

# ASCILITE 2025

## Future-Focused:

*Educating in an Era of Continuous Change*

### Exploring inclusivity, transparency, explainability and agency in learning analytics dashboard design

**Daniel Hickmott, James Goulding, Erica Southgate, Tess Rendoth, Erika Spray, Mirella Atherton**

University of Newcastle, Australia

This concise paper reports on a work-in-progress research project that involves the design, development and testing of learning analytics dashboards (LADs) designed to actively promote students' and educators' agency. A set of design principles were developed through analysis of literature on student-facing LADs that related to principles of inclusivity, transparency, explainability and agency. This set of principles informed the design and development of a prototype simulated LAD used for research purposes with university students from equity and non-equity groups. This paper explains and illustrates how these design principles were translated into design features that empower students to take control of their learning and build their data literacy. This work addresses a key shortcoming of most current dashboards, highlighting the need to develop LAD designs that address the nexus between learner inclusivity, equity and agency.

*Keywords:* learning analytics, higher education, inclusivity, equity, agency, mixed methods

#### Introduction

Learning analytics dashboards (LADs) are becoming ubiquitous in higher education, particularly with the shift toward online learning (Masiello et al., 2024). LADs enable students and educators to view information and insights about their learning, with the goal being to better understand and improve learning outcomes (Selwyn & Gasevic, 2020). Consequently, one of the focuses of learning analytics and LADs has been on providing 'actionable insights', which Jørnø & Gynther (2018) define as "...results, trends and recommendation from analysis of learning data that can inform stakeholders to take action to improve learning" (p.199).

Despite their potential for fostering better learning outcomes, conventional LAD design raises significant concerns about students' equity and agency. These include privacy issues, a lack of transparency in terms of statistical models behind LADs, a focus on descriptive analytics, and limited stakeholder agency in interacting with or contesting data in LADs (Jones et al., 2020; Roberts et al., 2017; Susnjak et al., 2022). Additionally, while numerous studies of student and educator perspectives on LADs have been conducted, there has been limited research involving marginalised students' perspectives (Williamson & Kizilcec, 2022).

This paper reports on a work-in-progress study that evaluates simulated LAD design for research purposes (University of Newcastle Human Research Ethics Committee approval H-2025-0098). The research involves creating a set of simulated educator- and student-facing dashboards to explore interaction and understanding of LADs that reflect different design approaches. Four LADs have been designed. We have termed the first set of LADs as conventional. There is one conventional LAD for educators, and one for students. Conventional LADs limit interaction, customisation and have minimal transparency and explainability components, reflecting current design trends. The second set of educator- and student-facing dashboards, which we have termed agentic LADs, have been designed to empower educators and students to interact with, customise and personalise the system. University educators and students (from equity and non-equity groups) will be asked to respond to both a conventional and agentic LAD, with a talk-aloud protocol capturing their insights when comparing the two design approaches. Data literacy will also be explored as part of the study. This paper reports on how we translated principles of transparency, explainability, inclusion and agency into the design of the student-facing agentic LAD.

# ASCILITE 2025

## Future-Focused:

*Educating in an Era of Continuous Change*

### Literature review

**Trends in LAD research:** Research into the design and implementation of LADs is increasing, as is the use of LADs in practice (Kaliisa et al., 2024). Many learning management systems (LMSs) now include pre-designed educator- and student-facing LADs (Williamson & Kizilcec, 2022). Custom LADs have also been developed by researchers (Eickholt et al., 2022; Ramaswami et al., 2023). These custom LADs can integrate with existing LMSs and source data from multiple university systems. LAD data are analysed and presented in a variety of ways, including descriptive, diagnostic, prescriptive and predictive features (Jayashanka et al., 2022).

*Descriptive* features includes summaries, averages and frequencies (i.e. a student's average grade), *diagnostic* features provide explanations about why something happened or the relationship between data (i.e. a graph that shows the relationship between low attendance and low scores), *predictive* features use machine learning to provide analysis that make predictions based on past data (i.e. predicting a student's final grade in a course), and *prescriptive* features presents data with future recommendations (i.e. providing a student study recommendations for topics where they are scoring poorly). Descriptive analytics are most commonly used in LADs, while the other features appear less often, despite their potential to enhance the student learning experience (Susnjak et al., 2022). The effectiveness of current LAD design has been mixed (Masiello et al., 2024; Yan et al., 2024). Researchers have argued that students and instructors should be involved in the design of LADs and that this could improve their adoption (Shum et al., 2019) and effectiveness (Bayer et al., 2024).

