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# Exploring the Use of Learning Analytics to Support High School History Class: A Pilot Study

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**Abstract:** This pilot study aims to find prospects and issues to use learning analytics dashboard for teachers in world historical inquiry-based class in high school. Analysis revealed high student engagement in page navigation but limited use of comprehension tools, suggesting passive learning. Integrating practice questions improved perceived learning. However, varied marker use indicated uneven metacognitive awareness, highlighting the need for strategies to support deeper cognitive engagement across all learners.

**Keywords:** Learning Analytics Dashboard, History class, Instructional design

## 1. Introduction

Ongoing formative assessment of knowledge acquisition and historical thinking is critical in secondary-level history education. Learning Analytics (LA) leverages log data to offer real-time insights, and Learning Analytics Dashboard (LAD) has demonstrated potential to enhance metacognitive regulation (Yamada et al., 2024). Empirical evidence for the implementation of LADs in high school history is scarce. This study aims to (1) visualize students' learning behaviors via LAD, (2) identify patterns that support historical understanding, and (3) propose data-informed instructional strategies.

## 2. Method

Over a three-week period, six Grade 11 world history lessons were conducted using iPads and the PDF viewing system B-QUBE. B-QUBE captured page navigations, red/yellow/blue marker use, handwritten annotations, and "Understood/Not understood" self-assessments, all visualized in a teacher-facing LAD. The Activity Monitor（AM） of the LAD aggregated class-level metrics, contrasted individual student behaviors with class averages, and plotted temporal annotation trends to reveal evolving comprehension (Geng & Yamada, 2025).

## 3. Results

The following learning logs were visualized through AM of the LAD during the six lessons (Table 1).

Table 1. Frequency of Learning Logs on B-QUBE Over Six Sessions

| Learning behavior | Total count | Average | SD |
|---|---|---|---|
| Page Changed | 6851 | 360.6 | 141.3 |
| Handwritten Memo Draw | 10647 | 560.4 | 446.4 |
| All | 251 | 13.2 | 16.3 |

| | | | | |
|---|---|---|---|---|
| Adding Marker (text) | Red(important) | 192 | 10.1 | 14.9 |
| | Blue(understand) | 54 | 2.8 | 5.6 |
| | Yellow(do not understand) | 5 | 0.3 | 0.8 |
| Clicking Response (page) | All | 152* | 8.0 | 10.5 |
| | Understand | 111 | 5.8 | 9.4 |
| | Not understand | 28 | 1.5 | 1.6 |

* Including frequency of closing response (13 times)

The teacher analyzed instructional design using the AM. Although students frequently navigated pages (M=242.2), use of comprehension tools—markers and response buttons—was low and variable (Markers: M=13.2; Responses: M=8.0), suggesting passive engagement due to prolonged explanation. Practice questions were added to promote active learning. Reflections after session five showed positive responses like “The questions were very helpful.” Note-taking was substantial (M=560.4), especially in teacher-emphasized sections. Heatmaps revealed increased notes on difficult geography content, prompting additional explanation. One student used 52 markers, far above the mean, highlighting the value of encouraging metacognitive awareness.

## 4. Discussion and Instructional Implications

Using the LAD for formative assessment, instructors refined materials iteratively. While analytics showed frequent page-turning and note-taking, low use of interactive tools (e.g., “Not understood” markers) suggested a teacher-centered model that limited self- and peer-regulated learning. Future designs should use detailed log and performance data to identify misunderstandings and offer tailored scaffolds. To promote higher-order historical thinking, LADs should support critical-reflection tasks linking factual content with conceptual frameworks (Seixas, 2017). Encouraging students to plan, monitor, and regulate their learning will further improve LAD utility (Yamada et al., 2016; Chen et al., 2023; Geng et al, 2024).

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## References

Chen, L., Geng, X., Lu, M., Shimada, A., & Yamada, M. (2023). How students use learning analytics dashboards in higher education: A learning performance perspective. Sage Open, 13(3).

Geng, X., Chen, L., Xu, Y., Ogata, H., Shimada, A., & Yamada, M. (2024). Learning behavioral patterns of students with varying performance in a high school mathematics course using an e-book system. Research and Practice in Technology Enhanced Learning, 19, 011.

Geng, X., & Yamada, M. (2025). Formative Evaluation of Teaching Analytics Dashboard. Proceedings of the 46th Annual Conference of Japan Society for Educational Technology (JSET) (pp. 557-558).

Seixas, P. (2017). A model of historical thinking. Educational Philosophy and Theory, 49(6), 593-605.

Yamada, M.,Okubo, F., Oi M., Shimada, A., Kojima, K., & Ogata, H. (2016). Learning Analytics in Ubiquitous Learning Environments: Self-Regulated Learning Perspective. Proceedings of International Conference on Computers in Education 2016, 306-314.

Yamada, M., Geng, X., Lu, M., & Taniguchi, Y. (2024). Exploring the Role of Metacognition in Enhancing Learning Outcomes through Learning Analytics Dashboard. In eLearn: World Conference on EdTech (pp. 294-301). Association for the Advancement of Computing in Education (AACE).