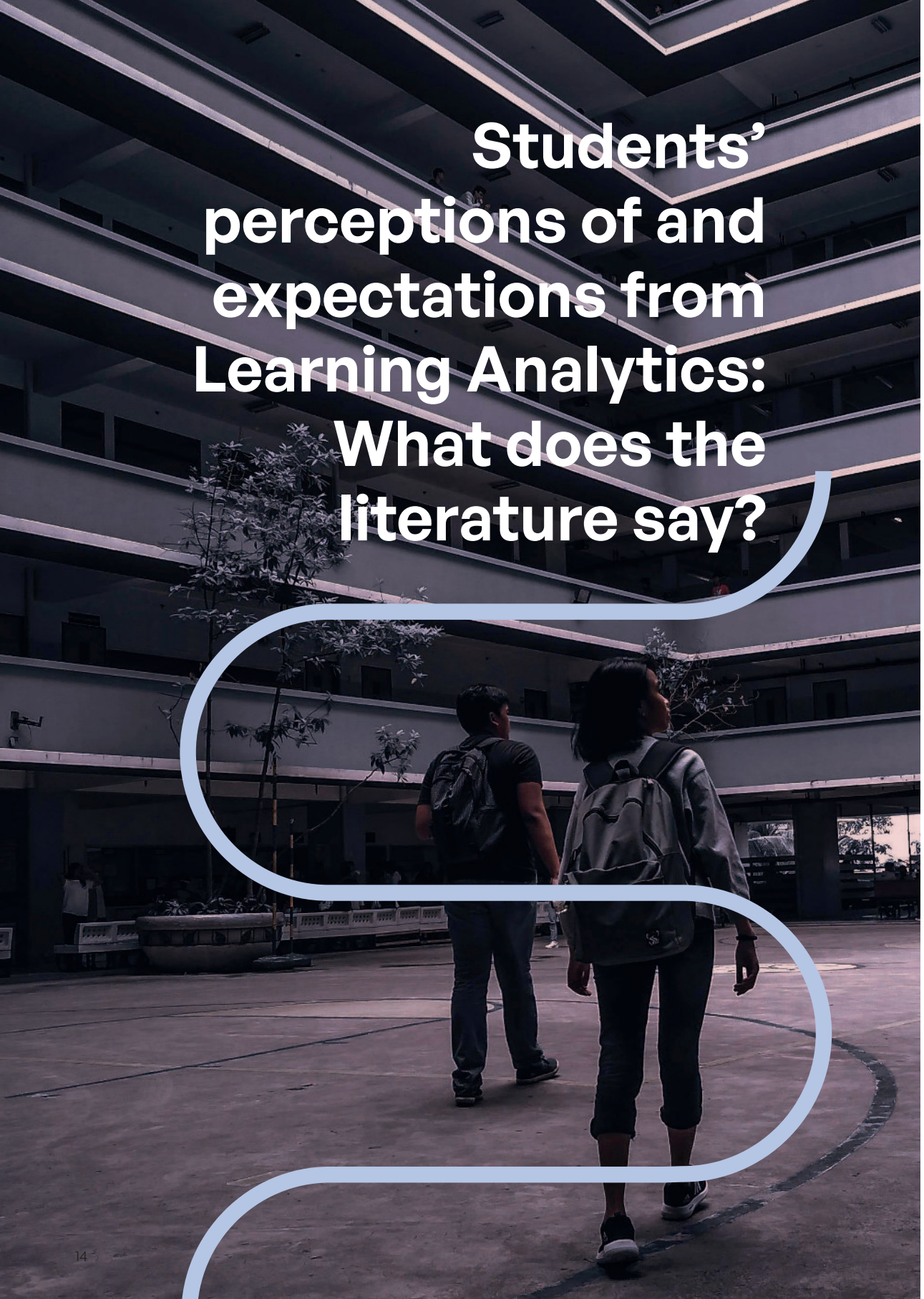
Algorithmic Bias and Fairness: The algorithms that power SFLA tools can inadvertently perpetuate biases if not carefully designed and monitored. For instance, if the data used to train these systems is not representative of the diverse student population, it could lead to biased outcomes that favour certain groups over others. Regular audits and updates of these algorithms, along with transparency in their workings, are essential to ensure fairness and accuracy.

Technical Complexity and Resource Requirements: Developing, implementing and maintaining SFLA systems require significant technical expertise and resources. The complexity of these systems often necessitates substantial upfront investment in technology and professional development for educators. Smaller institutions or those with limited budgets may find it challenging to adopt and sustain such advanced technologies. (Note: Data privacy and security requirements increase with higher-quality procedures and infrastructure.)

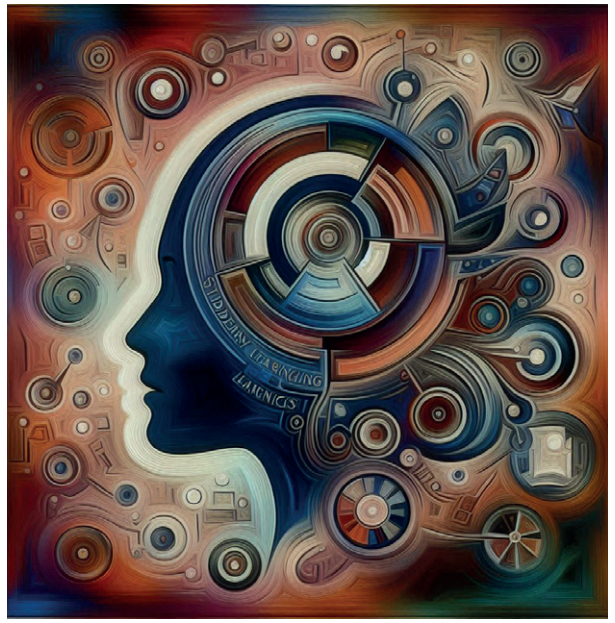
Misinterpretation of Data: There is also a risk that students may misinterpret the data provided by SFLA tools, leading to misguided decisions. Providing adequate training and support for users to understand and correctly interpret the analytics is crucial. Additionally, ensuring that these tools provide actionable insights rather than raw data alone can help prevent misuse and enhance their educational value. (Note: As data insights become more processed and guarded to mitigate misinterpretation, this can be detrimental to students' Agency and Reflection).

Wrapping up

Wrapping up our discussion on the current state of Student-Facing Learning Analytics, we see that significant changes are on the horizon. First of all, a strong theoretical foundation is set to underpin the next generation of tools, ensuring that they are both effective and ethically designed. We also see the potential of integrating prescriptive feedback and recommendations with visuali-sations in dashboards to bridge the gaps in students' data literacy, while maintaining their agency and fostering deeper reflection. Current research, including developments in Generative AI, points towards these tools not just analysing but also communicating with students to discuss and elaborate on the insights from their data. In the final section of this magazine, we discuss how these advancements could revolutionise the way we engage students and personalise their educational journeys.



Students' perceptions of and expectations from Learning Analytics: What does the literature say?



DALL·E 3 interprets Student-Facing Learning Analytics

In the previous section, we discussed different types of Student-Facing Learning Analytics (LA) and the challenges and benefits of those types. An important question that remains to be answered is what students think of the implementation of LA. In our first magazine, we established that stake-holder engagement is one of the main drivers of LA adoption, so it is vital to know if the students are on board with LA. Many international colleagues have investigated students' opinions, which makes it possible to compare across countries.

In this section, we will therefore look at research into student perceptions of LA to get a general idea, and a comparison between students of different countries. An interesting observation is that LA hasn't been widely implemented yet, so most studies consider the "idea" of LA, instead of experience with a specific system.

Student perceptions can be investigated in multiple ways. To make it possible to ask a large number of students at the same time, a useful option is to use a questionnaire. In international literature, the most popular instrument to measure students' opinion of LA is the Student Expectations of Learning Analytics Questionnaire (SELAQ), a questionnaire with 5 statements

related to *Ethics and Privacy* and 7 statements about the *Features of an LA Service*. The SELAQ was designed following an iterative process to ensure that it covers key expectations of students. As a standardized questionnaire, it can be applied in different contexts, allowing the results and insights to be compared. For each of the 12 items, students indicate 2 values: their ideal perception and how they predict it will actually be implemented. For example, one of the Ethics statements is "The university will ensure that all my educational data will be kept securely", and one of the LA Feature statements is "The Learning Analytics service will show how my learning progress compares to my learning goals/the course objectives".

The SELAQ was introduced in 2019 and has since been translated and filled in by university students from Estonia, Netherlands and Spain (see Appendix O in the link for the validated Dutch translation) in 2020, and later by students from Germany as well, to make a comparison to the other countries. Some of the findings include:

- In general, university students have very high **ideal expectations** of Ethics and Privacy, while their **implementation predictions** are somewhat lower. In other words, university students set a high bar for LA but expect that institutions cannot reach this bar completely.
- The Features of an LA Service showed lower ideal expectations and a higher variation across all countries. This seems to imply that university students find it more important that Ethics and Privacy are properly taken care of.
- While there are no significant differences between countries, there are some slight variations in their expectations.
  - One difference between countries is that students from the Netherlands showed slightly higher expectations in the implementation of LA Features, especially compared to Spain and Germany. However, this may be because the study was carried out at the Open University, so students are more familiar and confident in the use of technology in their education than in a "traditional" institution.
  - Another difference between countries is in the expectations of Ethics and Privacy, where students in Spain showed lower results than the rest.

The SELAQ was also applied in 2022 in Sweden, and again in Germany in 2024. In this last study, the researchers categorized students into four types depending on their opinions of LA: *Enthusiasts, Realists, Cautious and Indifferents*. Maybe surprisingly, the **enthusiasts were the biggest group**, consisting of 36.9% of the participants. The researchers also found that student perceptions differ between programs. This seems to signify that students are indeed open to the use of LA, if implemented carefully and safely, and that different faculties or programs require different strategies for implementing LA.

While the SELAQ measures *expectations* of LA, other studies have looked at perceptions of LA that students have actually interacted with. One study for example looked at student perceptions across four courses. The LA in the study provided personalised feedback to students. From focus groups with students, it turned out that most students had positive perceptions of the feedback they received, and that it was especially because the instructors had incorporated LA well into the courses and had put effort into maintaining personal contact with students as well. **In other words, the LA did not replace, but enhanced the feedback process**. As we will also see in the interviews with Dutch practitioners later on in this magazine, implementing LA is not only about the tool but mainly about how the teacher and students implement LA into existing practices.

The general view from the literature is that student perceptions differ within and across countries, but that students, in general, have high expectations of LA, especially regarding Ethics and Privacy. Students are open to the use of LA and its potential benefits. Student perceptions of technology are important because they relate to whether or not students will be willing to engage with the technology and because they provide practitioners with insights on how to design LA systems. Besides student perceptions, it is also important to investigate how students actually engage with LA and the effects of LA on students' learning gains and skill acquisition. For example, in a dashboard study that provides recommendations about what content and skills to work on, it was found that 75% of students were positive about the dashboard, but only 25% of students actually used the LA system multiple times. It is therefore also essential to incorporate LA well into the existing learning and teaching processes and to provide support to students on how to use LA, as we see in some of the successful examples of SFLA in later chapters.

Finally, a shortcoming in current research is that there is a blind spot in the LA literature, with no research published on the perceptions of students from mbo and hbo (or international equivalents, such as Vocational Education and Traning - VET). However, here is also where the strength of standardized instruments like SELAQ (Appendix O for Dutch) comes into play: the questionnaire is openly available and institutions can follow the established procedure in previous work, collect the perceptions of their students, and compare them to international results.

So, one concrete action that Dutch institutions could undertake is to use the SELAQ to ask their students about their perceptions of LA, so that they can tailor their LA implementation plan to the outcomes. German colleagues recommend different approaches depending on the results. If there are for example many students in the "Cautious" type, consider organizing workshops detailing LA's benefits and emphasizing the security measures that are taken. Students in the category "Realists" are skeptical about institutional capabilities to implement LA and for this group it would be good to pay attention to digital competences of staff and students and to be transparent about LA to take away students' concerns. We will also see some of these strategies in the interviews in this magazine.

International success stories of Student-Facing Learning Analytics.

Introduction

As described in the introduction to this magazine, student-facing learning analytics (SFLA) is receiving increasing attention. Where dashboards used to be mainly aimed at offering learning analytics insights to study advisors, teachers and management, the focus is increasingly shifting to the students themselves. According to Paulsen and Lindsay (2023), this creates opportunities to use educational principles more strongly when designing a dashboard that is student-oriented. This is necessary to ensure that dashboards focus not only on data analysis, but also on design based on didactic principles that support the student.

In this section, for inspiration, we look at two examples from the international literature on SFLA, in each of which there was a clear underlying educational goal, and an extensive design process was applied to achieve that goal. In the next section, we shift our focus to the Netherlands and present interviews about a number of SFLA systems that have been developed in the MBO, HBO and WO sectors.

“LevelUp” by Charité-Universitätsmedizin

The review study by Paulsen and Lindsay (2023) shows that most dashboards are still too exploratory to determine whether they are effective in supporting the learning process. Yet, the maturity of student-oriented dashboards has continued to increase in recent years. Particularly from 2016 onwards, student-oriented dashboards are becoming more mature and are increasingly being used on a larger scale. An inspiring example at the highest maturity of commitment and commercial availability is the “LevelUp” dashboard, which was developed by Roa Romero and collegues (2021).