**Inclusivity, transparency, and explainability for student agency in LADs:** Research indicates that diverse and underrepresented groups are rarely targeted for recruitment in LAD research (Sarmiento & Wise, 2022), even though principles of justice, equity, diversity, and inclusion (JEDI) remain important issues to be addressed to improve equity in education (Williamson & Kizilcec, 2022). Williamson & Kizilcec (2022) found that only two of the forty-five papers they reviewed adequately addressed JEDI issues. Other issues identified in research include students' concerns about their privacy and the extent of data collected for learning analytics (Roberts et al., 2016), the lack of transparency (Tzimas & Demetriadis, 2021) and customisation in LADs (Roberts et al., 2017), and reduced agency for students (Mavroudi, 2023).

Some students indicate that they are not aware of data being collected about them (Jones et al., 2020), while others believe that too much data is being collected (Roberts et al., 2016). This is related to the issue of *transparency* (Tzimas & Demetriadis, 2021) where students do not know who can view their analytics and do not know why or how data about them is generated. This, in turn, is related to the concept of the *explainability* of data representations and statistical and machine learning models (Memarian & Doleck, 2023), an area linked to data literacy. Combined, lack of transparency and explainability can negatively impact feelings of control and trust in LA; students may consider the presented information to be unreliable and/or not know whether recommendations are accurate. Students have also indicated a desire to *customise* LADs (Roberts et al., 2017) though customisation is not currently a common feature. Customisation is linked to learner control in digital environments.

Equity based LAD research has focussed on the concept of *agency* with the notion of *actionable insights* which is common in the LA literature. However, in the current LAD environment there are risks that stakeholder agency is being reduced (Arthars et al., 2019). For example, LAD stakeholders could be presented with information that is inaccurate and be unable to see or correct the data that information is sourced from (Mavroudi, 2023). Stakeholders have also expressed concern that providing prescriptive actions to students through LA can reduce agency by preventing students from leading their own learning (Roberts et al., 2016). Furthermore, there is a risk that LAD information may demotivate students, making them more likely to drop out of a course, rather than take action to improve their performance (Roberts et al., 2017). LADs that give recommendations and guidance to help students improve their performance are rare in the literature (Susnjak et al., 2022).

# ASCILITE 2025

## Future-Focused:

*Educating in an Era of Continuous Change*

### Translating inclusivity, transparency, and explainability into agentic LAD design

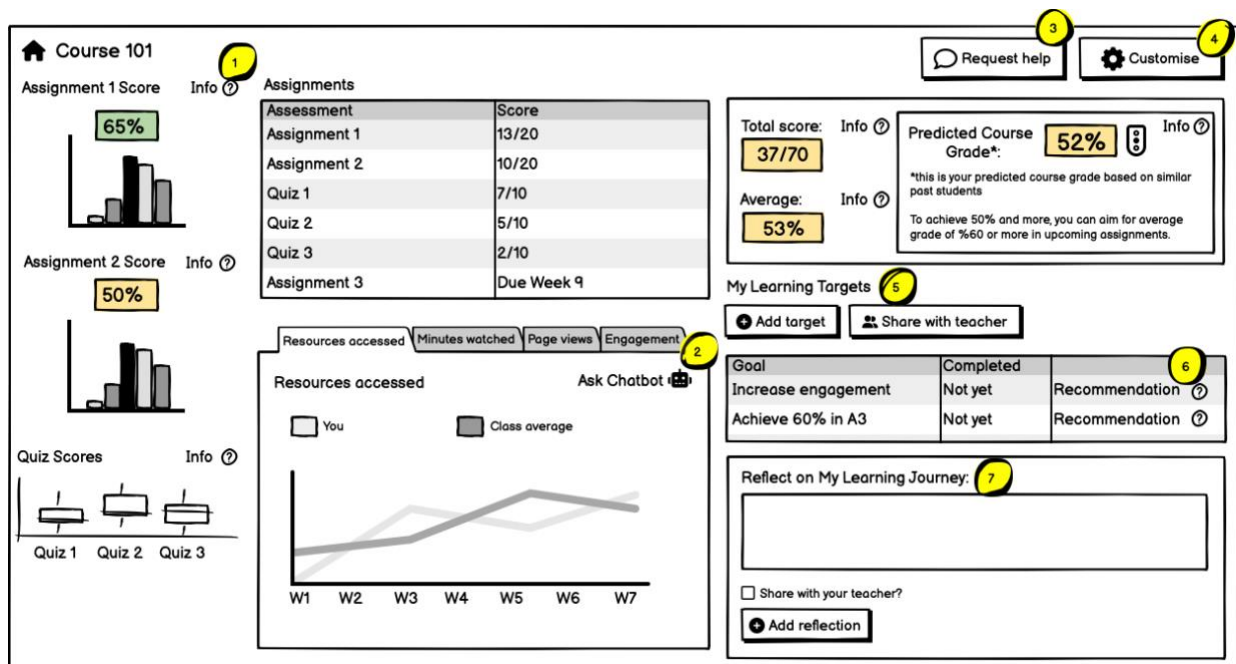
Principles for the agentic dashboard design were developed from issues identified in the literature.

