Koh, E., et al. (Eds.) (2026). Proceedings of the 2nd International Conference on Learning Evidence and Analytics. Asia-Pacific Society for Computers in Education.

Designing Reflective Learning Evidence for Older Adults: An Ethically Constrained AI-Supported Environment

Yoshiko NISHIMURA[a*], Masashi TODA [a], Hiroshi NAKANO [a] & Yoshiko GODA [a]
[a] *Graduate School of Instructional Systems, Kumamoto University, Japan*
*ynishimura@st.gsis.kumamoto-u.ac.jp

Abstract: As societies continue to age, sustaining reflective learning and health-related self-management among older adults has become a critical issue in lifelong learning. This study reports a design-oriented, practice-based investigation of a reflective learning environment developed alongside a community-based frailty prevention program. Rather than evaluating intervention effectiveness, the study examines how Learning Analytics can function as a design lens for structuring learner-generated reflective evidence. A simple digital reflection record system was implemented to accumulate weekly reflections on daily practices and perceived changes. Learning Analytics is treated not as post-hoc analysis but as the prior design of analyzable reflective traces. Artificial intelligence functions are deliberately limited to background organization of records without algorithmic interpretation or automated feedback. This limitation represents a theoretical position that rejects algorithmic interpretation in favor of human meaning-making, rather than a mere precaution for ethical sensitivity. The contribution lies in stabilizing reflective traces while preserving learner autonomy and ethical restraint in later-life learning contexts.

Keywords: reflective learning, older adults, learning analytics, instructional design, lifelong learning, AI-supported learning

1. Introduction

Population aging has intensified the need for educational approaches that support older adults in maintaining health-related practices and meaningful social participation. Reflective learning has been emphasized as a process through which individuals reinterpret experience and sustain self-directed development (e.g., Schön, 1983; Mezirow, 1991).

Specifically, older adults encounter technical and cognitive barriers such as complex procedures, burdensome input tasks, and anxiety about interpreting results (Czaja et al., 2006), which were also observed among participants in the present community-based program, including difficulties in completing input tasks independently and uncertainty in interpreting recorded information, as informally observed during the follow-up session. Recent research on artificial intelligence (AI) in education has focused on adaptation, optimization, and feedback. However, such interventions may weaken learner agency in meaning-making, which is essential in reflective learning. This study examines the significance of designing learning environments for older adults in which AI functions are constrained.

2. Design Framework and Research Positioning

2.1 Design-Oriented Perspective

This study is grounded in a design-oriented research perspective that prioritizes the conceptualization and construction of learning environments over the measurement of intervention effectiveness, treating the learning environment as a site for articulating and refining instructional principles rather than as a controlled experimental intervention.

Within this perspective, the primary contribution lies in explicating the instructional and ethical reasoning that shapes the system's structure. Decisions regarding simplicity, accessibility, and the constrained positioning of AI were informed by instructional design principles as well as gerontological considerations emphasizing autonomy, dignity, and non-intrusive support in later life contexts. This study explores how a minimally structured, ethically constrained AI-supported environment can support reflective learning among older adults.

2.2 Positioning of Learning Analytics

Learning analytics has traditionally developed as a method for prediction, optimization, and performance evaluation using learning data (Siemens, 2013; Ferguson, 2012). This study is positioned within learner-centered approaches to learning analytics, often referred to as Human-Centered Learning Analytics, that prioritize agency (Buckingham Shum & Ferguson, 2012).

Based on this perspective, this study reconceptualizes learning analytics not as an analytical method, but as a framework for designing record structures that support reflection. Rather than focusing on data analysis and optimization, this study emphasizes the prior design of reflective record structures.

Figure 1 illustrates the Learning Analytics–informed design logic of the reflective learning environment. Accordingly, this study adopts a position that reframes learning analytics from "analysis" to "design."