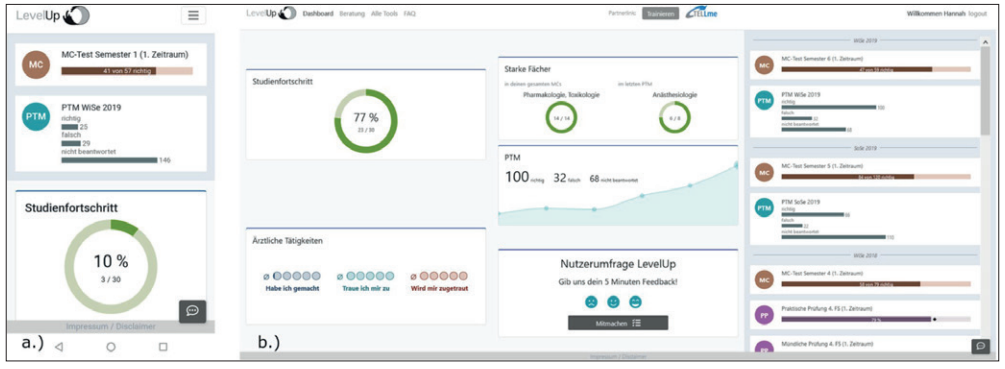
The LevelUp dashboard was designed for the medical training courses of the Charité-Universitätsmedizin in Berlin, based on the premise that feedback is essential for a self-regulating learning process. By using a student-oriented learning analytics dashboard, it is possible to

bring together feedback from many different channels on one platform and offer it clearly to students on both desktop and mobile. On this dashboard, students can view their progress, their test results, and on which topics in the curriculum they score strongly compared to averages. This has been achieved by aligning the data provision with the current (modular) curriculum in the dashboard development phase, and by focusing on the pedagogical principle of feedback and insight for self-regulation.

The LevelUp dashboard is also a platform for providing students with information to support their learning process. In addition to the 'Dashboard' tab, students can view the 'Advice' tab, which displays the study support options that the institution can offer, and the 'Tools' tab, which displays the more technical support resources that are available. Students can respond directly to the dashboard by leaving feedback as a user.

The close integration between the curriculum and the technical systems and the number of students who can use the system together create a dashboard at the highest level of maturity. The dashboard has been extensively tested with students. These tests showed that students appreciate that the dashboard provides an overview of the curriculum and test results and that the dashboard meets the need for clear feedback in Charité's modular curriculum. In addition, the user-friendliness of the dashboard ensures that students want to use the dashboard regularly. The dashboard can be used in open source for other (medical) courses.

If you're curious about LevelUp, you can take a look at the demo.

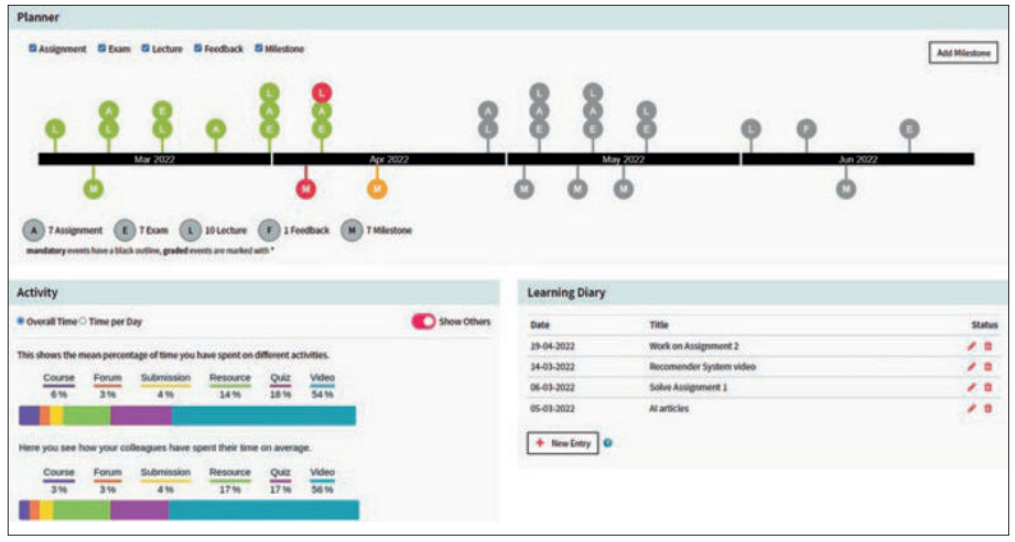


Screenshot Level Up from Roa Romero et al., 2021

"Learner's Corner" by TU Graz

While the Charité-Universitätsmedizin designed a dashboard based on a strong connection with the curriculum, TU Graz focuses on offering a dashboard with tools that ask students for input. The dashboard, called Learner's Corner, is specifically aimed at 'increasing study success by promoting and developing self-regulated learning'. Three tools are available in the Learner's Corner, to help students take control of their learning. These tools are Planner, Activity, and Learning Diary, which are displayed together on one dashboard.

Screenshot of the TU Graz dashboard



Planner

The Planner tool is centrally located at the top of the Learner's Corner dashboard. Based on Moodle data, activities recommended by teachers are offered to students to plan. By linking the dashboard to different courses, multiple teachers and education courses provide an overview of which activities a student can undertake to complete the education. From this overview, the student can plan when to pay attention to each activity, after which the dashboard sends reminders by email, monitors tasks and visualizes completion with traffic light colors (green, orange and red). Students thus remain in control of scheduling their tasks and can anticipate busy periods with their planning.

Activity

Through comprehensive data integration with Moodle, the Activity section in the Learner's Corner offers an overview of the time spent on activities in the LMS. Here, students can see how much time they have spent on specific activities, both per day and in total. In addition, they can choose to compare their data with the average of all fellow students, and thus get an idea of how much time they spend on specific assignments relative to their peers. This option was initially standard, but the design phase of the dashboard showed that, while a group of students liked this, there was also a group of students who found it unpleasant because the comparison caused them stress and discomfort. Therefore, it was decided to allow students to switch this option on or off themselves. It must be noted that the dashboard is only able to measure online activities in the LMS, so offline activities are not visualized. This is important to emphasize to study career counselors when discussing study progress and commitment, because a complete picture cannot be provided.

Learning Diary

Learner's Corner also offers a tool for students to add contributions to their own diary. In the Learning Diary, students can add textual information (for themselves or study career guidance) that they consider important. Although the tool was initially intended for reflection, students appeared to use the ability to save messages for different purposes. For example, there were students who wrote reflections that helped them look back on a period, but there were also students who used the tool to make notes for actions they still had to perform or to record feedback for the training.

Learner's Corner also provides a resource for broader analysis. By combining the Learner's Corner with a Creator's Dashboard and Course Dashboard, teachers, management and educational designers can also gain insight into which educational elements are used, when are they used, what the results are, and how students achieve and experience these activities with insight into planning and reflection. Students indicate that they are positive about the dashboard, but think it is important that they receive a transparent explanation of what their data is used for and which target group can view which information.

Interested in how the Learner's Corner encourages self-management by offering students tools for planning and reflection in addition to analytics? Then, watch the latest version in the (German) video via the blogpost from TU Graz.

Insights from the field: Interviews on Student-Facing Learning Analytics.

Learning Analytics continues to advance both in research and in practice, with many institutions in the Dutch Learning Analytics (LA) community developing applications to provide students with valuable insights. This section showcases some of this progress through a series of interviews with LA pioneers in MBO, HBO and WO.

These interviews emphasise the importance of a collaborative development process involving students, teachers and technical experts to ensure dashboards meet the needs of all users, with a particular focus on students. They also highlight the need for a phased implementation approach and comprehensive teacher support to integrate Learning Analytics into the educational landscape successfully.

We feature colleagues from several institutions discussing their current and future student-centered applications and their results. These discussions reveal how data can empower both students and educators by focusing on creating dashboards that are not only informative but also actionable. The goal is to design dashboards with clear visualizations and actionable insights, while fostering data literacy among students.

By embracing these key themes, we hope to inspire and inform the continued advancement of Learning Analytics in Dutch education. On the following pages, you will find interviews that explore the motivation behind developing Student-Focused Learning Analytics (SFLA), the proposed solutions, and the lessons learned.

Colleagues who were interviewed

Erwin van Vliet from the University of Amsterdam, saw an SFLA opportunity in the psychobiology elective, because some students started studying only a week before the exam, while others studied a lot but were still anxious about whether they would pass. He developed a SFLA dashboard to help students track their progress in comparison to other students who have the same goal as them.

to the interview

Simone Kooij and **Heleen van der Laan** work at MBO College Hilversum - ROC van Amsterdam and are designing an SFLA dashboard based on LMS systems. The dashboard gives students insights into their learning goals, provides feedback, and displays their grades.

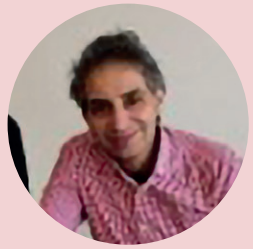
to the interview

Fulya Kula and **Heleen van der Zaag** from the University of Twente discovered that, during the bachelor's degree in civil engineering, sometimes students lack the prerequisite math knowledge from high school, and they designed a SFLA system to help students gain insight into this.

to the interview

Monika Donker and **Marije Goudriaan** from Utrecht University noted that students still had difficulty with academic writing at the end of the bachelor's and pre-master's program in pedagogical sciences, and they developed a SFLA system to help students view all the feedback they had received on their writing.

to the interview



Marcel van Vliet and **Memon Boukio ur** are teachers at The Hague University of Applied Sciences, they want to make better use of the LMS to help students manage, regulate their learning process and prepare for testing.

Hans Krommenhoek works at VISTA college. He set up the Digiwijs 3.0 project, a public-private partnership between business and education. He explains how SFLA can support students in this.

Jessica Zweers works at Hanze University of Applied Sciences. She combines education, research and policy and works on educational innovation. She shows how SFLA plays a role in this.

to the interview

Rianne Conijn and **Uwe Matzat** from Eindhoven University of Technology have been monitoring student behavior for some time, and during and after COVID they noticed that students had more difficulty regulating themselves and keeping up with their studies. They developed a SFLA system to provide students with insights into their online learning behaviour, in order to help them with their self-regulated learning.

to the interview

IguideME
Personalized feedback

Erwin van Vliet works as an associate professor at the Swammerdam Institute for Life Sciences at the University of Amsterdam and is program director of the bachelor's program in Psychobiology at the University of Amsterdam.

The Trigger

In a third-year elective course within the Psychobiology bachelor programme, I noticed that some students were starting to learn and practise one week prior to the exam, and that other students were studying a lot but were still stressed about whether they would pass the course. So, during the course, students did not know how well they were doing.

The Solution

At the UvA, we designed and developed the I guide My Education (IguideME) dashboard that is embedded in the Canvas learning management system. The dashboard provides students insight into the learning process, the learning environment and the learning outcomes. It helps students track their progress in comparison to other students who have the same goal as them. When students enter the dashboard, they set themselves a goal grade they would like to achieve. They can change this grade during the course. Based on the grade that a student sets, let's say 6, they will be compared with other students who set a 6. In the bar view (Image 1), the student can then see how they are performing in relation to their peers, in terms of quizzes, reading assignments, practice sessions, exam grades, learning outcomes, etc. Students also receive notifications, based on the activities they undertake during the course, for example, "You're outperforming your peers on Perusall assignments". We also try to motivate students if they are lagging behind, for example, "You're closing the gap to your peers on practice sessions". So, it's a combination of providing insight into what's going on as well as sending out notifications on what's going well and which things should go better. In the bar view, there are no numbers provided, but if the student is interested, they can go to the grid view (Image 2). For each type of activity, there is a tile. The student can view their progress and their average score on the top part of the tile and the peer comparison on the bottom part of the tile. The student can click a particular tile to view more information, such as how much time they spent on the activity, etc. The dashboard can be customised to the teacher's needs. It can show formative and summative assessments and it can include the tiles that are needed. We have another part of the dashboard that shows the students how much of the learning outcomes are achieved and gives them a predicted grade, using predictive analytics based on historical course data. Students can use the predicted grade to know whether they need to change their behaviour to achieve the grade they set.

I started using the dashboard within my own course, but it was soon used in multiple courses within different programmes and different faculties at University of Amsterdam. Then, we started using it at the Free University, and now we are embedding it at the University of Groningen. So, it has gone from being used in one course to being used across universities.

Students were involved in the design and development process. Through evaluations and focus groups, they provided feedback on what worked, what did not work, what they would like to see in the dashboard and how the dashboard benefitted them.

The purpose of the dashboard was to give students insight into the process, so that they knew how well they were doing and could take the necessary measures. If students are compared to their peers, that is, other students who have the set the same goal, it helps to keep them engaged, motivated and stimulates self-regulated learning. (. Learning analytics allowed for the provision of personalised feedback to the students, without much effort from the teacher, even with a large class of around 250 students. It also provided teachers with insight into what students were doing and how well they were doing in the course.