*Transparency* involved explaining where the data used for analysis in the simulated LAD has been sourced and who could see data and graphs presented in the LAD. This principle is related to *explainability*, which included information on how machine learning algorithms have been used to calculate figures in the LAD, the meaning of graphs and how to interpret them. This was designed to develop data literacy. *Inclusivity* involved ensuring that the LAD was compatible with assistive technologies (such as screen readers) and the use of plain English text. Developing learner *agency* involved providing *action enablers*. Action enablers were features such as having the option to question the analyses and data being presented and customising the interface. It also allowed students to set their own learning targets and write personal learning reflections with the option of keeping these private or sharing these with their instructor. The action enabler features of the simulated LAD addressed the flawed assumption in many conventional LAD designs that by simply showing students data, that action towards improving learning will inevitably occur.

**Design Process:** Low and medium-fidelity prototypes were developed. Development was conducted in 2-week sprints. Every fortnight the team met, and the developer (the first author) presented and demonstrated the current version of the prototypes. The team has members with a wide range of expertise, in technology ethics, digital learning, educational psychology, special education, and privacy law. The team gave feedback related to translating the principles of inclusivity, transparency, explainability and agency into specific LAD features, which were then incorporated into the next version of the prototype.

Web development technologies (JavaScript, HTML and CSS) were used to create the medium-fidelity prototypes. Prototypes could be shared as a single HTML file, which allowed team members to test the prototypes between meetings and provide feedback. The key frameworks and libraries used to develop the medium-fidelity prototypes were:

- Charts.js: used to create charts on the medium-fidelity prototypes
- Vue: a JavaScript framework that can be used for developing user interfaces for web applications
- Vite with the vite-single-file plugin: a development server and plugin that allows the LAD prototype to be shared as a single HTML file that can be opened in a web browser
- Bootstrap: a set of CSS styles that can be used to quickly develop web sites



# ASCILITE 2025

## Future-Focused:

*Educating in an Era of Continuous Change*

Figure 1. A low-fidelity prototype version of the agentic student-facing dashboard

A low-fidelity version of the agentic student-facing dashboard, shown in Figure 1, was created using the Balsamiq Wireframes software. Figure 1 includes numbered annotations that highlight the features that address the principles of transparency, explainability, inclusivity and agency, which are explained in Table 2.

Table 2

*Explanations of the annotations in the low-fidelity agentic student-facing LAD*

Annotation	Notes
<b>Transparency and Explainability:</b>	
1	The “Info?” buttons open a popup that explains where the data to create the graph (or calculate a total or average score) has been sourced from, in plain English.
2	The “Ask Chatbot” button opens a chatbot dialogue window to the LAD user. In the medium-fidelity prototype, there are preset questions that the LAD users can use to ask questions about the data. In a higher fidelity prototype, these responses could be generated with a large language model (LLM).
<b>Action Enabler:</b>	
3	The <i>Request Help</i> button opens a popup that allows the LAD user to request help. The user can request four different types of help using a dropdown menu, for example: with course content, study skills, querying incorrect data and seeking further support.
4	<i>My Learning Targets</i> allows the user to select and share their own learning targets. The dropdown menu allows the user to choose targets, such as “increase course engagement” or “improve my total score”.
5	The “Recommendation?” buttons in the My Learning Target section can be clicked to open a popup that presents a recommendation to help the learner achieve their learning target/s.
6	The <i>Customise</i> button changes the appearance and layout of the LAD in three ways: hiding predictions and recommendations, hiding comparisons between the student and their class average, and change the colours of the LAD to a darker colour scheme.
7	This section allows the LAD user to take notes on their learning journey, encouraging them to reflect on their learning so far. The LAD user can choose to share this note with their teacher.

