

Workshop Learning Analytics: Study Path and Curriculum Analytics

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Abstract: Learning analytics holds substantial potential for understanding learners and educational environments. Yet, the study of curriculum analytics and learner pathways is still a developing field, often limited to isolated studies of specific courses and programs. Researchers in Germany and the European Union face legal restrictions (e.g., GDPR) and data quality issues, which limit access to comprehensive data. These limitations hinder understanding factors influencing student success and study duration, which affects improving curricula. The workshop features expert presenters who offer diverse perspectives on these topics, sharing their insights, models, and tools to support stakeholders, including students, teachers, and university administrations. Subsequent discussions among the interdisciplinary participants from the German and Austrian areas highlight the current situation and pave the way for future curriculum analytics.


Keywords: Learning Analytics, Curriculum Analytics, Study Path Analytics


1 Introduction

In educational research, exploring study paths and curriculum analytics remains a nascent field, characterized predominantly by isolated efforts concentrated on specific courses or academic programs. The literature reveals a scant number of longitudinal studies emanating primarily from American universities, the findings of which are intrinsically confined to their original contexts, thereby limiting their applicability to other educational settings. Moreover, the methodologies and models employed in these studies have yet to undergo rigorous validation across a broad spectrum of subjects, disciplines, and institutions [Ga23, Sk19, Ar13, AA14].

Particularly in Germany and other European countries, researchers encounter formidable challenges—stemming from legal constraints such as the General Data Protection Regulation (GDPR), institutional policies, and issues about data quality—in accessing comprehensive enrollment and examination data for scholarly inquiry. This lack of data severely restricts academic faculties' ability to discern the myriad factors influencing student success and the duration of study at various junctures of the educational journey, especially for specific student demographics (e.g., [Ga23]).

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As a direct consequence of this information deficit, there is a significant impediment to the informed development and refinement of policies, curricula, and course designs to enhance the educational experience. Without a robust set of indicators, it becomes increasingly difficult to implement strategic adjustments that could potentially optimize student learning outcomes, manage teaching workloads more effectively, and improve the key performance metrics of academic departments.

During the 11th Learning Analytics Workshop, we aimed to convene a distinguished assembly of scholars from Germany, Austria, and Switzerland who share a keen interest in examining curricula, academic trajectories, or student attrition. This gathering was mainly aimed at individuals who have previously collected and analyzed relevant data or have created models, tools, and applications designed to aid students, educators, or university administrations.

2 Goals of the Workshop

The overall goals of this interdisciplinary workshop are (i) Networking of the Learning Analytics community in German-speaking countries to initiate research and joint projects as well as fostering network activities beyond this workshop; (ii) Presentation of current research projects and results by distinguished scholars; (iii) Enhancing the interdisciplinarity in the working group: e.g., computer sciences, artificial intelligence, mathematics, learning sciences, and psychology, as well as ethics and philosophy; (vi) Establishing a research network to be funded by the DFG.

3 Workshop Summary

The workshop took place as a full-day event with 20–25 participants. The workshop was divided into five presentations alternating with group discussions. The presentation slides and discussion notes are available online: <https://learning-analytics.eu/workshop-2024/programm-2024>.

In the first presentation, Stefan Krüger from the University of Bonn presented the *Kennda-tenportal*, a web-based platform for visualizing study path data. This tool generates real-time heat maps from a campus management system and allows the analysis of cohorts, modules, and exams. The portal has been used for decentralized program management for a decade and has been open-source since 2017, making it accessible to other universities. The talk also explored potential future developments of the system in learning analytics and artificial intelligence.

Kerstin Wagner from the Berlin University of Applied Sciences presented a course recommendation system designed to support students at risk of dropping out in the early semesters of their studies. The system uses an explainable nearest-neighbor algorithm to recommend

courses completed by similar students. The evaluation showed that the recommendations closely matched the courses taken by successful students, suggesting potential benefits for high-achieving students. The study revealed alternative learning paths for struggling students, highlighting differences between recommended and completed courses.

Niels Seidel of the FernUniversität in Hagen discussed the potential of learning path analytics in implementing a new learning analytics policy at his institution [Fe24, JGN23a, JGN23b]. The policy focuses on reducing dropout rates, providing personalized learning recommendations, and monitoring student activities. The talk outlined the critical components of the regulation and reflected on its implications for learning analytics research.

Sina Lenski from the German Institute for Adult Education (DIE, Bonn) presented research on the relationship between test anxiety and early warning signs of student dropout. The study examined how test anxiety influences critical academic decisions and how it may signal potential delays or dropouts. Therefore, four types of exam anxiety have been considered in a questionnaire: affective, cognitive, motivational, and physiological anxiety. The presentation encouraged deeper consideration of early indicators of educational challenges and invited discussion on interventions to mitigate these issues.

Finally, Stefan Janke from the University of Mannheim argued for integrating psychological indicators into study path analytics. His presentation emphasized the importance of moving beyond traditional metrics of persistence and performance by incorporating measures of psychological well-being, motivation, and identity formation into AI-assisted study orientation tools. He discussed how these indicators could improve the understanding of student success in longitudinal studies conducted within the project.

4 Outlook

The work on the topics discussed in the workshop is planned to continue as a DFG network. A corresponding proposal (working title: SPACE—Study Path Analytics for Cross-Institutional Higher Education) is in preparation. Interested parties can contact the workshop organizers.

Acknowledgements This research was supported by CATALPA - Center of Advanced Technology for Assisted Learning and Predictive Analytics of the FernUniversität in Hagen, Germany.

Literaturverzeichnis

- [AA14] Alauddin, Mohammad; Ashman, Adrian: The changing academic environment and diversity in students' study philosophy, beliefs and attitudes in higher education. *Higher Education Research & Development*, 33(5):857–870, 2014.
- [Ar13] Arnold, Ivo J M: Ethnic minority dropout in economics. *Journal of Further and Higher Education*, 37(3):297–320, 2013.

- [Fe24] FernUniversität in Hagen: Ordnung zur Einführung, zum Einsatz und zur Weiterentwicklung von Learning Analytics-Verfahren an der FernUniversität in Hagen (LAO) vom 07. Februar 2024. Amtliche Mitteilungen der FernUniversität in Hagen, (08/2024), 2024.
- [Ga23] Gardner, Joshua; Yu, Renzhe; Nguyen, Quan; Brooks, Christopher; Kizilcec, Rene: Cross-Institutional Transfer Learning for Educational Models: Implications for Model Performance, Fairness, and Equity. In: Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency. FAccT '23, Association for Computing Machinery, New York, NY, USA, S. 1664–1684, 2023.
- [JGN23a] Johannes, Paul C.; Geminn, Christian L.; Nebel, Maxi: Learning Analytics nach Satzung. Datenschutz und Datensicherheit - DuD, 47(11):715–720, 2023.
- [JGN23b] Johannes, Paul C.; Geminn, Christian L.; Nebel, Maxi: Learning Analytics nach Satzung: Rechtssicherer Einsatz durch Hochschulen. Datenschutz und Datensicherheit - DuD, 2023. Ausgabe 11/2023.
- [Sk19] Skaniakos, Terhi; Honkimäki, Sanna; Kallio, Eeva; Nissinen, Kari; Tynjälä, Päivi: Study guidance experiences, study progress, and perceived learning outcomes of Finnish university students. European Journal of Higher Education, 9(2):203–218, 2019.