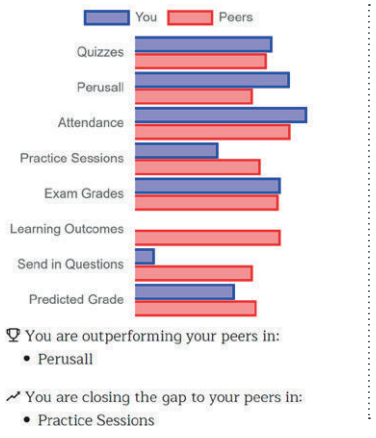


Figure 1. IguideME Bar View

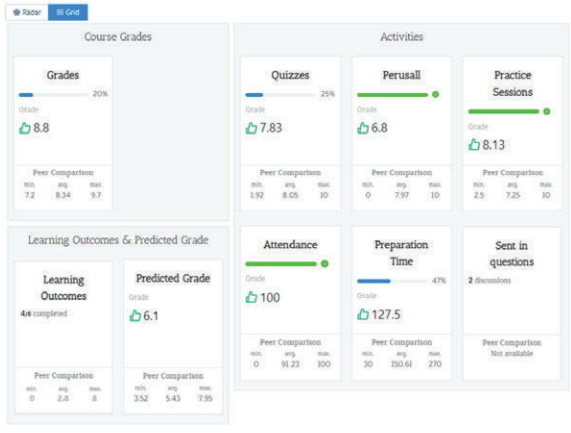


Figure 2. IguideME Grid View

The Outcomes

Students who had access to the dashboard were more motivated, showed better self-regulated learning, measured via validated questionnaires (see Fleur et al. 2023). They also obtained better results. Also, the quality of education improved, because the lecturer had insight into how the study materials were used and started to change the didactics during the course. Students reported that they were really happy with the dashboard. They said they were engaged, and the dashboard was helpful and provided insight. A few students said they did not need the dashboard. The good thing is that, if students do not need or want the dashboard, they don't have to use it. Some lecturers really like the idea and want to have it in their course. But some teachers are a bit hesitant. With onboarding we showe them how it works and support them through workshops and personal assistance. Once they went through the process, they saw it's quite easy and were more likely to use it the next year.

While we have had good success, it was not that way from the beginning. Some things did not go as planned. The first time we used the dashboard, we compared students with the average of the whole class. Students were not too happy with this and lacked motivation. Thereafter, we introduced the peer-comparison, and things went much better. Also, it is very difficult to engage students who are never in class and do not have much contact with the teacher.

The Future

We are trying to think about how to attract students who do not engage with the dashboard, because we think they can benefit from it. We are now implementing a module design, so that students can see an overview of different courses in the programme. Teachers or study advisors or other people who support students would also be able to see this overview, so that they can support students better. We are connected the dashboard to Brightspace, so that the dashboard can be used at the University of Groningen. And we are thinking about connecting to Moodle as well. Due to a NWO Take-off grant we are investigating the feasibility of being a startup company to make the tool sustainable and provide it also to other educational institutions.

Facilitators and Barriers

We arranged a number of factors and talked to various stakeholders before we started the process. We discussed e.g., with the legal department to make sure that everything was legally okay. We talked to the Privacy Officer, in order to have GDPR arranged. Because we combined tools within the learning management system, we had a data processing agreement. We ensured that every student would have the same opportunity by paying for the server space and for the AI that's used. We provided full transparency about the data we collected and what we did with it. We thought about the didactics and aligned the dashboard with the educational goals. And we ensured that we had an ICT person to make the connection between the dashboard and the learning management system.

Tips for others who are thinking about implementing a learning analytics system

First of all, evaluate what is needed by your institution. Conduct some focus groups to get people's opinions. Make sure you have all the stakeholders available and talk to them about what is needed. Once you implement it, check whether it works or not. If it doesn't work, learn from that and create a better iteration for next time. Start small, and once you achieve success, scale up and get everyone on board. Do not forget to include the general management of your institution. Provide support to teachers by asking them what they want to measure and what the didactics are. Talking about how they want to use the dashboard already leads the teachers to a different way of thinking and improves the quality of education. Communicate your progress to others, so that we can help each other.

A Study Coach Dashboard for Vocational Education

Simone Kooij is an educational specialist at the MBO College Hilversum - ROC van Amsterdam. She focuses on designing and improving educational programs, training and guiding teachers, and coaching and providing feedback to students.

Heleen van der Laan works as an information manager at the ROC van Amsterdam and has significant experience with learning management systems. She is a driving force behind the SFLA dashboard, which was developed in collaboration with Canvas LMS for your Educational Institution | Drieam Consultancy.

Shaping SFLA from the Educational Perspective

"Based on the vision of 'personalized education', we decided to focus on where the student currently stands and their needs—can they go further, or do they need additional support?" explain Heleen and Simone. The SFLA application at ROCvA-F is a study coach dashboard that gives students insights into their learning goals, provides feedback, and displays their grades. The dashboard supplier was closely involved in the process. Heleen explains that she consciously chose to involve colleagues with ideas and wishes for the dashboard from a practical perspective, without heavy ICT involvement. She gathered an enthusiastic group of about 20 professionals who were eager to contribute to the dashboard's development. Simone joined the team at that point.

"During the sessions, it became clear that key objectives were prioritizing student ownership and improving teachers' ability to give feedback. We also limited the project scope to only data from Canvas, as that was complex enough," Simone and Heleen explain. "Despite the various wishes and needs of the involved programs and teachers, we didn't want to get stuck on technicalities. Some teachers requested to include attendance tracking and BSA (binding study advice) or exams, but we aim to go a step further, such as allowing for a visual representation of a student's growth in their work processes and competencies or of the kind of framework that the curriculum has for this."

What does the SFLA Application Do?

Simone Kooij and Heleen van der Laan explain that the application places the student at the center. Students can track their development and are encouraged to reflect on their growth and contributing factors. There was a deliberate decision not to compare students with one another, as this does not align with the vision of increasing student ownership. The goal is to support personalized study guidance and make progress and self-management more visible—not just for the student, but also for the study coach and educational staff.

The application fosters communication and collaboration not only between students and teachers, but also among teachers. Moreover, it helps students learn independently and work on their personal development. The application enables students to make independent decisions about their learning process and reflect on their learning behavior.

> "We're not at the top of the mountain yet, but the pass already offers a beautiful view!"

The dashboard is still under development and will be evaluated and improved during the 2024/2025 school year based on user feedback and experiences. Heleen and Simone stress that the tool does not replace human interaction between students and teachers, but rather complements and enriches it. "We're not saying students will check this daily, that's something we still have to experience," says Simone. The focus is on the guidance session after an educational period, allowing teachers and students to review study progress together. One major goal is to provide cross-disciplinary insights, focusing on motivation and ownership, a key priority from the outset.

Additionally, the dashboard provides insights into student behavior—specifically learning behavior: how are you learning, exactly? The dashboard pulls data from Canvas and visualizes it in a spiderweb diagram, showing students where they stand concerning each learning goal and where there is room to improve. Simone mentions that the dashboard is different for every program or team, so it can be customized to suit the needs of the curriculum. The dashboard only displays learning goals entered into Canvas, which Simone sees as an important benefit, as programs appreciate seeing their LMS content reflected in the dashboard (Figure 1).

The Outcomes

Simone Kooij is involved with two programs currently working with the study coach dashboard. The dashboard features a menu where students can see the subjects they are enrolled in, with green and orange bars showing what has been submitted and what is still pending. The last login moment is also visible. For Simone, it's understandable that mentors value this information. In her role as an educational specialist, she looks at how a student is progressing in their context. Therefore, it's possible to view information in the dashboard from different roles.

The study coach dashboard was co-developed by students, with a student council meeting as part of the process. The question posed to students wasn't about the tool itself but rather about what they find important in study guidance and how they can be supported. The spiderweb visualization will be tested in the coming school year (Figure 2). This will also require the team to determine how the dashboard should be integrated with the education process.

Simone emphasizes that the dashboard is not just a technical innovation, but also a pedagogical one. It also requires the team to consider how they organize their education and use the dashboard. Simone provides an example of a program that received a new qualification dossier and decided to renew its educational approach, allowing for more flexibility from learning goals toward the exam. They opted for a portfolio with graded assignments instead of traditional tests. The dashboard fit well with this vision, as it provided students with more insight and control over their learning process. The program is enthusiastic about the dashboard and uses it to guide and coach students. The learning goals of the program were entered into the Canvas learning platform, which students have been using for several years for their learning activities.

Figure 1. StudyCoachPoster

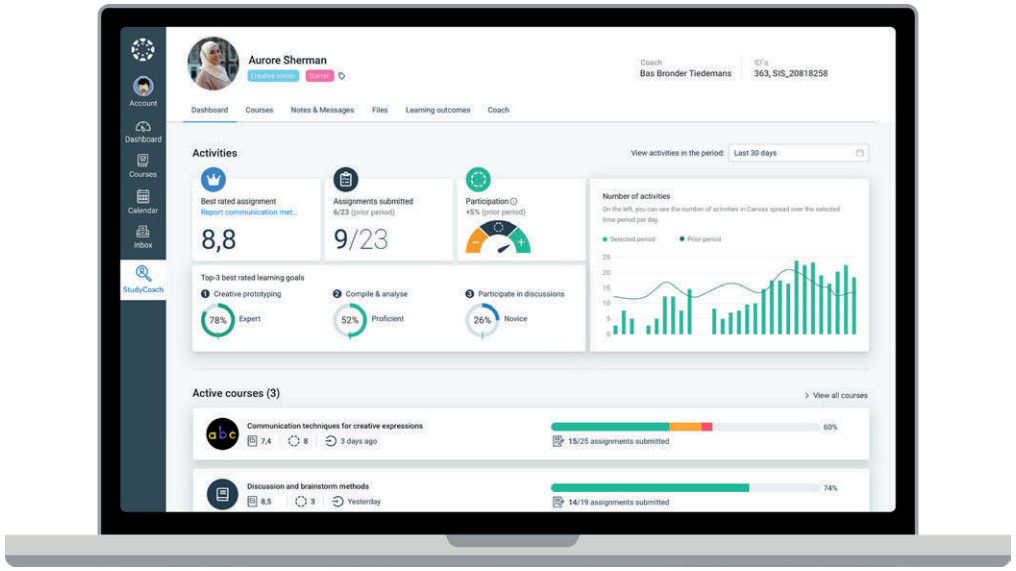


Figure 2. StudyCoachLaptop

Challenges During the Process

Simone Kooij and Heleen van der Laan acknowledge that the dashboard brings challenges. They mentioned that the project timeline was quickly extended because the dashboard was more complex than expected. They decided not to continue using the old dashboard, thinking the new one would be much better. They didn't want to burden teachers with a system that would soon change. However, completing the new dashboard took longer than expected, causing frustration among teachers and students. They couldn't access the information they needed, so they reverted to the old system of pass/fail grades.

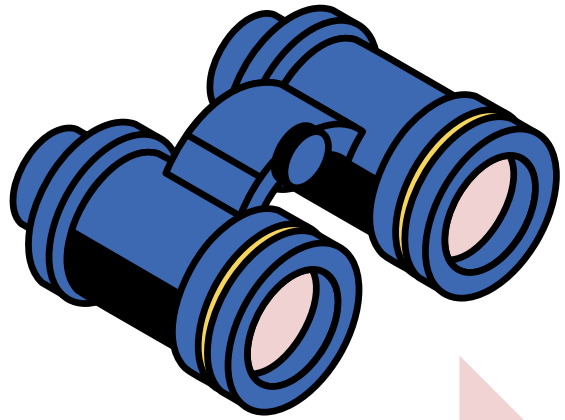
Preparations

Heleen van der Laan was pleased with the collaboration with the project manager for the Canvas implementation, who had many contacts at all the ROCvA-F colleges and knew how things worked. This allowed the formation of an advisory group, which included professionals from different programs and disciplines who contributed to the dashboard. She was also happy with the director, who valued the project and provided the resources to execute it effectively.

Plans for the Future

Facilitating and implementing the dashboard now requires attention. Teachers need to work on clearly formulating learning goals and assessment criteria and linking them to the various assignments. The program must have a clear path toward the exam, and students need to understand the learning goals. Both Simone and Heleen see challenges in implementing the dashboard but deliberately choose to do it step by step. They hope the study coach dashboard will contribute to student ownership and enhance teachers' ability to provide feedback.

The process of monitoring and evaluating the dashboard is yet to begin. Simone hopes the dashboard will continue to be developed to stay aligned with evolving educational practices. As Heleen emphasizes: "We're not at the top of the mountain yet, but the pass already offers a beautiful view!"



Feedback on Student's Math Transition

Fulya Kula and **Heleen van der Zaag** both work at the University of Twente. Fulya is a mathematics teacher and part of the FERMAT group, where they conduct research into mathematics education. Heleen is an IT Consultant for Educational Innovation and part of the Technology Enhanced Learning and Teaching team that tests technological educational innovations with teachers.

The Trigger

In the Civil Engineering bachelor programme, the students have a calculus course, which requires prior knowledge of concepts like limits, derivatives, graphs and functions. We assume that students have this prior knowledge from high school. But we have found that when students had to solve a problem on, let's say, differentiation, they were stuck because they lacked prior knowledge of, let's say, graphs and functions. This meant that we had to teach students the concepts from high school individually.

The Solution

To avoid individual explanations, we designed an online bridging course consisting of 33 topics of high school calculus that students could go through on Canvas, with topics they need to know and learning analytics that showed them where they are for each of those topics. Within each topic, students first answer a multiple-choice question. If they provide the correct answer, they can go to the next topic. If they provide an incorrect answer, they are shown a short video explaining the topic and are encouraged to answer some practise questions. After the video, they are asked another multiple-choice question, which is equivalent to the first question, but not exactly the same.

The data from the students' answers to the questions is collected and used to provide students with feedback on which topics they are good at and which topics they need to study a bit more for a successful calculus course. The feedback is provided as a star-based system, where, for each topic, the student gets from one to five stars (Image 1). This is all done real time, so if a student would answer another question, that would change their number of stars. Using the goal-based method, we tell them that from two and a half stars onwards they're going strong, and under two and a half stars they need more practice. This way of providing feedback aims at not judging or demotivating students. Instead of telling them to study more, they are encouraged to answer more questions, to change the number of stars they have for a topic. The feedback is available as one of the modules in the course. Students can visit that module at any time to view their feedback in real time, or they can visit the module after completing all 33 topics to view their overall feedback. Students are informed about the feedback module on the Home page of the course, so that they are aware that it exists and of how it works.