In terms of inclusivity, the text in the prototype is written in plain English and the prototype has high contrast colours. The medium-fidelity prototypes will be mapped against Web Content Accessibility Guidelines (WCAG).

## Conclusion

LADs hold the potential to improve learning outcomes for all students, but only if current equity, inclusivity, privacy and agency concerns are addressed. This paper reported on the development of a simulated agentic LAD prototype designed to reflect these principles. By designing a LAD prototype with features that directly reflect these principles, this study hopes to address the gap in research on how LADs can be effectively designed to empower users. Our next steps are to conduct interviews with university students and educators, which will involve having them undertake a data literacy survey before testing the different LAD prototypes with a talk-aloud protocol. Eye-gaze and event log data will also be collected during the sessions and triangulation used for analysis of the quantitative and qualitative data. The LAD design preferences of students from equity and non-equity groups will be compared. Results will inform the design and development of LADs that support students’ and teachers’ agency and address issues of privacy, equity and inclusivity. The study will also produce and disseminate guidelines for Australian universities considering the adoption or design of LADs.

# ASCILITE 2025

## Future-Focused:

*Educating in an Era of Continuous Change*

### References

- Bayer, V., Mulholland, P., Hlosta, M., Farrell, T., Herodotou, C., & Fernandez, M. (2024). Co-creating an equality diversity and inclusion learning analytics dashboard for addressing awarding gaps in higher education. *British Journal of Educational Technology*, 55(5), 2058–2074. <https://doi.org/10.1111/bjet.13509>
- Eickholt, J., Weible, J. L., & Teasley, S. D. (2022). Student-facing Learning Analytics Dashboard: Profiles of Student Use. *Proceedings - Frontiers in Education Conference, FIE, 2022-October*. <https://doi.org/10.1109/FIE56618.2022.9962531>
- Jayashanka, R., Hettiarachchi, E., & Hewagamage, K. P. (2022). Technology Enhanced Learning Analytics Dashboard in Higher Education. *The Electronic Journal of E-Learning*, 20(2), 151–170. [www.ejel.org](http://www.ejel.org)
- Jones, K. M. L., Asher, A., Goben, A., Perry, M. R., Salo, D., Briney, K. A., & Robertshaw, M. B. (2020). “We’re being tracked at all times”: Student perspectives of their privacy in relation to learning analytics in higher education. *Journal of the Association for Information Science and Technology*, 71(9), 1044–1059. <https://doi.org/10.1002/asi.24358>
- Jørnø, R. L., & Gynther, K. (2018). What Constitutes an ‘Actionable Insight’ in Learning Analytics? *Journal of Learning Analytics*, 5(3). <https://doi.org/10.18608/jla.2018.53.13>
- Kaliisa, R., Misiejuk, K., López-Pernas, S., Khalil, M., & Saqr, M. (2024). Have Learning Analytics Dashboards Lived Up to the Hype? A Systematic Review of Impact on Students’ Achievement, Motivation, Participation and Attitude. *ACM International Conference Proceeding Series*, 295–304. <https://doi.org/10.1145/3636555.3636884>
- Masiello, I., Mohseni, Z., Palma, F., Nordmark, S., Augustsson, H., & Rundquist, R. (2024). A Current Overview of the Use of Learning Analytics Dashboards. In *Education Sciences* (Vol. 14, Issue 1). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/educsci14010082>
- Mavroudi, A. (2023). Challenges and Recommendations on the Ethical Usage of Learning Analytics in Higher Education. In O. , Viberg & Å. Grönlund (Eds.), *Practicable Learning Analytics. Advances in Analytics for Learning and Teaching* (pp. 193–206). Springer, Cham. [https://doi.org/10.1007/978-3-031-27646-0\\_11](https://doi.org/10.1007/978-3-031-27646-0_11)