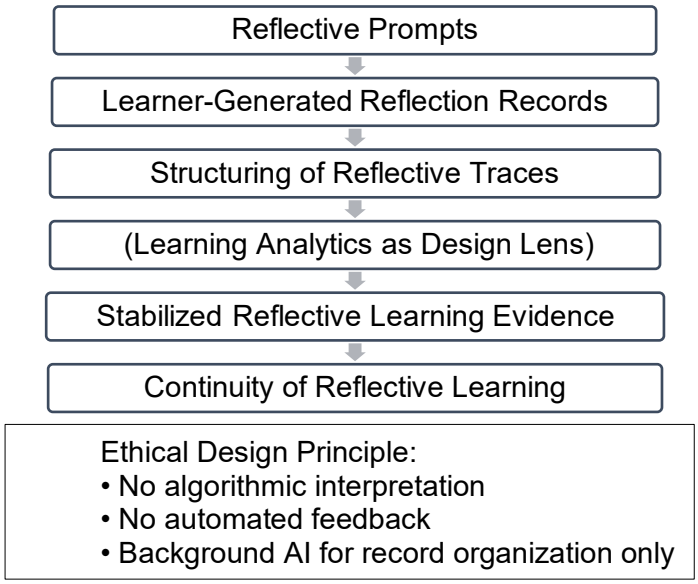

Figure 1. Learning Analytics–Informed Design of Reflective Learning Evidence.

3. AI-Supported Reflective Learning Environment

3.1 Structure of the Reflection Record System

A digital system was developed using Google Forms to record daily health-related practices, accessible via smartphones. Two participants who completed the program and agreed to provide follow-up data entered their reflections during a single face-to-face follow-up session conducted four months after the program, which were examined descriptively. Recording

items included daily practices, changes or challenges, and intentions for the following week, and the system was designed to allow participants to input and review their reflections through a simple, single-step interface accessible on smartphones, to minimize cognitive and operational load. A minimal, free-text format was adopted to reduce operational complexity while preserving learner agency (Czaja et al., 2006), and exploratory data from two participants who completed the community-based program included health-related actions, associated reflections, and subsequent intentions, suggesting that the system can support learners' meaning-making.

3.2 Constraints on AI and Ethical Positioning

In this study, AI is limited to organizing and storing learner-generated records, without providing interpretation or feedback. Reflective learning centers on the learner's own process of meaning-making (Schön, 1983), which may be weakened by external interpretation. External feedback may also undermine intrinsic motivation depending on its nature (Deci & Ryan, 2000) and does not enhance learning. These issues are particularly important for older adult learners, for whom meaning-making itself is central to learning. Delegating interpretation to AI may reduce opportunities for reflection. Accordingly, AI is positioned not as a decision-making agent but as an infrastructure that supports record-keeping while preserving learner agency. This design aligns with ethical perspectives that emphasize human autonomy in AI (Floridi et al., 2018).

4. Implications and Future Directions

The findings suggest that suggest that sustaining reflective learning among older adults may depend less on advanced AI interventions and more on accessible, ethically grounded record structures that support continuous self-reflection. From a Learning Analytics perspective, this study reconceptualizes learning analytics as a design-oriented framework rather than a post-hoc analytical method. Practically, minimal recording systems can support the continuity of reflective practice in community-based lifelong learning contexts. However, this study is exploratory and based on a limited number of participants, and it does not evaluate intervention effectiveness; therefore, the findings should be interpreted with caution.

Future research will examine the sustainability of reflective practices through longitudinal observation and refine design principles for ethically constrained AI use.

References

Buckingham Shum, S., & Ferguson, R. (2012). Social learning analytics. *Educational Technology & Society, 15*(3), 3–26.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging, 21*(2), 333–352. https://doi.org/10.1037/0882-7974.21.2.333.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01.

Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P., & Vayena, E. (2018). AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and Machines, 28*(4), 689–707. https://doi.org/10.1007/s11023-018-9482-5.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

Siemens, G. (2013). Learning analytics: The emergence of a discipline. *American Behavioral Scientist, 57*(10), 1380–1400. https://doi.org/10.1177/0002764213498851.