The data from the students' answers to the questions is also available to the teacher, in the form of a heatmap. The teacher can view the whole class's information, in terms of which topics students performed well in and which topics they did not do so well in (Image 2). This helps teachers understand which topics they should reflect on a bit or teach more.

The bridging course aims to prepare students for the expectations of a first-year university mathematics course. The learning analytics are designed to help students understand their progress in each topic without judgment or demotivation, and to inform the teacher about the topics that pose challenges for the group, enabling them to address these issues effectively.

Figure 1. Student Feedback

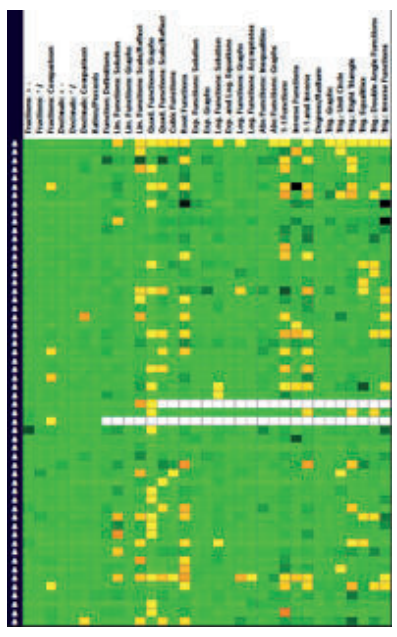


Figure 2. Teacher Feedback

The Outcomes

The bridging course and the accompanying learning analytics benefitted the students. There was an increase in student success from the pre to the post questions. Also, during the panel meetings with the students and during the course evaluations, students mentioned that they appreciate being made aware of where they were lacking in the high school mathematics topics required for the calculus course and where they needed to put in more effort, especially because it was in line with what they expected and allowed them to focus their efforts. The teacher felt that the learning analytics were also beneficial to her. The heatmap saved her a lot of time, prevented her from making (incorrect) assumptions about where students were lacking, and provided her with tangible results for the whole class.

There was one part of the learning analytics that did not go as planned. We wanted to collect data on how the videos were being watched and interacted with, but that completely failed due to technical problems. The video hosting platform allowed us to collect data on whether a video was played, paused, etc., but it did not allow us to collect data on when the student would stop watching the video. So, we couldn't analyse the data. But luckily, this one thing that didn't work didn't affect the students, the outcomes of the course and learning analytics.

The Future

We would like to make a few improvements to the visualisations. We want to add a reference line at the two and a half stars mark, like a kind of finish line. We also want to be able to sort the topics, based on the number of attempts that students have made for each topic.

In 2023-2024, the bridging course was implemented for the civil engineering bachelor programme. In 2024-2025, an updated version of the bridging course will be implemented for seven bachelor and pre-master programmes. We are also planning to make the skeleton of the bridging course, in terms of its functionality and visualisations, available for the development of other bridging courses. However, the realisation of these new bridging courses would be dependent on the relevant teachers coming up with the content and questions.

Facilitators and Barrier

We had an expert in educational design and psychology, who could give us advice on how to provide feedback without judging or demotivating the students. We also had an expert on the technical side, who helped promptly and effectively.

One technical issue that we have is that the visualisations are all rendered client side, in the teacher's webpage, which means that there is a lot of data that's being processed real-time on the teacher's browser, and it can take a while for the page to load, which is really annoying for the teacher. While extremely detailed and useful, the xAPI data format is also a barrier, because we need to use external tools that give us the data, which excludes a lot.

Tips for others who are thinking about implementing a learning analytics system

Define your educational goals and then develop the learning analytics system to meet those goals. It may take time to build, but it is worth it in the end.

Learning Analytics for Academic Writing

Monika Donker is an assistant professor at the Youth and Family department of Utrecht University. As a researcher, she is involved in the InTransition project, in which she mainly looks at the interactions between parents and adolescents and autonomy development during adolescence.

Marije Goudriaan is Data Platform Coordinator of the Learning Analytics Team at the Department of Students, Education and Research at Utrecht University.

The Trigger

In the bachelor and pre-master programme of pedagogical sciences, we noticed that when the students have to write their thesis at the end of the programme, they still have trouble with academic writing, although they have had many writing assignments over the course of the programme. Also, students within the programme were at different levels, making it difficult to fine tune the assignment and the instructions to the needs of all the students.

The Solution

One of the difficulties for students was to combine the feedback they received in each course, because each course uses a different grading form or rubric or different words for the writing skills. We designed a dashboard to make it easier for the students to use the feedback that they received over the different courses and take it with them throughout the entire bachelor programme or maybe even the bachelor programme AND the master programme, so that they do not start over in every course. So far, the dashboard has been implemented in two courses of the pedagogical sciences pre-master programme, which has around 150 students.

The dashboard combines different sources of information (e.g., peers and teachers) and helps students see at what level they are and to help them make progress starting from their individual level and take the next step. On the Introduction page, students see what the dashboard does and how you can use it (Image 1). On the Overview of Performance page, in the lower part, students see what their average scores on the different academic writing skills are (Image 2 and 3). The scores are on a scale from zero to two, with two being the best score. Students can improve the skills that are not yet sufficient, by going to the Feedback Details page, where, in the bottom right, they see resources for the different skills. If they click on a particular skill, the relevant resources for improving that skill are displayed. And in the bottom left, they see the actual feedback that they received in Feedback Fruits. Students can use the filters in the top left to view feedback only from a specific year or only from the teacher or only from their peers. So, overall, the dashboard is very interactive and you can click a particular skill or a particular source of feedback to filter the information and view only what you want.

Students were involved in the design and development of the dashboard. Before the start of the project, we asked them what they would need and what would be helpful to improve their academic writing. We got the impression that they did not want to do much more themselves (e.g., making a portfolio). So, we designed and implemented the dashboard to give them an overview of their previous results. We then asked students to provide feedback on whether they like the format of the dashboard, whether they use it and how they use it. They could provide this feedback through the dashboard itself — they could leave comments about a page or a particular figure, if they had suggestions to change or improve it or if they didn't understand it. We also had a focus group to ask for and discuss students' feedback.

The purpose of the dashboard was to improve students' feedback literacy, so that we do not need to have more assignments and teachers do not have to keep giving (the same) feedback, but rather students know how to ask for specific feedback and how to use feedback better. The dashboard aims to give students the tools to steer their own learning process, to get better insight into what they already can do and what they need and how they could improve. It aims to make them more self-regulated, and thereby ultimately improve their performance. The learning analytics combined the different sources of information and used weighting formulas to present the information for separate skills, in a way that's very difficult for students to see or come up with themselves, because of the different rubrics in different courses.

As a side note, the data that are visualized in the dashboard are extracted from the educational application Feedback Fruits. This means that feedback for a particular student needs to be present in Feedback Fruits, otherwise the dashboard will be empty.

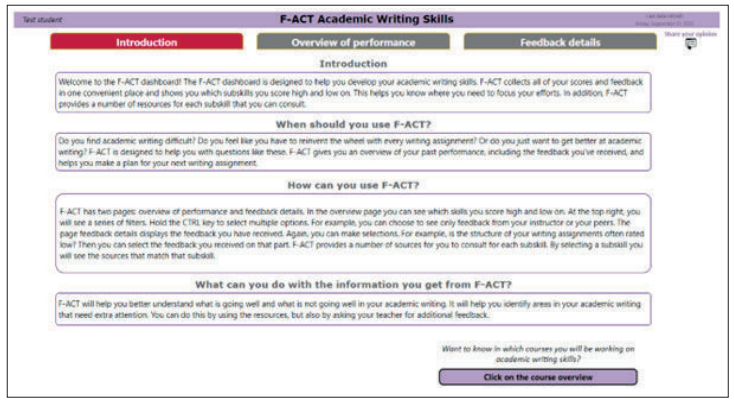


Figure 1.
F-ACT Dashboard

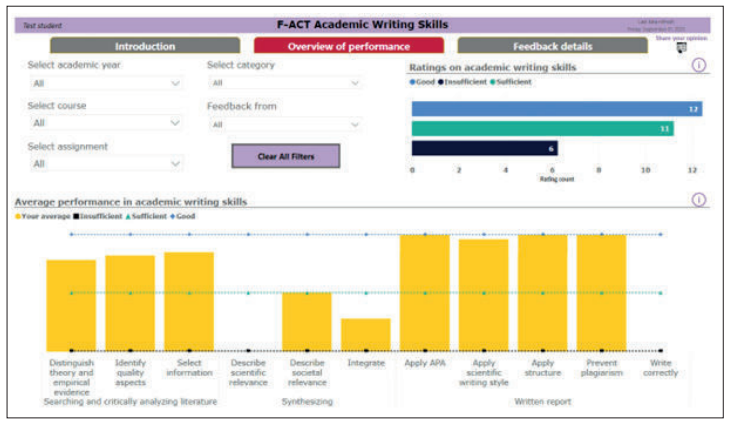


Figure 2.
F-ACT Dashboard Skills Overview

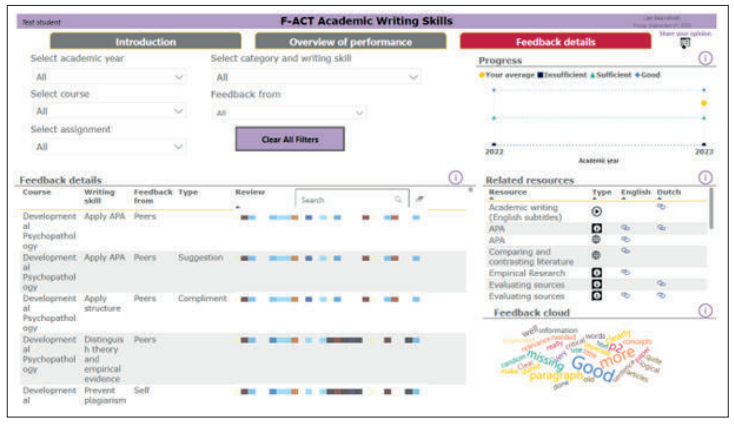


Figure 3.
F-ACT Detail

The Outcomes

For now, the dashboard is a pilot. So, we try to integrate it into the courses and we try to mention it in the lecture on academic writing. But it's still optional and unfortunately, also since the pre-master students are very busy, not a lot of students used the dashboard, so we don't have enough data to be able to evaluate if it had the proper effect. But, based on what the students in the focus groups mentioned, they thought it was very useful, not only for their academic writing skills, but also for their time management. The teachers liked the idea of giving feedback digitally in the Feedback Fruits program, and they liked that students could formulate questions based on how they were doing or what they wanted feedback on. They also felt that the dashboard was very helpful for students.

Some things worked out well. When the teachers had the initial idea for the dashboard, they were not sure how they were going to do it. But when they came in contact with the learning analytics team, they realised it can actually be built, and it turned out better than expected.

Some things didn't work out so well. There are a lot of stakeholders. Aside from the students, there are also the teachers and the coordinators and the programme director. If we want to make the dashboard a success, we have to get buy in from all the stakeholders. The purpose of the dashboard is to include all the feedback from all the courses, so it doesn't work well if some people do not put their feedback in Feedback Fruits. When it is not in Feedback Fruits, the feedback will also not be available in the dashboard. We realised we need a more top down approach, where a curriculum director says that we're going to use the dashboard (and Feedback Fruits) in all these courses from now on. So, I think in that sense, it's not that it could be better, but it is something that we didn't realize. We will include this in the next academic year.

The Future

Based on the focus group and on a meeting with the teachers, we're going to make some changes to the design, to make the information more visible, clear, and streamlined. We are also going to include more filters (e.g., on group vs individual assignments). And we're going to improve the implementation and uptake in the courses, by having a clear manual on how teachers and students could use it and what the potential is, as well as by using it during the tutorial sessions with the students.

Academic writing is quite a general skill at the university, so in the coming years, we want to see whether the dashboard can be more general, whether we can have it at a higher level, at faculty level, or maybe even at university level, so that other people can also use it within their own programmes. We have already had inquiries about the dashboard from two other study programmes and, in general, we're very open to sharing it.

But first, we want to be sure that it works well. We also want to think about how to support scaling up. If we go top down and get buy in from management, more students can benefit. But if we keep it bottom up, it can be more needs based.

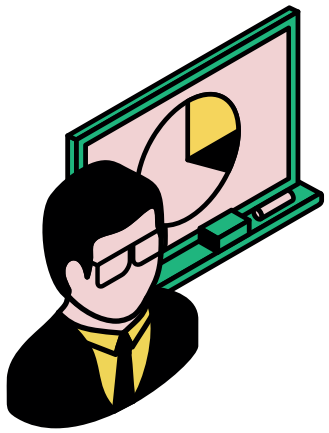
Facilitators and Barriers

Monika and co-worker Sanne Geeraerts came up with the idea together and is also one of the project leaders. Marije is part of team learning analytics at the UU. There were a lot of people involved in getting it started — the Privacy Officer, the Information Security Officer, the educational committee — and that's good, but it might slow things down a bit. It was good that we had people with different skills, both with the content knowledge and the technical skills, they were very important to the project.

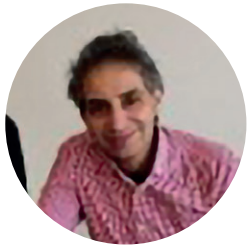
We had a good collaboration between the teachers and the learning analytics team and we made it work well. Sometimes it is difficult to take an idea that you have and translate it into a dashboard. Not all students know how to use a dashboard and how to interpret it. It requires a bit of data literacy. It might be difficult to scale up.