- Memarian, B., & Doleck, T. (2023). Fairness, Accountability, Transparency, and Ethics (FATE) in Artificial Intelligence (AI) and higher education: A systematic review. *Computers and Education: Artificial Intelligence*, 5. <https://doi.org/10.1016/j.caeai.2023.100152>
- Ramaswami, G., Susnjak, T., & Mathrani, A. (2023). Effectiveness of a Learning Analytics Dashboard for Increasing Student Engagement Levels. *Journal of Learning Analytics*, 10(3), 115–134. <https://doi.org/10.18608/jla.2023.7935>
- Roberts, L. D., Howell, J. A., Seaman, K., & Gibson, D. C. (2016). Student attitudes toward learning analytics in higher education: “The fitbit version of the learning world.” *Frontiers in Psychology*, 7(DEC). <https://doi.org/10.3389/FPSYG.2016.01959>
- Roberts, L. D., Howell, J. A., Seaman, K., & Roberts LynneRoberts, L. D. (2017). *Give Me a Customizable Dashboard: Personalized Learning Analytics Dashboards in Higher Education*. 22, 317–333. <https://doi.org/10.1007/s10758-017-9316-1>
- Selwyn, N., & Gasevic, D. (2020). The datafication of higher education: discussing the promises and problems. *Teaching in Higher Education*, 25(4), 527–540. <https://doi.org/https://doi.org/10.1080/13562517.2019.1689388>
- Shum, S. B., Ferguson, R., & Martinez-Maldonado, R. (2019). Human-centred learning analytics. *Journal of Learning Analytics*, 6(2), 1–9. <https://doi.org/10.18608/jla.2019.62.1>
- Slade, S., Prinsloo, P., & Khalil, M. (2019). Learning analytics at the intersections of student trust, disclosure and benefit. *ACM International Conference Proceeding Series*, 235–244. <https://doi.org/10.1145/3303772.3303796>
- Susnjak, T., Ramaswami, G. S., & Mathrani, A. (2022). Learning analytics dashboard: a tool for providing actionable insights to learners. *International Journal of Educational Technology in Higher Education*, 19(1). <https://doi.org/10.1186/s41239-021-00313-7>
- Tzimas, D., & Demetriadis, S. (2021). Ethical issues in learning analytics: a review of the field. *Educational Technology Research and Development*, 69(2), 1101–1133. <https://doi.org/10.1007/s11423-021-09977-4>
- Williamson, K., & Kizilcec, R. (2022). A Review of Learning Analytics Dashboard Research in Higher Education: Implications for Justice, Equity, Diversity, and Inclusion. *ACM International Conference Proceeding Series*, 260–270. <https://doi.org/10.1145/3506860.3506900>

# ASCILITE 2025

## Future-Focused:

*Educating in an Era of Continuous Change*

Yan, L., Zhao, L., Echeverria, V., Jin, Y., Alfredo, R., Li, X., Gašević, D., & Martinez-Maldonado, R. (2024).

VizChat: Enhancing Learning Analytics Dashboards with Contextualised Explanations Using Multimodal Generative AI Chatbots. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 14830 LNAI, 180–193.

[https://doi.org/10.1007/978-3-031-64299-9\\_13](https://doi.org/10.1007/978-3-031-64299-9_13)

Hickmott, D., Goulding, J., Southgate, E., Rendoth, T., Spray, E. & Atherton, M. (2025). Exploring inclusivity, transparency, explainability and agency in learning analytics dashboard design. In S. Barker, S. Kelly, R. McInnes & S. Dinmore (Eds.), *Future-focused: Educating in an era of continuous change*. Proceedings ASCILITE 2025. Adelaide (pp. 320-325) <https://doi.org/10.65106/apubs.2025.2669>

Note: All published papers are refereed, having undergone a double-blind peer-review process.

The author(s) assign a Creative Commons by attribution license enabling others to distribute, remix, tweak, and build upon their work, even commercially, as long as credit is given to the author(s) for the original creation.

© Hickmott, D., Goulding, J., Southgate, E., Rendoth, T., Spray, E. & Atherton, M. 2025