Tips for others who are thinking about implementing a learning analytics system

Make sure that you have all the right people involved. The experts who come up with the idea, who know the background and the reason why they want a dashboard. And the technical staff, who know how to build the dashboard, how to obtain, use and visualise the data. But try to not have too many people involved. Start with a small key team that works on it and then involve the other people to ask specific questions at specific moments, to avoid slowing down the process too much. Ask students for their feedback on whether they like it, whether they would use it, and whether they have any tips for improvement at all stages of the project.



SFLA from the Classroom



Marcel van Vliet and **Memon Boukiour** teach at De Haagse Hogeschool (The Hague University of Applied Sciences). Marcel focuses on how to make software systems user-friendly (user experience). Memon is involved with the Learning Technology & Analytics | The Hague University of Applied Sciences. He wants to extract more information from the learning management system (LMS), so that students can benefit from it during their studies. He teaches psychology and research at The Hague University of Applied Sciences.

Hans Krommenhoek works at VISTA college and teaches in the ICT programs.

Jessica Zweers values the combination of education, research and policy. She teaches medical diagnostics at Hanze University of Applied Sciences and is heavily involved in educational innovation.

Hans Krommenhoek (Vista College), Jessica Zweers (Hanze University of Applied Sciences), and Marcel van Vliet and Memon Boukier (The Hague University of Applied Sciences) are four teachers working on an SFLA initiative from within their respective programs. They are happy to share their experiences and insights about how they place students at the center of learning analytics.

Shaping SFLA from the Educational Perspective

Teachers Marcel and Memon want to better inform and guide students toward their exams by giving them insights into their study progress and learning strategy. Their goal is to provide students with a clear picture of exam requirements and the relationship between partial scores and the actual exam scores. Additionally, they aim to use AI technology in the future to analyze and improve students' learning processes, where possible.

Jessica noticed that, when grading exams, she often saw things she wished she had identified earlier, so she could have better helped and guided her students. She was also disappointed that many students didn't learn from their mistakes, either because they didn't review their exams or felt no need to after passing. She devised a solution for this (Figure 1): in her approach, the exam process is part of the SFLA dashboard.

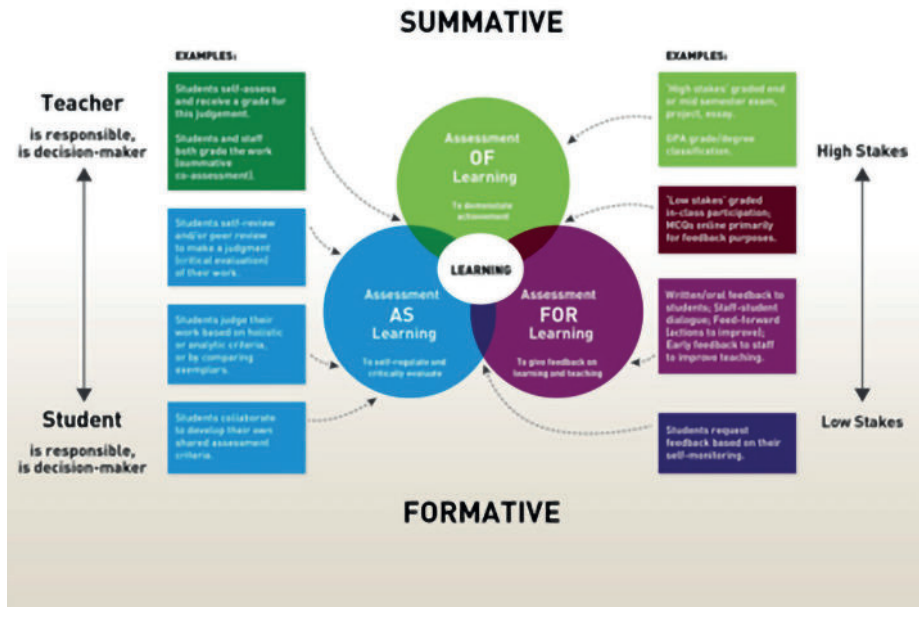


Figure 1. Assessment Process

Hans wants to focus not only on what he calls "hard data", like grades and attendance, but also on soft skills. At Vista, they use Challenge-Based Learning (CBL - Wat is Challenge Based Learning en hoe geef je dat vorm? - ECBO). CBL is an educational model in which students learn to solve complex societal problems without predefined questions or answers. They develop practical knowledge and skills that are well-suited to the job market. In this

type of education, the teacher plays a coaching role, and, instead of attending traditional lessons, students participate in workshops, with students of multiple levels in the same session. Hans sees a pedagogical challenge in using LA to support and improve students' soft skills through data insights and feedback.

What do the SFLA Applications Do?

Jessica uses data from the ANS testing system to see which topics students master well or struggle with, so she can adjust her teaching and feedback accordingly. She also wants students to learn from their mistakes and manage and regulate their own learning process.

Jessica integrates formative assessments into her lessons, providing immediate feedback to students during class so they can use it to improve. She hopes this will motivate and support students in improving their math skills. Currently, students can see their percentage scores during class, but discussing the results and receiving feedback is still done orally. In this case, SFLA is only possible thanks to the teacher's involvement.

Hans has a visualization he wants to implement digitally based on learning analytics, and he realizes that it's not just about the data. At the moment, Hans differentiates based on his own observations and gives oral feedback to students during class.

Students in the Nutrition and Diet program at The Hague University take partial tests and quizzes in Brightspace, and these partial scores are linked to the final exam. Memon and Marcel hope to gain an overview of how the student population is performing and what connections exist between the formative assessments and the summative exams. In addition to this student journey, both teachers believe that students' perception and feelings about their study progress play a significant role. This is why they collaborate with the Research Group on Philosophy and Professional Practice at The Hague University of Applied Sciences (Filosofie en Beroepspraktijk | De Haagse Hogeschool). They are working together on the question: "How do you frame feedback when results are less positive, but the feedback still benefits the student and keeps them motivated to continue their studies?"

At all three educational institutions, the desire to work with SFLA comes from the teachers. As Memon notes, it's important to understand how the system works. At the start of their learning analytics project, Memon requested an Excel export from Brightspace, but now he understands why that wasn't possible. As Marcel points out, it took eight months for the organization to agree to extract data from Brightspace for all 220 students in the program. For Hans and Jessica, the process is simpler, as they use study data they generate within their own teaching. Hans has 80 students of varying levels in his ICT classes.

As Jessica notes, she started with the launch of a new curriculum and is currently focusing on a group of 100 first-year students.

Jessica explains that learning analytics provides both students and teachers with insights into prior knowledge and the effects of teaching and teaching materials on learning outcomes. As a teacher, she can better adapt the education to the students' needs and levels. She can also show students the value of formative assessment and feedback. Using SFLA, students can be encouraged to self-regulate their learning and make informed decisions about their learning process.

Jessica mentions that they consciously decided to include the subject of math, an important part of the program. She now also gains insights into how students arrive at a solution, which tells her more than just the final result. At The Hague University, they also see the functional didactics that SFLA can offer as part of the bigger picture. They are very aware of how feedback is delivered and how it affects the student. The pedagogical aspect is essential in supporting students' progress, not just in showing grades, emphasize Memon and Hans.

The Outcomes

Jessica notices that students appreciate learning analytics because it gives them insights into their prior knowledge, learning outcomes before and after the lesson, and feedback from the teacher. However, students still need to learn how to integrate learning analytics into their study process. She also sees that the approach impacts students' behavior. They are more motivated and curious to track and improve their learning. They are more likely to review their exams, even when they have passed, and they want to understand why they scored more points than before. They also better understand the connection between different assessments and the importance of mastering the material.

Jessica also advocates for functional LA, which involves working with data at the class and student levels, rather than at the institutional level. This allows teachers to receive small, relevant data sets for their teaching methods and curriculum. She explains that it's a simple way to use and interpret the data, helping teachers decide whether to approach students differently or implement alternative interventions. It also enables teachers to monitor student behavior, such as observing when a student performs well on formative assessments but does poorly on a second test (Figure 2). In some cases, students may choose to skip workshops if they score above 80% on the formative assessments. In practice, this decision is not always wise, as students may then spend less time engaging with the material.

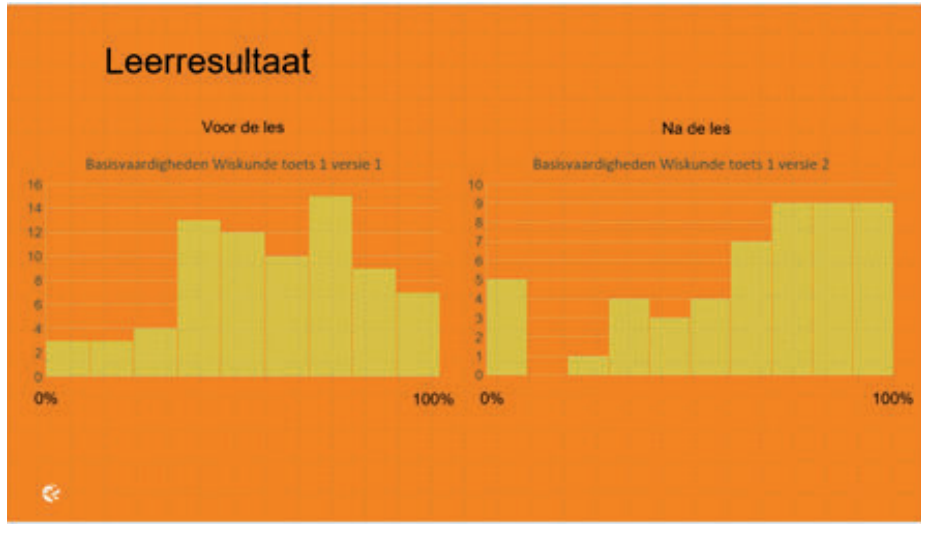


Figure 2. Assessment Result

At Vista College and The Hague University of Applied Sciences, the development of SFLA is still underway. However, Hans has already noticed positive results when grouping students of similar levels together. Students feel recognized and taken seriously. Marcel and Memon also value student experiences, which they have incorporated into the SFLA framework. They emphasize that not only the data outcomes are important but also how students experience the SFLA model. Marcel and Memon believe that educational institutions must be transparent about the use of LA and ensure that students are well-informed.

Jessica finds it essential to maintain a dialogue with students about their learning process and focuses on the remaining 20% of students through the growth mindset approach. She aims to motivate students to explore and stay within their zone of proximal development: the level where they can slightly exceed their current knowledge, but not push themselves too far beyond their abilities. She also teaches students how to recognize and discuss this, so they can later adjust their learning strategies. She engages in discussions with students, encouraging them to think and experiment on their own. Through mentoring and the Student Success Programs (SOB), Jessica reflects with students on their academic success, trying to find common threads across the various subjects they are studying.

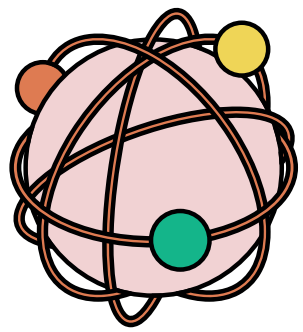
Plans for the Future

Marcel and Memon have stayed committed to their plan and vision for SFLA and have now reached a point where three research groups are involved in their initiative: Theo Bakker from the Learning Technology & Analytics | The Hague University of Applied Sciences, Chris Detweiler from the Philosophy and Professional Practice Research Group, and the AI hub De Haagse Labs.

The AI hub is involved in building the model that will track progress, results and feedback. Marcel and Memon receive substantial knowledge and support from the researchers and also feel that the organization is taking the issue seriously. Marcel anticipates that more teachers will adopt this approach to education. As early adopters, they frequently encounter questions from within the organization, such as “How do we approach this?”. Memon agrees, noting that there is currently a divide between working with data and understanding how education can adapt to it.

Facilitators and Barriers

Hans is currently in a phase where the technology and culture of his institution are not yet ready to work with data and SFLA. The data is available, but the challenge lies in extracting it from the systems and presenting it to the students. Jessica realizes that the medical students she works with are highly motivated to learn, and the results of SFLA, along with their intrinsic drive for improvement, have been very supportive in applying SFLA. However, she emphasizes the importance of starting small and gaining initial experience before scaling up. This approach helps maintain control and reduces dependence on the organization’s data infrastructure. But, as Jessica acknowledges, it does take a lot of time. The fact that she started with SFLA alongside a new curriculum has made the process iterative for now.



Evaluating a Canvas Dashboard in TU/e

Rianne Conijn is an Assistant Professor in the Human-Technology Interaction (HTI) group at the Eindhoven University of Technology. Rianne conducts research on learning processes, such as online learning behavior and writing processes. Additionally, she studies the impact of technology on these learning processes and outcomes.

Uwe Matzat is an Associate Professor in the Human-Technology Interaction (HTI) group at Eindhoven University of Technology. Uwe's areas of expertise include educational technology research, such as learning analytics, blended learning, and virtual agents, as well as the digital divide and social media research.

In this final interview, they tell us about their experiences designing and evaluating SFLA.

The Trigger

We have been tracking student behaviour for quite a while now, and we've realized during and after COVID that students had a tougher time regulating themselves and keeping track of their studies in online or blended environments. A lot more of the learning is happening online and students have less day-to-day contact with the course teacher, so it becomes harder for them to keep track of their studies and for teachers to keep track of their students.

The Solution

The research team developed a student dashboard to help students in terms of their self-regulated learning behaviour, by providing them insights in their online learning behavior in the learning management system Canvas, related to the three phases of self-regulated learning. In particular, we helped students to set goals in the course for themselves, provided feedback on the goals set, guided them on how to evaluate the goals, and made recommendations on what to do next based on what the student has done so far in the learning management system. The dashboard showed students various data, such as what type of activities they performed on Canvas, the duration for which they performed these activities, the number of assignments they submitted, when they submitted the assignments, how close to the deadline they submitted the assignments, the grades on the assignments, and the upcoming deadlines. The system made recommendations such as "This is how well or how much activity you did on Canvas, in comparison to people that are predicted to have the same grades as you in your course." or "You're aiming for an 8/10. People within the group that received similar grades usually performed these kinds of activities.".

The dashboard was implemented in two courses of a bachelor programme (for two different cohorts of students). Students had to provide their informed consent to access the dashboard. Around 30% of the students were provided with this access.

Students were involved in the development of the dashboard. We usually have student sounding boards to talk about learning analytics interventions aproximately four times a year. For this dashboard specifically, we also had additional interviews, to discuss the different types of indicators that are useful for them and that they would like to see on the dashboard as well as for them to provide some insights about the design of the graphs and visualizations.

The dashboard was specifically created to aid students in their self-regulated learning. We also hoped that it would actually improve their self-regulated learning skills as well as enhance their motivation and perceived autonomy in the course. We also hoped that it would eventually increase their course performance in the end. To evaluate this, both cognitive and affective outcomes were measured. We really wanted to have something that was personalized to the students themselves, because some students benefit from such interventions differently than other students. In this dashboard, we could show them tailor-made recommendations, based on their own learning patterns. So, learning analytics allowed us to automatically personalize the information.

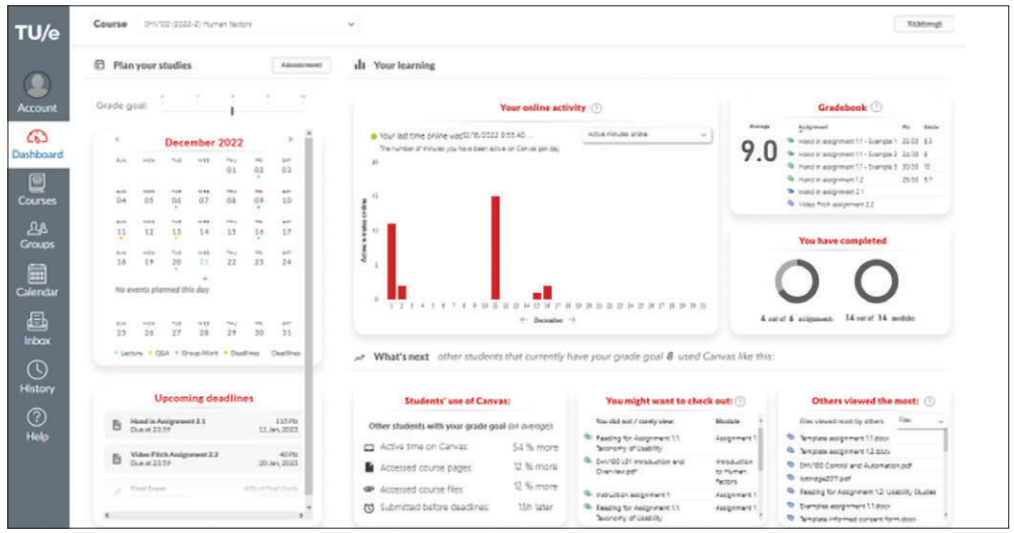


Figure 1. TUeDash

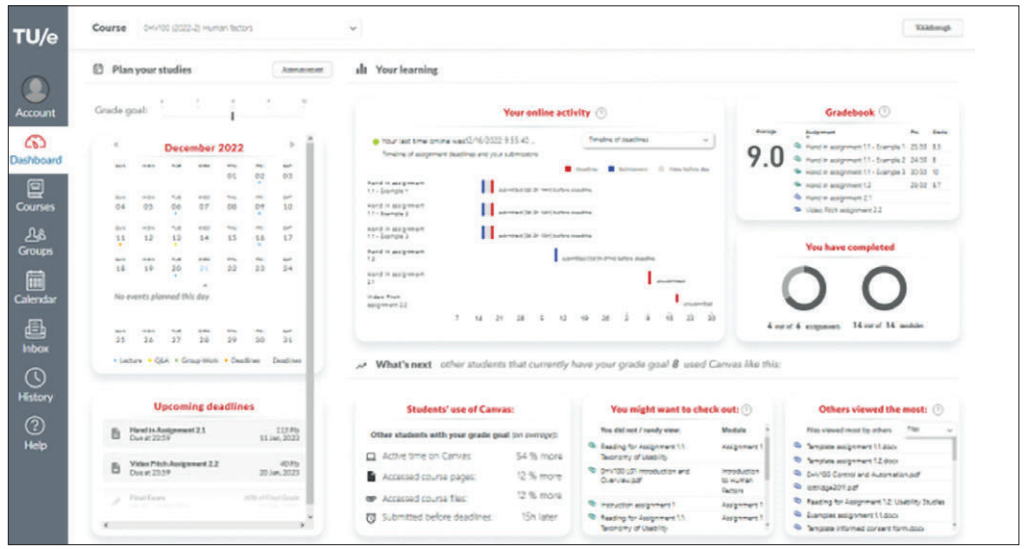


Figure 2. TUeOverview

The Outcomes

In this case, Uwe and Rianne specifically compared two different dashboard designs. One was tailored to help students with their self-regulated learning behaviour. The other one was a baseline dashboard showing students what they did. It was expected that the dashboard which was tailored to the self-regulated learning strategies would work better, but, potentially due to a bit of a smaller sample size, no differences were found between dashboard designs. Students were slightly more motivated with the self-regulated learning dashboard, but there was no effect on self-regulated learning behaviour measured via self-report questionnaires or on performance measured via course grades.

Students' opinions were sought via open-ended questions in the final questionnaires. Among students who experienced the dashboard that was focusing on self-regulated learning, some students really liked it. They thought "Oh, there's a lot of information. It's very nicely organized. It's very easy to understand." But other students argued "It's too much information. It's really overwhelming and I don't know how to actually make sense of this." Similarly, among the students who experienced the dashboard that only showed them what they did on Canvas, some students thought it was very clear, but others argued that it did not give enough information. So, we saw quite some differences in terms of the responses. Some students also argued that it might not be very useful to actually look at the dashboard more than one or two times during the course, because the information didn't actually change that much. Of course, it showed some additional information, but they felt that the usefulness was lower over time. Also, some students said that some more interactivity would have been nice. And some said they would have preferred a better connection with Canvas, so that they could see even more information about the assignments that were coming up.

As for the teachers' opinions, although we were in contact with the teacher for designing and implementing the dashboard, also to see what kind of indicators made sense in terms of their course design, no specific evaluations were made specifically after the implementation. This will be done when the dashboards will be tested in a larger set of courses, were more teachers will be involved.

A number of things worked out well. It was nice that the dashboard looked like the standard structure and house style that we use on Canvas at TU/e, so students could easily recognise it. The dashboard provided students with an overview of the deadlines and provided them with some recommendations on how to continue.

However, some things didn't go as planned. From the overall metrics, students looked at the dashboards twice during the course, on average. So, the use of the dashboard was limited. Also, there was no possibility to identify exactly who accessed the dashboard and when, because all usage data were aggregated. Additionally, as a common limitation focusing on online learning behavior in learning management systems, no

information is shown on students' behaviour outside the learning management system. Finally, information was refreshed only on a daily basis, so some students were confused because they thought they had done something and it was not being reflected on the dashboard.

The Future

Based on the findings, it's clear that this dashboard is not the tool that we want to bring to more students just yet. We would need to do more iterative testing to improve the content, design, interaction flows, and embedding of the dashboard within the learning management system and the course structures. We are working on new design iterations. For example, we are working to reduce the amount of information in the overview. We are also looking into different kind of prompts to aid students in their learning and into facilitating students to add information to the dashboard. Also, we are trying to see how we can develop a more generalizable dashboard that works in multiple types of courses, also in other faculties.

Rianne and Uwe are definitely looking into how they can scale up the implementation of the dashboard and want to roll it out in more places at the university. This also depends on the university's policy. Does a dashboard need to be available in all courses, or is this an optional choice for the teacher and/or student?

Facilitators and Barriers

We have been working with Canvas data, so we knew a bit about how it was structured and what it means. This helped a lot. We have a product owner on learning analytics who could help us to connect to all necessary stakeholders for the implementation, including colleagues from privacy, ethics, and security. For example, for the project an elaborate DPIA needed to be created, as well as a possibility for students to log in to the dashboard using single sign-on.

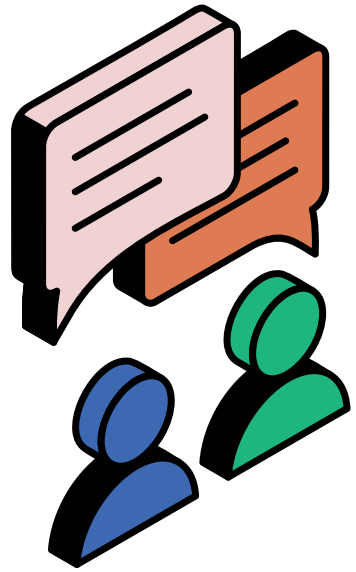
The tool utilized for creating the dashboards, PowerBI, makes it relatively easy to quickly create some visuals. However, it has limited flexibility, making it impossible to implement all the interactions and visualizations we would have liked.

Tips for others who are thinking about implementing a learning analytics system

If you want to pilot test a learning analytics system in your own course, a lot of things are already possible and have been done. So, it's definitely good to seek out and contact people that have done similar pilots or developments before, so that you don't start from scratch.

Aside from the students and teachers, there are quite a few other stakeholders, such as the privacy team, the security team, the ethics team, educational support staff who know the educational theory, people from human-computer interaction backgrounds, and researchers. It's good to be aware of all the different stakeholders and involve them within the project in the correct stages.

Finally, it is important to carefully evaluate the learning analytics system with the students. Aside from asking students whether they liked it, there is a lot more that goes into determining whether it is a success.

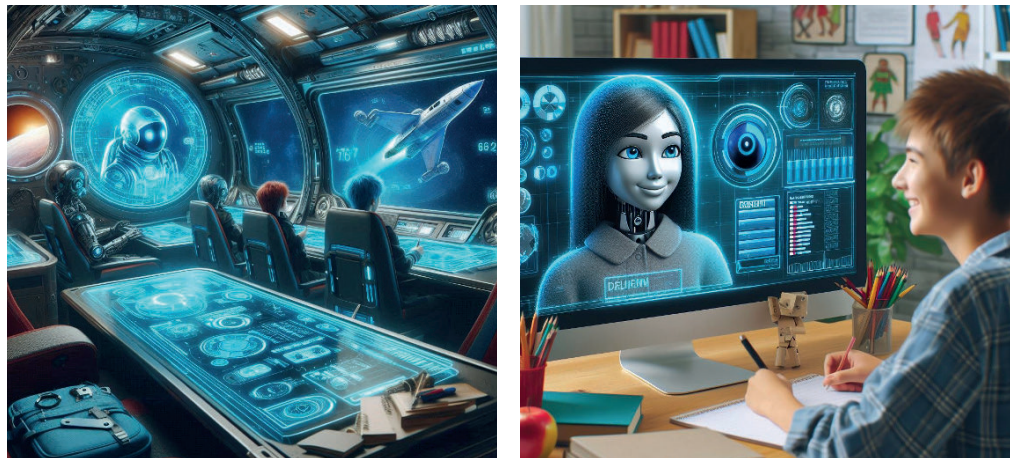


Wrapping up

The interviews presented in this section highlight the diverse approaches and innovative efforts undertaken by various institutions to develop Student-Focused Learning Analytics (SFLA). From addressing individual learning patterns and enhancing academic writing skills to leveraging LMS systems for better student support, these pioneering projects showcase the potential of Learning Analytics to transform education. While they show an inspiring process, widespread adoption remains a challenge. As we continue to explore and implement SFLA, we look forward to seeing even greater advancements and their positive impact on student learning and success.

Learning Analytics with AI - What to expect.

A competitive market is revolutionising how we interact with Education. Generative AI is empowering and simple to instruct via your favourite natural language. Using AI tooling, teachers and students alike can swiftly generate insights tailored to the student's learning journey.



DALL·E 3 draws the near future

Introduction

In recent years, we have seen the rapid evolution of commercially-driven AI. Due to this rush to market, education, in general, and SFLA, in particular, are gaining rapid AI-centric improvements. In this section, we review what AI means for SFLA. We include educators, system designers and policymakers as stakeholders of SFLA, since we are all learning about AI developments as they happen.

For the educator, we show clear examples of where AI is succeeding and will add value. We also focus on the value of Learning Theory in constraining applications. For the system designer, we highlight the current importance of prompt engineering. We look at how we use natural language to provide instructions, the use of context information (specific data about

a student) and the importance of keeping humans in the loop. For policymakers, we emphasise that the deployment of AI in the educational context is actionable, that the technologies are well understood, and that it is worth investing resources in; however as mentioned in our first magazine, the cultural, organisational and legal aspects require review. And, of course, we keep the students in focus, as they are the main users of these brand-new, AI-powered SFLA systems.

AI and its Effects on Education

With AI there is a significant drive to apply the technology in every corner of education because it is relatively easy to create a prototype, it is fashionable, it is quick to get results and it has great potential for delivering value to all stakeholders.

The near future looks to be dominated by Generative AI. Generative AI is an algorithm that creates new content or data similar to existing data by learning from patterns. Generative AI, such as ChaptGPT, within dashboards is available 24/7, can provide instant feedback, is cost-effective, and, if designed appropriately, provides significant time savings for teachers, students, study advisors and other front-line stakeholders in education.

Ask a generative AI model a question, and you get a full-page answer, an image, voice or video, multiple choice questions, or even feedback on an essay or assignment in a few seconds. If we construct the question well and inform the model with the correct contextual information, the results are impressive. For a teacher on a demanding schedule or a student facing deadlines, content generation and chat responses positively impact workload and improve the user experience. However, if we do not correctly construct the interaction with the AI, then this will be to the detriment of the quality of education and the students' learning.

However, in the AI gold rush, we have to be careful that we do not forget the context and values that we wish to exemplify. Enriching dashboards without a focus on educational theory and our core values will lead to limited benefits and risk a backlash. Earlier in this magazine, we mentioned that Student-Facing Learning Analytics dashboards are making the *move from analytics to learning*. The main cause for concern with AI support in education is to keep students actively learning rather than oversimplifying the experience and outsourcing the mastery to the dashboard and the reflection process. Luckily, learning design can help in avoiding this pitfall.

Ramaswami et al. found that most studies leveraging predictive analytics go only as far as identifying at-risk students. The studies do not employ model interpretation or explainability capabilities that would give students insights into their behaviour and help them understand what they need to improve. One popular approach to explaining a model is to use counter-factuals. Counterfactuals are hypothetical scenarios used to describe the decision-making of AI models. An example is "Would I have gotten a B grade if I had spent two more hours a week in my online class?" Counterfactuals are relatively easy to deploy as the AI model is available and trained, so you only have to provide it with slightly modified data for the prediction. Counterfactuals can give a certain amount of trust to a commercial model you have not trained in within your organisation. However, using counterfactuals with Generative AI, which generates text instead of numbers, is still under active research.

Lack of interoperability limits the ability of Learning Analytics Dashboards (LADs) to offer students data-driven prescriptive advice that can provide them with guidance on appropriate learning adjustments. Therefore, there is a central place in dashboard design for interpretation and explainability, in which LLMs can excel by providing personalised narratives such as counterfactuals.

What is coming our way?

This section examines four examples of AI integration into educational systems to illustrate the potential and challenges of using advanced technologies in our context. We first explore a system that incorporates a conversational AI agent, which processes and explains an existing LA dashboard. Then we consider a coding support app, which aids students in solving coding problems by providing feedback and suggestions, not solutions. Next, we review a wellness app that integrates sensor data with AI processing to offer personalised feedback, demonstrating the importance of prompt engineering. Finally, we close with a feedback generation app for essay assignments, emphasising the crucial role of human oversight in maintaining quality.

VizChat: A True Dashboard Assistant

Vizchat is an open-sourced prototype chatbot designed to augment Learning Analytics Dashboards by providing contextualised, AI-generated explanations for visualisations. The answers are part of an intuitive workflow between sometimes hard-to-understand datasets and the student.

VizChat uses GPT-4V (the v is for vision) to offer on-demand, contextually-relevant explanations and can clarify ambiguous queries to help students understand their data without feeling overwhelmed. It also uses a technique called retrieval-augmented generation to remember previous interactions, personalise responses, and ensure that responses are based on factual information. Moreover, VizChat integrates information from multiple visualisations, offering a comprehensive view that aids in deeper understanding. It also provides insights

into the data collection and analysis processes behind each visualisation, building trust in the information presented.

Through a case study involving undergraduate nurses, the creators of VizChat demonstrated its diverse capabilities, from explaining specific visualisations to connecting related data points, thereby supporting a shift from merely exploring data to gaining thorough explanations. An example interaction is shown in Figure 5.1. Nurse 2 asked where they have spent the most time in the ward. The chatbot interprets the graphic and returns a literate response. The conversation is natural and fluent.

Figure 5.1 VizChat explaining the meaning of a visualisation to Nurse 2

This approach highlights the potential of combining generative AI and chatbots to enhance the educational value of learning analytics, making SFLA tools more effective and user-friendly for students.

Figure 5.2: Showcases nursing course (A) and 3 examples of questions and clarifications. The different types of potential responses are highlighted from seeking clarification, contextualization to integrating multiple visualisations to exploration. It does not take much imagination to see simulations of real-world situations with walkthroughs of best and worst practices. The potential of such dashboards is limited mostly by our own ambitions and learning theory.

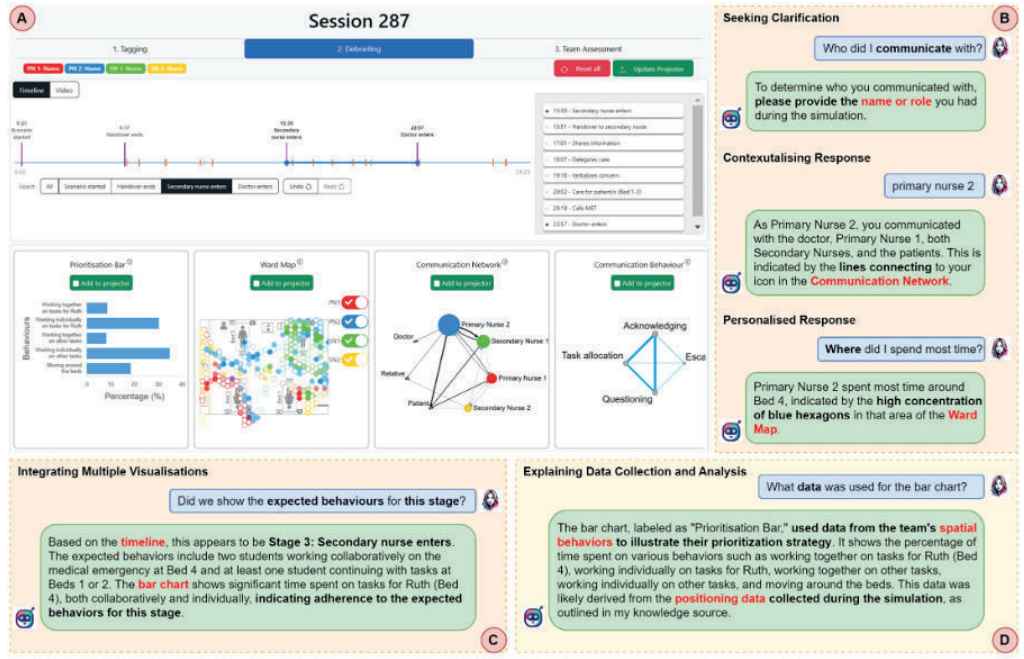


Figure 5.2 A detailed example of multiple chatbot interactions

Humans and machines working hand-in-hand and learning together

AI supports the rapid development of code, but currently, there is a considerable risk of providing answers that have errors, or that work only in specific contexts, or that should be more optimal. For machines and humans to co-develop, the human in the relationship needs some domain knowledge, critical thinking and creativity. Furthermore, tools need to be precisely aligned when the goal is to help coders learn, and not simply co-create. CodeAid is an example of a tool design that boosts these skills. CodeAid is a student-facing example that answers conceptual questions, generates pseudo-code with line-by-line explanations, and annotates student's incorrect code with fix suggestions. Unlike commercial tools, it avoids direct responses to encourage motivated learning.

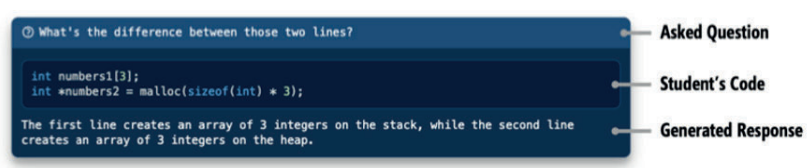


Figure 5.3 CodeAid in action

Prompting Strategies for Personalised Feedback

Personalised feedback for students needs to be embedded and guardrailed by best practices associated with learning theory. Otherwise, the students will not maximise their opportunity to progress on their learning path. Embedding learning theory into the interaction with generative AI requires considering the rules and information we provide during the conversation with the student. The difference between an educationally-valid dashboard and a random projectile is how we shape the prompts (textual instructions).

If you are looking for AI prompt strategies for providing feedback to your students, then the developers behind MindScape, an AI journaling application, describe their approach.

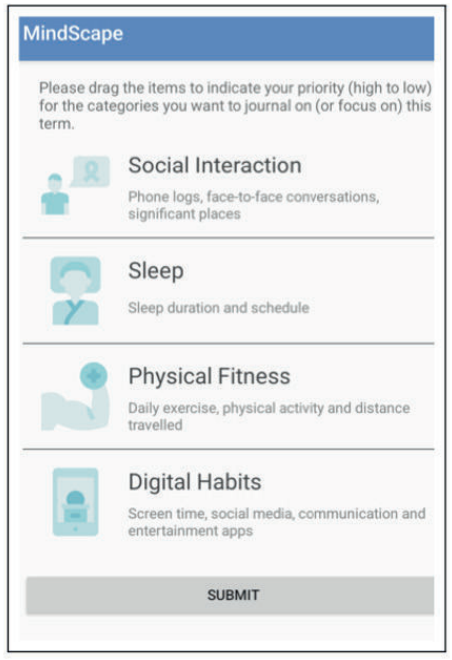


Figure 5.4 The main screen of MindScape

AI *prompting* refers to the process of providing an artificial intelligence system with a set of instructions or a scenario, which it then uses to generate a response or content. This technique is commonly used in a conversational AI, where prompts are designed to elicit specific types of responses from the AI, guiding it to produce relevant and contextually-appropriate information, stories, code, or other creative outputs. The quality of the AI's output heavily depends on the clarity and specificity of the prompt given.

The researchers create a detailed system prompt that explains the general audience and the context that needs processing. They add information based on time-series data, reducing the chances that the AI *hallucinates* and makes things up. Next, they perform prompt optimisation, in terms of feedback length and any other rules discovered during testing. Finally, the pedological strategy is detailed.

The researchers created the template for ChatGPT4. Considering the prompt's final length, a considerable amount of time and model-specific knowledge are necessary. The implication for our organisations is that we should share these prompt templates so that our community can verify the quality of, build off off and improve the prompting.

Human in the Loop

Another example is Feedback Copilot, which provides personalised feedback on student assignments using conversational user interfaces. The dashboard is visually described in the next screenshot.

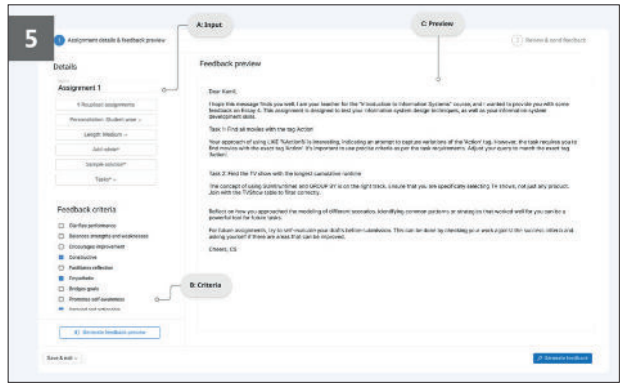


Figure 5.5 Human in the loop within Feedback Copilot

There is an opportunity to modify the AI prompt, the set of text instructions for the model, depending on the feedback criteria selected by the teacher. The preview adds a human in the loop, another strategy necessary to defend quality. Therefore, there is still work for the teacher, but the time-saving efficiency and baseline quality of the feedback to the student is improved. The AI model effectively becomes a valued co-worker with whom you get to know its quirks and strengths.

Challenges of AI in education

Values and their legal expressions are hard to quantify, but there are a number of intersections with dashboard design that will become increasingly urgent to address.

Here is a selection of those scalability factors:

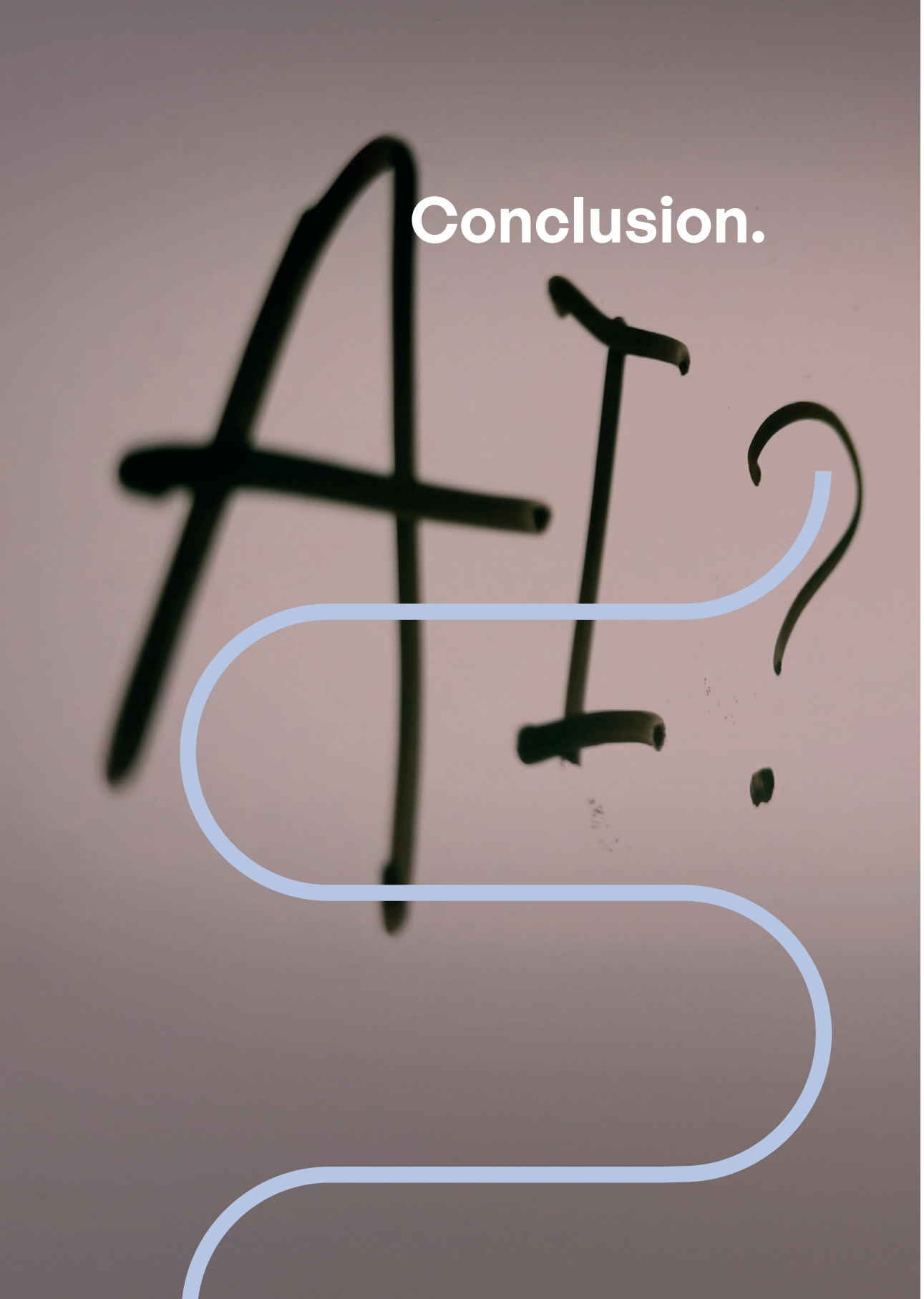
1. **Learners need to learn to learn**: The use of AI in EdTech to scaffold and personalise learning is on the rise. Results indicate a student tendency to rely on AI, rather than learn from it. Therefore, we have to make sure the learner is not a passenger in the learning process, but an active participant who develops self-efficacy.
2. **Hallucinations, fairness and transparency**: There may well be underlying biases in the training data of AI models, and consequently, in their output. Additionally, models often generate incorrect information with a confident and convincing tone, commonly known as hallucinations, which might be even more disruptive. LLMs are also notorious black boxes, meaning that it is practically impossible to explain the output of a model. Although there are methods to understand how choices are made, it isn't easy, and research is in progress to explain those choices.
3. **Ethical, Privacy and Legal issues**: If we are using commercial, "black box" AI models, then we must be careful with the advice of the AI. We will also be transmitting our student data across the Internet even if the companies promise that they do not retain that data. The AI ACT and its evolving nature will add an extra layer of process control during the development and deployment, and eventually the monitoring of dashboards. And the ethical issues are even more complex than the legal ones.
4. **Sustainability**: Large Language Models currently cost a significant amount of energy/money to train and use. Open Source Models tend to be smaller and have smaller ecological footprints.
5. **Responsible IT**: There is a battle for dominance in the commercial sphere. Do we as a sector want to plot our own course or be constrained to the values, roadmaps and licensing structures of the few giants of "Big Tech"?
6. **Technology**: Considering costs, complexity and the need for standardisation, the rapid pace of change and the need for skilled staff to maintain their knowledge will continue to be a significant constraining factor.

What does it Mean for Our Practice?

As they say in Dutch, we don't dare to say. AI has been around for decades, but in the last 18 months, we have seen unprecedented developments and access to AI tools. At the time of writing, Open AI has released ChatGPT-4o for free users, as well as ChatGPT Edu, with features that are usually restricted for paid users. The latest models can generate and interpret data visualisations, or create, solve and grade homework. And with every iteration, the required effort from the user decreases. In short, it's not easy to keep up.

Specifically for LA, this raises several questions. For instance, should we generate dashboards to be interpreted by an AI agent so it can tell the student exactly what to do? In the section on the background, benefits and challenges of Student-Facing Learning Analytics, we discussed the interplay between students' ability to reflect based on their data and the risk of misinterpretation, which was a tricky balance even before adding AI to the equation. Another privacy issue is that, although current systems like ChatGPT use only the information contained in the conversation, personalisation and recommendations for individual students require personal data, which we cannot share with the private companies offering these services. Furthermore, it is difficult to thoroughly quantify bias in textual replies across all educational use cases without having access to the complete design details and training data. Still, there is much opportunity for positive impact.

Our recommendation to the Dutch LA community is to involve ourselves in developing policies and practices around the use of AI, both in our institutions and in the educational system, regardless of how we perceive our own "technical" skills. As data-driven disciplines, the overlap between Learning Analytics and AI in education will continue to grow, so it's best to be part of the conversation. By participating, we form a consensus and, as a community, reach a higher standard where we can share lessons learned in adopting LA for AI.



Conclusion.

In the first magazine our project team published, the central topic was *how to get started* with Learning Analytics, with an overview of the main facilitators and challenges to consider for the real-world adoption and upscaling of LA. In this second magazine, we dived deeper into a specific case of LA: Student-Facing Learning Analytics (SFLA).

We started with an introduction of the literature and a brief history of the rise of SFLA, with a particular focus on the students' perception of LA. Then we looked at international and national stories with a variety of applications and approaches, as well as different levels of success. The lessons learned from the different stories are in line with the barriers and facilitators from our last publication, often referring to the "data culture" of an institution or the need for support from management. Finally, we discussed the future of LA in light of advances in Generative AI, and the dilemma of facilitating analysis for students at the cost of reflecting on their learning process.

Overarching Themes

Looking at the literature overview and the inspirational stories from international and national colleagues, there are a number of overarching themes that are related to the implementation of SFLA. First of all, in all of the examples of SFLA it was of high importance that the initiation of the project was largely informed by a pedagogical goal. It has been stressed oftentimes before, but having a clear question in mind and a vision for what should be achieved with the SFLA will help during each step of the process - for example in conversations with stakeholders and in selecting the appropriate data and analysis techniques.

Second, the literature stresses the importance of awareness of the needs and perceptions of the prospective users (students) and those of other stakeholders (teachers, management, data governance). This can be achieved, for example, by conducting focus groups or questionnaires prior to the initiation of the SFLA (see resources below). Having insight into student (and other stakeholder) expectations enables choosing the appropriate implementation strategy.

Finally, although it was not a topic yet in the examples of SFLA we presented, there is no doubt that AI will come to play a big role in future implementations of LA. There is uncertainty about the speed and direction that AI will take, but whatever the outcome will be, it should not withhold us from investing in the building blocks for (SF)LA, as many of the same questions about pedagogy, ethics and privacy will come up.

Further Reading and Resources

To conclude this magazine, we offer a number of resources and reading suggestions for interested readers who want to explore this magazine's themes even further.

Assessing the validity of a learning analytics expectation instrument: A multinational study

This article describes the development and validation of the Student Expectation of Learning Analytics Questionnaire (SELAQ) in different languages. Initially, the authors identified 79 items related to 4 themes: Ethical and Privacy Expectations, Agency Expectations, Intervention Expectations, and Meaningfulness Expectations. After several iterations, the questionnaire was reduced to 12 items, where 5 cover Ethical and Privacy Expectations and 7 Service Feature Expectations. The article also implements and analyses students' results from universities in Estonia, Spain and the Netherlands.

Why read it?

SELAQ is a validated questionnaire to measure student's perception of LA in your institution. They also include a Dutch translation in Appendix O.

The Dilemma Game and the Ethical Data Assistant

The Dilemma Game is a set of cards, each describing a dilemma concerning fictitious examples related to privacy and ethics around LA. Players can choose a persona and respond to the dilemma from that role, thereby enabling them to think about various stakeholder perspectives. The Ethical Data Assistant helps data analysts, project managers and policymakers to collaboratively think about the ethical questions involved in data projects.

Why read it?

Getting started with SFLA in your institution and want to spark the conversation with various stakeholders? The Dilemma Game and the Ethical Data Assistant are two concrete tools to engage in that conversation in a structured yet playful way.

Note: According to the website, If you are running a workshop and want to have a physical set of cards then contact: studiedata@surf.nl

Learning analytics dashboards are increasingly becoming about learning and not just analytics - A systematic review

This paper presents a review of the design and implementation of SFLA in higher education. It focuses specifically on assessing whether the examples of SFLA are informed by pedagogical theory, to then determine how that theory influences the design and the impact of the LA interventions.

Why read it?

Institutions who are working on an SFLA solution may obtain inspiration on how to connect pedagogical principles to the design of SFLA. The paper also provides concrete design recommendations for SFLA.

IguideME: Supporting self-regulated learning and academic achievement with personalized peer-comparison feedback in higher education

This article explains in-depth how an SFLA (the IguideME dashboard, see here for the interview) was developed and evaluated, integrating personalized peer comparison, goals and motivation.

Why read it?

This article is an inspiring example of how an SFLA can be implemented, and how the project leaders dealt with all the facilitators and barriers. Furthermore, the project leaders invested considerably in setting up an elaborate evaluation plan, so that they can understand whether the SFLA has the desired effect, and continue to work on and improve the SFLA.

VizChat: Enhancing learning analytics dashboards with contextualised explanations using multimodal generative AI chatbots description

This paper introduces an open-source prototype chatbot designed to enhance Student-Facing Learning Analytics dashboards by providing AI-generated, contextualized explanations for visualizations. The case study demonstrates VizChat's capabilities in clarifying queries, personalizing responses, integrating multiple visualizations, and detailing data analysis processes. The aim is to improve the students' comprehension, without causing cognitive overload.

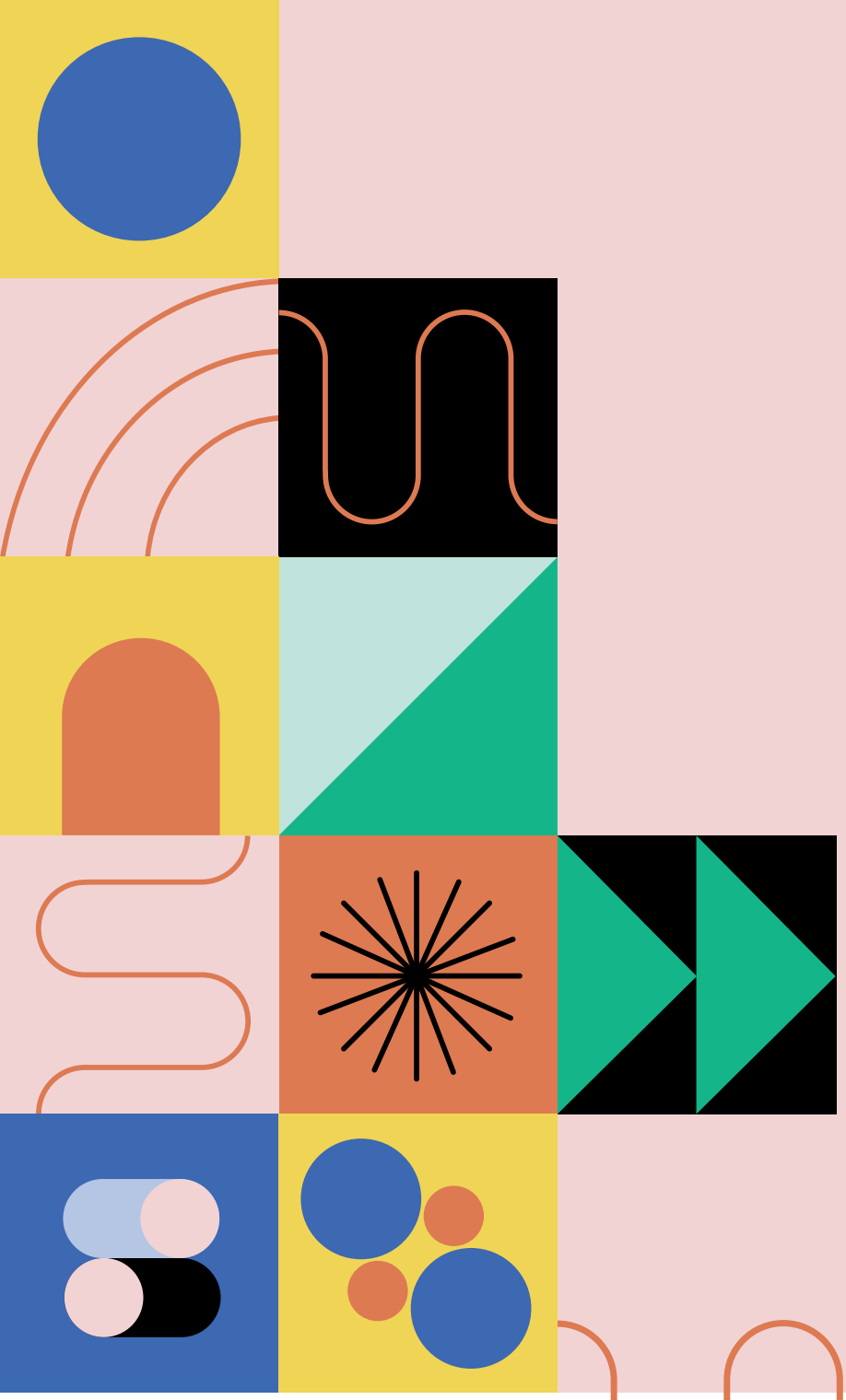
Why read it?

This article gives an idea of how integrating AI chatbots with Learning Analytics Dashboards (LADs) can shift the approach from exploratory to explanatory, improving the dashboards' educational value and usability.

Contact

We hope this magazine has been an inspirational read. If you have any questions or suggestions, we would be happy to hear from you. Please visit our project page for our contact details.

Npuls



Moving
education.